

RECOMBINANT ADENO ASSOCIATED VIRUS (rAAV) ENCODING GJB2 AND USES THEREOF

RELATED APPLICATIONS

[0001] This application claims priority under 35 U.S.C. § 119(e) to U.S. Provisional Application, U.S.S.N. 63/161,619, filed March 16, 2021, and to U.S. Provisional Application, U.S.S.N. 63/078,233, filed September 14, 2020, each of which is incorporated herein by reference.

FEDERALLY SPONSORED RESEARCH

[0002] This invention was made with Government support under DA048787 awarded by the National Institutes of Health. The Government has certain rights in the invention.

BACKGROUND

[0003] Loss of gap junction beta 2 (*GJB2*) expression in the inner ear underlies a disorder termed nonsyndromic Hearing Loss and Deafness, (DFNB1), characterized by recessive, mild-to-profound sensorineural hearing impairment. Many of these patients are born with profound hearing loss, which is probably irreversible even at birth. Two-thirds have some residual hearing at birth, and the majority of those lose hearing over the next few years. Therefore, these patients are potential candidates for treatment of DFNB1. Previous gene replacement therapy of *GJB2* failed to rescue hearing even though gene addition of the *GJB2* gene rescued cell survival and the gap junction network. Effective *GJB2* gene replacement therapy for hearing rescuing has not been developed.

SUMMARY

[0004] The present disclosure, at least in part, relates to an isolated nucleic acid comprising an expression cassette, wherein the expression cassette comprises a gap junction beta 2 (*GJB2*) gene regulatory element (GRE), and a nucleotide sequence encoding a GJB2 protein. In some embodiments, the expression cassette further comprises a promoter (*e.g.*, *GJB2* promoter). In some embodiments, the expression cassette is flanked by two adeno-associated virus (AAV) inverted terminal repeats (ITRs). The presence of native *GJB2* regulatory elements (GREs) in the isolated nucleic acid prevents promiscuous *GJB2* gene expression in the inner ear, which is toxic and damages hearing. Accordingly, in some embodiments, the isolated nucleic acid described herein is capable of expressing the GJB2 protein in inner ear

cells that normally express the *GJB2* gene (e.g., connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions), but not in the cell that do not normally express *GJB2* (e.g., hair cells and spiral ganglion neurons).

[0005] In some aspects, the present disclosure provides an isolated nucleic acid comprising an expression cassette, wherein the expression cassette comprises a gap junction beta 2 (*GJB2*) gene regulatory element (GRE), and a nucleotide sequence encoding a GJB2 protein.

[0006] In some embodiments, the GJB2 protein is a human GJB2 protein. In some embodiments, the GJB2 protein comprises an amino acid sequence at least 80% identical to SEQ ID NO: 1. In some embodiments, the nucleotide sequence encoding a human GJB2 protein comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 2.

[0007] In some embodiments, the expression cassette further comprises a promoter operably linked to the nucleotide sequence encoding a GJB2 protein. In some embodiments, the promoter is a human *GJB2* promoter. In some embodiments, the promoter comprises 500 nucleotides of a human *GJB2* promoter. In some embodiments, the promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 5. In some embodiments, the promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 102. In some embodiments, the promoter comprises a nucleic acid sequence 100% identical to SEQ ID NO: 102.

[0008] In some embodiments, the promoter is a human *GJB2* basal promoter. In some embodiments, the human GJB2 basal promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 47.

[0009] In some embodiments, the expression cassette comprises a nucleotide sequence encoding a 5' UTR. In some embodiments, the 5' UTR is positioned between the promoter and the nucleotide sequence encoding the GJB2 protein. In some embodiments, the 5' UTR comprises about 300 nucleotides of a human *GJB2* gene 5' UTR. In some embodiments, the promoter and the 5' UTR comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 30.

[0010] In some embodiments, the *GJB2* gene regulatory element comprises an enhancer. In some embodiments, the enhancer is positioned 5' to the promoter. In some embodiments, the enhancer is normally present within approximately 200 kb upstream or downstream of a *GJB2* gene. In some embodiments, the enhancer is normally present within approximately 95 kb of a *GJB2* gene. In some embodiments, the *GJB2* GRE comprises one or more enhancers. In some embodiments, the one or more enhancers are the same enhancers or different enhancers. In some embodiments, the enhancer comprises a nucleotide sequence at least 80%

identical to nucleotide sequence or a fragment thereof as set forth in any one of SEQ ID NOs: 6 to 29. In some embodiments, the enhancer comprises a nucleotide sequence at least 80% identical to a *GJB2* enhancer as set forth in any of SEQ ID NOs: 37-46 and 55-60. In some embodiments, the enhancer comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 42.

[0011] In some aspects, the present disclosure also provides an isolated nucleic acid comprising an expression cassette, wherein the expression cassette comprises a Gap Junction beta 2 (*GJB2*) promoter, and a nucleotide sequence encoding a *GJB2* protein.

[0012] In some embodiments, the *GJB2* promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 102. In some embodiments, the *GJB2* promoter comprises a nucleic acid sequence 100% identical to SEQ ID NO: 102.

[0013] In some embodiments, the expression cassette further comprises a 5' UTR. In some embodiments, the 5' UTR comprises: a first nucleic acid sequence at least 80% identical to SEQ ID NO: 103; and/or a second nucleic acid sequence at least 80% identical to SEQ ID NO: 104. In some embodiments, the expression cassette further comprises a 5' UTR. In some embodiments, the 5' UTR comprises: a first nucleic acid sequence 100% identical to SEQ ID NO: 103; and/or a second nucleic acid sequence 100% identical to SEQ ID NO: 104.

[0014] In some embodiments, the isolated nucleic acid comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 105. In some embodiments, the isolated nucleic acid comprises a nucleic acid sequence 100% identical to SEQ ID NO: 105.

[0015] In some embodiments, the isolated nucleic acid is capable of expressing *GJB2* in cells that normally express the *GJB2* gene. In some embodiments, the isolated nucleic acid is capable of expressing *GJB2* in cochlear connective tissue cells and supporting cells of the organ of Corti. In some embodiments, the supporting cell of the organ of Corti are pillar cells, Deiter cells, Hensen's cells, Claudius cells, inner phalangeal cells, and border cells. In some embodiments, the cochlear connective tissue cells are strial intermediate cells, fibrocytes of the lateral wall and supраstrial zone, basal cells of the stria vascularis, fibrocytes in the spiral ligament, fibrocytes in the spiral limbus, mesenchymal cells lining the bony otic capsule facing the scala vestibuli, and supralimbal dark cells.

[0016] In some embodiments, the expression cassette is flanked by two adeno-associated virus inverted terminal repeats (ITRs). In some embodiments, the AAV ITR is from a serotype selected from the group consisting of AAV1 ITR, AAV2 ITR, AAV3 ITR, AAV4 ITR, AAV5 ITR, and AAV6 ITR. In some embodiments, the AAV ITR is AAV2 ITR.

[0017] In some embodiments, the expression cassette comprises: a 5' ITR having a nucleotide sequence at least 80% identical to SEQ ID NO: 106; and/or a 3' ITR having a nucleotide sequence at least 80% identical to SEQ ID NO: 107. In some embodiments, the expression cassette comprises: a 5' ITR having a nucleotide sequence 100% identical to SEQ ID NO: 106; and/or a 3' ITR having a nucleotide sequence 100% identical to SEQ ID NO: 107.

[0018] In some embodiments, the expression cassette further comprises a Woodchuck Hepatitis Virus (WHP) Posttranscriptional Regulatory Element (WPRE) 3' to the nucleotide sequence encoding the GJB2 protein.

[0019] In some embodiments, the WPRE comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 108. In some embodiments, the WPRE comprises a nucleotide sequence 100% identical to SEQ ID NO: 108.

[0020] In some embodiments, the expression cassette further comprises a nucleotide sequence encoding a 3' UTR located 5' of the WPRE. In some embodiments, the 3' UTR is a *GJB2* exon 2 3' UTR. In some embodiments, the *GJB2* exon 2 3' UTR comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 32.

[0021] In some embodiments, the expression cassette further comprises one or more miRNA binding site positioned in the 3' UTR. In some embodiments, the miRNA binding site is a neuron-associated miRNA binding site. In some embodiments, the neuron-associated miRNA is selected from: miR-124, miR-127, miR-129, miR-129*, miR-136, miR-136*, miR-137, miR-154, miR-300-3p, miR-323, miR-329, miR-341, miR-369-5p, miR-376a, miR-376b-3p, miR-376c, miR-379, miR-382, miR-382*, miR-410, miR-411, miR-433, miR-434, miR-495, miR-541, miR-543*, miR-551b, miR-143, miR-449a, miR-219-2-3p, miR-126, miR-126*, miR-141, miR-142-3p, miR-142-5p, miR-146a, miR-150, miR-200c, and miR-223. In some embodiments, the neuron-associated miRNA is miR-124. In some embodiments, the miRNA binding site is a cochlear hair cell-associated miRNA binding site. In some embodiments, the cochlear hair cell-associated miRNA binding site is selected from: miR-124, miR-96, miR-182, and miR-183.

[0022] In some embodiments, the expression cassette further comprises a poly A signal. In some embodiments, the poly A signal is a bovine growth hormone poly A signal.

[0023] In some embodiments, the poly A signal comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 109. In some embodiments, the poly A signal comprises a nucleotide sequence 100% identical to SEQ ID NO: 109.

[0024] In some aspects, the present disclosure also provides an isolated nucleic acid comprising a nucleotide sequence 100% identical to SEQ ID NO: 110 or 111. In some

aspects, the present disclosure also provides an isolated nucleic acid comprising a nucleotide sequence at least 80% identical to SEQ ID NO: 110 or 111.

[0025] In some aspects, the present disclosure also provides a vector comprising the isolated nucleic acid as described herein. In some embodiments, the vector is a plasmid or a viral vector. In some embodiments, the viral vector is an AAV vector.

[0026] In some aspects, the present disclosure also provides a vector comprising from 5' to 3': (a) an AAV 5' ITR; (b) a *GJB2* promoter, or a basal *GJB2* promoter sequence thereof; (c) a *GJB2* 5' UTR (e.g., a *GJB2* exon 1 5' UTR); (d) a nucleotide sequence encoding a *GJB2* protein; (e) a *GJB2* 3' UTR (e.g., a *GJB2* exon 2 3' UTR), optionally the *GJB2* 3' UTR comprises one or more miR-124 binding site; (f) a bovine growth hormone poly A signal; and (g) an AAV 3' ITR.

[0027] In some aspects, the present disclosure also provides a vector comprising from 5' to 3': (a) an AAV 5' ITR; (b) a *GJB2* enhancer; (c) a *GJB2* promoter, or a basal *GJB2* promoter sequence thereof; (d) a *GJB2* 5' UTR (e.g., a *GJB2* exon 1 5' UTR); (e) a nucleotide sequence encoding a *GJB2* protein; (f) a *GJB2* 3' UTR (e.g., a *GJB2* exon 2 3' UTR), optionally the *GJB2* 3' UTR comprises one or more miR-124 binding site; (g) a bovine growth hormone poly A signal; and (h) an AAV 3' ITR.

[0028] In some embodiments, the vector comprises a nucleotide sequence at least 80% identical to any one of SEQ ID NOs: 36, 48-62 and 61-83. In some embodiments, the vector is an AAV vector. In some embodiments, the vector is capable of expressing a *GJB2* gene in cells that normally express *GJB2*.

[0029] In some aspects, the present disclosure also provides a recombinant adeno-associated virus (rAAV) comprising: (i) a capsid protein; and (ii) the isolated nucleic acid described herein.

[0030] In some aspects, the present disclosure also provides a recombinant adeno-associated virus (rAAV) comprising: (i) a capsid protein; and (ii) an isolated nucleic acid comprising: (a) an AAV 5' ITR (e.g., a *GJB2* exon 1 5' UTR); (b) a *GJB2* promoter, or a basal *GJB2* promoter sequence thereof; (c) a *GJB2* 5' UTR (e.g., a *GJB2* exon 2 3' UTR), optionally the *GJB2* exon 2 3' UTR comprises one or more miR-124 binding site; (d) a nucleotide sequence encoding a *GJB2* protein; (e) a *GJB2* 3' UTR; (f) a bovine growth hormone poly A signal; and (g) an AAV 3' ITR.

[0031] In some aspects, the present disclosure also provides a recombinant adeno-associated virus (rAAV) comprising: (i) a capsid protein; and (ii) an isolated nucleic acid comprising: (a) an AAV 5' ITR; (b) a *GJB2* enhancer; (c) a *GJB2* promoter, or a basal *GJB2* promoter

sequence thereof; (d) a *GJB2* 5' UTR (e.g., a *GJB2* exon 1 5' UTR); (e) a nucleotide sequence encoding a *GJB2* protein; (f) a *GJB2* 3' UTR (e.g., a *GJB2* exon 2 3' UTR), optionally the *GJB2* exon 2 3' UTR comprises one or more miR-124 binding site; (g) a bovine growth hormone poly A signal; and (h) an AAV 3' ITR.

[0032] In some embodiments, the rAAV has tropism for a subset of cochlea cells that normally express the *GJB2* gene. In some embodiments, the rAAV has tropism for cells of the inner ear.

[0033] In some embodiments, the capsid protein is an AAV1 capsid protein, an AAV2 capsid protein, an AAV5 capsid protein, an AAV7 capsid protein, an AAV8 capsid protein, an AAV9 capsid protein, an AAV-S capsid protein, or a variant thereof. In some embodiments, the AAV capsid is AAV9.PHP.B, AAV9.PHP.eB, or AAV-S. In some embodiments, the AAV capsid protein is AAV-S.

[0034] In some aspects, the present disclosure provides a host cell comprising the isolated nucleic acid, the vector, or the rAAV as described herein.

[0035] In some aspects, the present disclosure provides a pharmaceutical composition comprising the isolated nucleic acid, the vector, the rAAV, or the host cell as described herein. In some embodiments, the pharmaceutical composition further comprises a pharmaceutically acceptable carrier.

[0036] In some aspects, the present disclosure provides a method for specifically expressing *GJB2* in cells that normally expresses the *GJB2* gene in a subject, the method comprising administering to the subject an effective amount of the isolated nucleic acid, the vector, the rAAV, the host cell, or the pharmaceutical composition as described herein.

[0037] In some aspects, the present disclosure provides a method for treating Non-syndromic Hearing Loss and Deafness (DFNB1) in a subject, the method comprising administering to the subject an effective amount of the isolated nucleic acid, the vector, the rAAV, the host cell, or the pharmaceutical composition as described herein.

[0038] A method for treating a *GJB2*-associated disease in a subject in need thereof, the method comprising administering to the subject an effective amount of the isolated nucleic acid, the vector, the rAAV, the host cell, or the pharmaceutical composition as described herein.

[0039] In some embodiments, the subject is a mammal. In some embodiments, the mammal is a human. In some embodiments, the mammal is a non-human mammal. In some embodiments, the non-human mammal is mouse, rat, or non-human primate.

[0040] In some embodiments, the hearing loss is associated with a mutation in the *GJB2*

gene. In some embodiments, the mutation in the *GJB2* gene is a point mutation, a missense mutation, a nonsense mutation, a splice-altering mutation, a synonymous mutation, a deletion, an insertion, or a combination thereof. In some embodiments, the subject is human; and the mutation is a mutation listed in Table 2 (below) or a combination thereof. In some embodiments, the mutation is NM_004004.6 c.101T>C (GRCh37/hg19 Chr13:20763620A>G) or c.35delG (GRCh37/hg19 chr13:20763685AC>A).

[0041] In some embodiments, the administration results in expression of GJB2 protein in the cochlea connective tissue cells and supporting cells of the organ of Corti and nearby regions. In some embodiments, the supporting cell of the organ of Corti are pillar cells, Deiters' cells, Hensen's cells, Claudius cells, inner phalangeal cells, and border cells. In some embodiments, the connective tissue cells are strial intermediate cells, fibrocytes of the lateral wall and supracristal zone, basal cells of the stria vascularis, fibrocytes in the spiral ligament, fibrocytes in the spiral limbus, mesenchymal cells lining the bony otic capsule facing the scala vestibuli, and supralimbal dark cells.

[0042] In some embodiments, the administration is via injection. In some embodiments, the injection is through round window membrane of the cochlea, into the scala media of the cochlea, into the scala tympani of the cochlea, into the scala vestibuli of the cochlea, into a semicircular canal of the inner ear, or into the saccule or the utricle of the inner ear.

[0043] The details of one or more embodiments of the invention are set forth in the description below. Other features or advantages of the present invention will be apparent from the following drawing and detailed description of certain embodiments and also from the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0044] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate certain embodiments, and together with the written description, serve to provide non-limiting examples of certain aspects of the compositions and methods disclosed herein.

[0045] **FIGs. 1A-1C** show the structure and expression distribution of GJB2, and how loss of *GJB2* expression affects the patients. **FIG. 1A** shows the structure of the GJB2 hemichannel. Six subunits of GJB2 protein, each with four trans-membrane helices, assemble in the plane of the membrane to form a large central pore. GJB2 hemichannels from adjacent cells join to create a channel from the cytoplasm of one cell to the cytoplasm of the other. Gap junctions are formed by hundreds or thousands of channels packed in a junctional plaque. **FIGs. 1B-1C**

show the network of fibrocytes and epithelial cells in which *GJB2* is expressed (FIG. 1B), and the inner and outer hair cells, in which *GJB2* is not expressed (FIG. 1C). **FIG. 1D** shows that many patients carrying *GJB2* mutation(s) who have some residual hearing at birth show further hearing loss over the next 3-6 years. A window for treatment is present for 1-5 years after birth. with ~10,000 affected children in the United State aged 0-5 possibly treatable.

[0046] FIGs. 2A-2B show the delivery of viral vector to the cochlea by direct injection through the round window membrane (RWM) and the deleterious effect of promiscuous expression of *Gjb2* to the hearing of injected mice. **FIG. 2A** is a cartoon illustrating the round window membrane (RWM) injection. **FIG. 2B** shows that promiscuous expression of *Gjb2* in the inner ear damaged hearing in wild-type mice.

[0047] FIGs. 3A-3N show the identification of cis-regulatory elements (*e.g.*, enhancers) that are critical for *GJB2* expression in the subset of cochlea cells that naturally express the *GJB2* gene. **FIGs. 3A-3B** show that certain patients with *GJB2*-associated deafness have upstream deletions occurring in trans with *GJB2* coding sequence mutations, which suggests that some patients carry mutation(s) in the cis-regulatory element, and the region next to the *CRYL1* gene is of particular importance for identification of such cis-regulatory elements. **FIG. 3C** (top) shows the identification of gene regulatory elements (GREs), in UCSC Genome Browser views of ATAC-Seq from mouse cochlea at developmental stages P2, P5 and P8, over ~300 kb in the region of the mouse *Gjb2* gene. Shaded regions mark regions containing putative GREs. X-axis is the genomic region on chr14 in the mouse genome. Y-axis is the number of reads from the ATAC- Seq that align to a specific region in the genome. Light shading denotes regions of open chromatin, which are the hallmarks of transcriptionally active regions that are enriched for read pile up, suggesting higher activity in these regions. Regions A and B mark the transcriptionally active sequences within mouse *Gjb2* itself. Regions C-M are regions that are transcriptionally active around *Gjb2* that might be part of a cis-regulatory network. **FIG. 3C** (bottom) shows transcriptionally active regions in and around the light-shaded regions that have been tested as specific GREs (dark highlight). Note that the GREs were initially identified in mouse. Human *GJB2* GREs were identified *in silico* by modeling the mouse GREs. Human *GJB2* GREs were tested in subsequent experiments. **FIGs. 3D-3E** show various vector designs with or without incorporation of *GJB2* promoter and/or enhancers. These vectors were tested in mouse inner ear. The C15 vector, which is the *GJB2* enhancer vector, concatenates 500 bp of the human *GJB2* promoter, the human *GJB2* 5' UTR followed by a coding sequence for GFP and human *GJB2* 3' UTR, and three human *GJB2* enhancers that match mouse sequences identified by ATAC-seq. Vectors c20-23 were

constructed to test the toxicity of promiscuous expression of *Gjb2* in mouse. Vector c20 was lethal at doses over 2×10^9 genomic copies. **FIG. 3F** shows a segment of the mouse cochlea, from the lateral wall (top) to the interdental cells (bottom). Cells transduced with the AAV9-PHP.B-C15 vector and expressing the GFP marker gene under *Gjb2* enhancers are shown in the left panel. Cells normally expressing *GJB2* are shown in the middle panel. In the right panel, IHCs and OHCs (indicated) are also identified by labeling actin with fluorescent phalloidin. The expression pattern of GFP, which was driven by the c15 construct, is consistent with native *Gjb2* expression reported in Kikuchi *et al.*, 1995 using the same antibody against GJB2. Notably, c15 does not drive GFP expression in hair cells. **FIG. 3G** shows the expression of *Gjb2* in inner hair cells driven by construct c20. 3D reconstruction of the organ of Corti in an uninjected mouse cochlea, with outer hair cells and inner hair cells is shown in the top panel. GJB2-containing gap junctions in supporting cells were labeled with an antibody to GJB2 protein. Hair cells do not make gap junctions. Vector c20, with a promiscuous promoter, drives *GJB2* expression in inner hair cells and other cell types (see bottom panel). **FIG. 3H** shows that promiscuous *Gjb2* expression damages hearing in wild-type mice, but targeted expression rescues hearing in *Gjb2* knockout mice. However, a C70 construct, which includes *GJB2* promoter/enhancer based on preliminary results from the ATAC-Seq, was capable of rescuing hearing by 15-20 dB, and did *not* damage hearing in the wild-type. **FIGs. 3I-3L** shows the map of the c70 vector plasmid encoding mouse GJB2 or human GJB2 with or without an HA tag. **FIG. 3M** shows schematics of vector c.70 encoding mouse GJB2 or human GJB2 with or without the HA tag. **FIG. 3N** shows additional vectors that were created and tested.

[0048] FIG. 4 shows that AAV-S encoding eGFP with a CBA promoter efficiently transduces hair cells, supporting cells, and cells of the lateral wall, in both neonatal mouse and juvenile NHP cochlea.

[0049] FIGs. 5A-5V show vector maps of the AAV vectors including the identified *GJB2* GREs 1, 2, 3, 4, 5, 7, 8, and 9, respectively. The vectors include, from 5' to 3', a 5' ITR, a human *GJB2* GRE, a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, a nucleotide sequence encoding an eGFR, and *GJB2* exon 2 3' UTR. **FIG. 5A** shows vector c.81.1, which includes human *GJB2* GRE1, and encodes human GJB2; **FIG. 5B** shows vector c.81.1, which includes human *GJB2* GRE1, and encodes mouse GJB2; **FIG. 5C** shows vector c.81.2, which includes human *GJB2* GRE2, and encodes eGFP; **FIG. 5D** shows vector c.81.2, which includes human *GJB2* GRE2, and encodes human GJB2; **FIG. 5E** shows vector c.81.2, which includes human *GJB2* GRE2, and encodes mouse GJB2; **FIG. 5F** shows vector c.81.3, which

includes human *GJB2* GRE3, and encodes eGFP; **FIG. 5G** shows vector c.81.3, which includes human *GJB2* GRE3, and encodes human *GJB2*; **FIG. 5H** shows vector c.81.3, which includes human *GJB2* GRE3, and encodes mouse *GJB2*; **FIG. 5I** shows vector c.81.4, which includes human *GJB2* GRE4, and encodes human *GJB2*; **FIG. 5J** shows vector c.81.4, which includes human *GJB2* GRE4, and encodes mouse *GJB2*; **FIG. 5K** shows vector c.81.5, which includes human *GJB2* GRE5, and encodes eGFP; **FIG. 5L** shows vector c.81.5, which includes human *GJB2* GRE5, and encodes human *GJB2*; **FIG. 5M** shows vector c.81.5, which includes human *GJB2* GRE5, and encodes mouse *GJB2*; **FIG. 5N** shows vector c.81.7, which includes human *GJB2* GRE7, and encodes eGFP; **FIG. 5O** shows vector c.81.7, which includes human *GJB2* GRE7, and encodes human *GJB2*; **FIG. 5P** shows vector c.81.7, which includes human *GJB2* GRE7, and encodes mouse *GJB2*; **FIG. 5Q** shows vector c.81.8, which includes human *GJB2* GRE8, and encodes human *GJB2*; **FIG. 5R** shows vector c.81.8, which includes human *GJB2* GRE8, and encodes mouse *GJB2*; **FIG. 5S** shows vector c.81.9, which includes human *GJB2* GRE9, and encodes eGFP; **FIG. 5T** shows vector c.81.9, which includes human *GJB2* GRE9, and encodes human *GJB2*; **FIG. 5U** shows vector c.81.9, which includes human *GJB2* GRE9, and encodes mouse *GJB2*. **FIG. 5V** shows schematics of c81.2, c81.3, c81.5, c81.7 and c81.9 encoding eGFP, mouse *GJB2* and human *GJB2* as described above.

[0050] FIGs. 6A-6D show GFP expression by vector c81.5 in the cells of the organ of Corti. **FIG. 6A** shows a fluorescent image of GFP expressing cells, including a variety of supporting cells in, and medial to, the organ of Corti. **FIG. 6B** shows antibody label of endogenous *GJB2* in the region of the organ of Corti. *Gjb2* expression largely overlapped that of exogenous GFP. **FIG. 6C** is an overlay of FIGs. 6A and 6B, with a third staining of actin, which revealed stereocilia of hair cells. No GFP was expressed in the hair cells. **FIG. 6D** shows a frozen section immunofluorescence image of GFP and a protein marker for hair cells, MYO7A. GFP was expressed in a variety of supporting cells in the organ of Corti, but did not overlap with MYO7A expression, which was expressed in hair cells.

[0051] FIGs. 7A-7E show GFP expression pattern by vector 81.5 in the lateral wall of the cochlea. **FIG. 7A** shows GFP expression in cells including fibrocytes of the lateral wall. **FIG. 7B** shows an antibody labeling of endogenous *Gjb2* in the region of the lateral wall. *GJB2* expression largely overlaps that of exogenous GFP. **FIG. 7C** is an overlay image of FIGs. 7A and 7B. Note that GFP was expressed in the cells expressing *Gjb2*. **FIGs. 7D-7E** show frozen section immunofluorescences of GFP (FIG. 7D) and *GJB2* in supporting cells of the organ of Corti and fibrocytes of the lateral wall (FIG. 7E).

[0052] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate certain embodiments, and together with the written description, serve to provide non-limiting examples of certain aspects of the compositions and methods disclosed herein.

DETAILED DESCRIPTION

[0053] The present disclosure, at least in part, relates to an isolated nucleic acid comprising an expression cassette, wherein the expression cassette comprises a gap junction beta 2 (*GJB2*) gene regulatory element (GRE), and a nucleotide sequence encoding a *GJB2* protein. In some embodiments, the expression cassette further comprises a promoter (*e.g.*, *GJB2* promoter). In some embodiments, the expression cassette is flanked by two adeno-associated virus (AAV) inverted terminal repeats (ITRs). The presence of native *GJB2* regulatory elements (GREs) in the isolated nucleic acid prevents promiscuous *GJB2* gene expression in the inner ear, which is toxic and damages hearing. Accordingly, in some embodiments, the isolated nucleic acid described herein is capable of expressing the *GJB2* protein in inner ear cells that normally express the *GJB2* gene (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions), but not in the cell that do not normally express *GJB2* gene (*e.g.*, hair cells and spiral ganglion neurons).

I. Isolated Nucleic Acid

[0054] In some aspects, the present disclosure relates to compositions and methods for treating certain autosomal recessive genetic diseases, for example, non-syndromic hearing loss (DFNB1). DFNB1 is caused by mutations in the *GJB2* gene. The *GJB2* gene encodes the *GJB2* protein, also known as connexin 26. Connexin 26 is a member of the connexin protein family. *GJB2* protein forms channels in clusters called gap junctions, which allow communication between neighboring cells, including cells in the inner ear. Mutations in the *GJB2* gene eliminate or change the structure of gap junctions and affect the function or survival of cells that are needed for hearing. Gene replacement therapy (*e.g.*, gene therapy by recombinant adeno-associated virus (rAAVs)) is attractive due to the small size of the *GJB2* gene coding sequence (less than 700 bp). However, restoration of *GJB2* expression in the inner ear using the currently available gene therapy does not lead to the restoration of hearing.

[0055] Accordingly, the present disclosure is based, in part, on the surprising discovery that successful *GJB2* gene therapy requires *GJB2* expression in cells that normally express the

GJB2 protein (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions) and not in other cells (*e.g.*, hair cells and spiral ganglion neurons). Excluding sensory cells, most cells in the cochlea are connected via gap junctions, and these gap junctions appear to play a critical role in cochlear function. GJB2 protein occurs in gap junctions connecting most cell classes in the cochlea. There are two independent systems of cells, which are defined by interconnecting gap junctions. The first system, the epithelial cell gap junction system, is mainly composed of all organs of Corti supporting cells (*e.g.*, epithelial cells of the inner and outer sulcus, and interdental cells), and also includes interdental cells in the spiral limbus and root cells within the spiral ligament. In the inner ear, the sensory region of the cochlea, termed the organ of Corti, includes one row of inner hair cells (IHC) and three to four rows of outer hair cells (OHC) that are surrounded by various supporting cells. The supporting cells play crucial roles in the development, function, and maintenance of inner ear sensory epithelia. Unlike hair cells, which contact only the luminal surface of the epithelium, supporting cells span the entire depth of the epithelium, from the basal lamina to the lumen. Supporting cells are linked to each other and to hair cells by tight and adherens junctions; they communicate directly with other supporting cells by gap junctions (*e.g.*, Wan *et al.*, Inner ear supporting cells: Rethinking the silent majority, *Semin Cell Dev Biol.* 2013 May; 24(5): 448–459). Non-limiting examples of supporting cells for the organ of Corti include pillar cells, Deiters' cells, Hensen's cells, Claudius cells, inner phalangeal cells, and border cells. The second system, the connective tissue cell gap junction system, includes stria intermediate cells, fibrocytes of the lateral wall and supраstrial zone, basal cells of the stria vascularis, fibrocytes in the spiral ligament, fibrocytes in the spiral limbus, mesenchymal cells lining the bony otic capsule facing the scala vestibuli, and supralimbal dark cells. In some embodiments, in the cochlea, *GJB2* is normally expressed in supporting cells of the organ of Corti and nearby regions (*e.g.*, pillar cells, Deiters' cells, Hensen's cells, Claudius cells, inner phalangeal cells; and border cells), and the connective tissue system comprising stria intermediate cells, fibrocytes of the lateral wall and supраstrial zone, basal cells of the stria vascularis, fibrocytes in the spiral ligament, fibrocytes in the spiral limbus, mesenchymal cells lining the bony otic capsule facing the scala vestibuli, and supralimbal dark cells (See, *e.g.*, Kikuchi *et al.* (1995) Gap junctions in the rat cochlea: immunohistochemical and ultrastructural analysis. *Anat Embryol* (Berl) 191:101-118; and Kikuchi *et al.*, Gap junction systems in the mammalian cochlea, *Brain Res Brain Res Rev.* 2000 Apr;32(1):163-6. doi: 10.1016/s0165-0173(99)00076-4.).

[0056] *GJB2* expression is critical for cochlear function. For example, the K⁺ that enters hair

cells through transduction channels and leaves through basal K^+ channels is shuttled away from the organ of Corti by the epithelial system and conveyed by the cytoplasmic system to the stria, where it is pumped back into endolymph. Further, GJB2 plays a role in the development of the cochlea, as mice lacking GJB2 protein in the inner ear have reduced endocochlear potential and profound apoptotic loss of hair cells and supporting cells by postnatal day 30 (P30), even though hair cells do not express *Gjb2* (Cohen-Salmon *et al.*, 2002; Wang *et al.*, 2009; Sun *et al.*, 2009; Crispino *et al.*, 2011; Johnson *et al.*, 2017). If *Gjb2* is deleted after P6, the phenotype is much milder (Chang *et al.*, 2015). However there remains a long-term requirement for GJB2 protein: hair cell loss occurs after months even with deletion as late as P14 (Ma *et al.*, 2020). Not wishing to be bound by any particular theory, GJB2's function in shuttling K^+ may be related to its role in the development of the cochlea: If K^+ is not carried away from hair cells by a gap junction network, K^+ accumulation could depolarize hair cells, leading to Ca^{2+} influx and eventual cell death. The gap junction network may also be required to transport glucose and nutrients from blood vessels to the sensory epithelium, and its absence could lead to cell death.

[0057] In some embodiments, the present disclosure provides an isolated nucleic acid comprising two adeno-associated virus (AAV) inverted terminal repeats (ITRs) flanking an expression cassette, wherein the expression cassette comprises a promoter (*e.g.*, a human GJB2 promoter) operably linked to a nucleotide sequence encoding a *GJB2* gene regulatory element (GRE), and a nucleotide sequence encoding a gap junction beta 2 (GJB2) protein. Incorporation of the native *GJB2* gene regulatory element and/or tissue/cell-specific promoter in the isolated nucleic acid facilitates the expression of the *GJB2* gene in cells that normally express it (*e.g.*, connective tissue cells of the cochlea including fibrocytes and supporting cells of the organ of Corti and nearby regions). An expression cassette, as used herein, refers to component of vector DNA comprising a protein coding sequence to be expressed by a cell having the vector and its regulatory sequences. Once delivered to the target cell, the expression cassette directs the cell's machinery to make RNA and/or protein(s) (*e.g.*, GJB2 protein).

[0058] A "nucleic acid" sequence refers to a DNA or RNA sequence. In some embodiments, proteins and nucleic acids of the disclosure are isolated. As used herein, the term "isolated" means artificially produced. As used herein with respect to nucleic acids, the term "isolated" means: (i) amplified *in vitro* by, for example, the polymerase chain reaction (PCR); (ii) recombinantly produced by cloning; (iii) purified, for example, by cleavage and gel separation; or (iv) synthesized by, for example, chemical synthesis. An isolated nucleic acid

is one which is readily manipulable by recombinant DNA techniques well known in the art. Thus, a nucleotide sequence contained in a vector in which 5' and 3' restriction sites are known or for which polymerase chain reaction (PCR) primer sequences have been disclosed is considered isolated but a nucleic acid sequence existing in its native state in its natural host is not. An isolated nucleic acid may be substantially purified, but need not be. For example, a nucleic acid that is isolated within a cloning or expression vector is not pure in that it may comprise only a tiny percentage of the material in the cell in which it resides. Such a nucleic acid is isolated, however, as the term is used herein because it is readily manipulable by standard techniques known to those of ordinary skill in the art. As used herein with respect to proteins or peptides, the term "isolated" refers to a protein or peptide that has been isolated from its natural environment or artificially produced (*e.g.*, by chemical synthesis, by recombinant DNA technology, *etc.*).

[0059] In some embodiments, the GJB2 protein is a human GJB2 protein. In some embodiments, the human GJB2 protein comprises an amino acid sequence at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% identical to SEQ ID NO: 1.

[0060] An exemplary human GJB2 protein sequence is set forth in SEQ ID NO: 1:

```
MDWGTLLQTLGGVNVKHSTSIGKIWLTVLFIFRIMILVVAKEVWGDEQADFCNTLQPGCKN
VCYDHYFPI SHIRLWALQLIFVSTPALLVAMHVAYRRHEKRKF IKGEIKSEFKDIEEIKTQK
VRIEGLSLWWTYTSSIFFRVIFEAAFMVVFYMYDGF SMQRLVKCNAWPCPNTVDCFVSRPTE
KTVFTVFMIAVSGICILLNVTELCYLLIRYCSGKSKKPV
```

[0061] In some embodiments, the expression cassette of the isolated nucleic acid encodes a human GJB2 protein having the amino acid sequence as set forth in SEQ ID NO: 1. In some embodiments, the nucleotide sequence encoding a human GJB2 protein comprises a nucleotide sequence at least 50%, at least 60%, at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% identical to SEQ ID NO: 2.

[0062] An exemplary nucleotide sequence encoding a human GJB2 protein is set forth in SEQ ID NO: 2:

```
ATGGATTGGGGCACGCTGCAGACGATCCTGGGGGGTGTGAACAAACACTCCACCAGCATTGG
AAAGATCTGGCTCACCGTCCTCTTCATTTTCGCATTATGATCCTCGTTGTGGCTGCAAAGG
AGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACACCCTGCAGCCAGGCTGCAAGAAC
GTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGCTATGGGCCCTGCAGCTGATCTT
CGTGTCCACGCCAGCGCTCCTAGTGGCCATGCACGTGGCCTACCGGAGACATGAGAAGAAGA
GGAAGTTCATCAAGGGGAGATAAAGAGTGAATTTAAGGACATCGAGGAGATCAAAACCCAG
```

AAGGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAAGCAGCATCTTCTTCCGGGTCAT
 CTTTCAAGCCGCTTCATGTACGTCTTCTATGTACGTACGACGGCTTCTCCATGCAGCGGC
 TGGTGAAGTGCAACGCCTGGCCTTGTCCCAACACTGTGGACTGCTTTGTGTCCCGGCCACG
 GAGAAGACTGTCTTCACAGTGTTTCATGATTGCAGTGTCTGGAATTTGCATCCTGCTGAATGT
 CACTGAATTGTGTTATTTGCTAATTAGATATTGTTCTGGGAAGTCAAAAAGCCAGTT

[0063] In some embodiments, the GJB2 protein is a mouse GJB2 protein. In some embodiments, the mouse GJB2 protein comprises an amino acid sequence at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% identical to SEQ ID NO: 3.

[0064] An exemplary mouse GJB2 protein sequence is set forth in SEQ ID NO: 3:

MDWGTLLQSLGGVKNKHSTSIGKIWLTVLFI FRIMILVVAKEVWGDEQADFVCNTLQPGCKN
 VCYDHHFPISHIRLWALQLIMVSTPALLVAMHVAYRRHEKKRKF MKGEIKNEFKDIEEIKTQ
 KVRIEGLWWTYTTSIFFRVIFEAVFMYVFYIMYNGFFMQRLVKCNAWPCNTVDCFI SRPT
 EKT VFTVFMISVSGICILLNITELCYLFVRYCSGSKSRPV

[0065] In some embodiments, the isolated nucleic acid comprises a nucleotide sequence encoding a mouse GJB2 protein having an amino acid sequence as set forth in SEQ ID NO: 3. In some embodiments, the nucleotide sequence encoding a mouse GJB2 protein comprises a nucleotide sequence at least 50%, at least 60%, at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% identical to SEQ ID NO: 4.

[0066] An exemplary nucleotide sequence encoding a mouse GJB2 protein is set forth in SEQ ID NO: 4:

ATGGATTGGGGCACACTCCAGAGCATCCTCGGGGTGTCAACAAACACTCCACCAGCATTGG
 AAAGATCTGGCTCACGGTCCTCTTCATCTTCCGCATCATGATCCTCGTGGTGGCTGCAAAGG
 AGGTGTGGGGAGATGAGCAAGCCGATTTTGTCTGCAACACGCTCCAGCCTGGCTGCAAGAAT
 GTATGCTACGACCACCACTTCCCCATCTCTCACATCCGGCTCTGGGCTCTGCAGCTGATCAT
 GGTGTCCACGCCAGCCCTCCTGGTAGCTATGCATGTGGCCTACCGGAGACATGAAAAGAAAC
 GGAAGTTCATGAAGGGAGAGATAAAGAACGAGTTTAAGGACATCGAAGAGATCAAAACCCAG
 AAGGTCCGTATCGAAGGGTCCCTGTGGTGGACCTACACCACCAGCATCTTCTTCCGGGTCAT
 CTTTGAAGCCGTCTTCATGTACGTCTTTTACATCATGTACAATGGCTTCTTCATGCAACGTC
 TGGTGAAATGCAACGCTTGGCCCTGCCCAATACAGTGGACTGCTTCATTTCCAGGCCACAC
 GAAAAGACTGTCTTCACCGTGTTTATGATTTCTGTGTCTGGAATTTGCATTCTGCTAAATAT
 CACAGAGCTGTGCTATTTGTTTCGTTAGGTATTGCTCAGGAAAGTCCAAAAGACCAGTC

[0067] In some embodiments, the nucleotide sequence encoding the GJB2 protein is codon optimized for expression in a host (*e.g.*, a human). “Codon optimization” as described herein, refers to the design process of altering codons to codons known to increase maximum protein expression efficiency in a desired cell. In some alternatives, codon optimization is described,

wherein codon optimization can be performed by using algorithms that are known to those skilled in the art to create synthetic genetic transcripts optimized for high protein yield. Programs containing algorithms for codon optimization are known to those skilled in the art. Programs can include, for example, OptimumGene™, GeneGPS® algorithms, etc. Additionally, synthetic codon optimized sequences can be obtained commercially, for example from Integrated DNA Technologies and other commercially available DNA sequencing services.

[0068] As used herein, the term “sequence identity” refers to the percentage of amino acid (or nucleic acid) residues of a candidate sequence that are identical to the amino acid (or nucleic acid) residues of a reference sequence, *e.g.*, GJB2 protein disclosed herein and its coding sequences, after aligning the sequences and introducing gaps, if necessary, to achieve the maximum percent identity (*e.g.*, gaps can be introduced in one or both of the candidate and reference sequences for optimal alignment and non-homologous sequences can be disregarded for comparison purposes). Alteration of the amino acid sequence or nucleic acid coding sequences can be obtained by deletion, addition, or substitution of residues of the reference sequence. Alignment for purposes of determining percent identity can be achieved in various ways that are within the skill of one in the art, for instance, using publicly available computer software, such as BLAST, BLAST-2, BLAST-P, BLAST-N, BLAST-X, WU-BLAST-2, ALIGN, ALIGN-2, CLUSTAL, or Megalign (DNASTAR) software. Those skilled in the art can determine appropriate parameters for measuring alignment, including any algorithms needed to achieve maximal alignment over the full length of the sequences being compared. For instance, the percent amino acid (or nucleic acid) sequence identity of a given candidate sequence to, with, or against a given reference sequence (which can alternatively be phrased as a given candidate sequence that has or includes a certain percent amino acid (or nucleic acid) sequence identity to, with, or against a given reference sequence) is calculated as follows:

$$100 \times (\text{fraction of A/B})$$

where A is the number of amino acid (or nucleic acid) residues scored as identical in the alignment of the candidate sequence and the reference sequence, and where B is the total number of amino acid (or nucleic acid) residues in the reference sequence. In particular, a reference sequence aligned for comparison with a candidate sequence can show that the candidate sequence exhibits from, *e.g.*, 50% to 100% identity across the full length of the candidate sequence or a selected portion of contiguous amino acid (or nucleic acid) residues of the candidate sequence. The length of the candidate sequence aligned for comparison

purpose is at least 30%, *e.g.*, at least 40%, *e.g.*, at least 50%, 60%, 70%, 80%, 90%, 95%, 98%, 99%, or 100% of the length of the reference sequence. When a position in the candidate sequence is occupied by the same amino acid (or nucleic acid) residue as the corresponding position in the reference sequence (*e.g.*, GJB2 amino acid sequences, coding sequences, nucleotide sequences for *GJB2* gene regulatory elements (GREs), or any other sequences described herein), then the molecules are identical at that position.

[0069] An expression cassette of an isolated nucleic acid sequence described herein (*e.g.*, the expression cassette of the isolated nucleic acid comprising a nucleotide sequence encoding a GJB2 protein) may further comprise a promoter operably linked to the coding sequence (*e.g.*, GJB2 protein coding sequence). A “promoter” refers to a DNA sequence recognized by the synthetic machinery of the cell, or introduced synthetic machinery, required to initiate the transcription of a gene. The phrases “operatively linked,” “under control,” or “under transcriptional control” means that the promoter is in the correct location and orientation in relation to the nucleic acid to control RNA polymerase initiation and expression of the gene. A promoter may be a constitutive promoter, inducible promoter, or a tissue-specific promoter.

[0070] In some embodiments, the promoter is a tissue/cell-specific promoter. A tissue/cell specific promoter, as used herein, refers to a promoter that has activity in only certain cell types. In some embodiments, the promoter used in the isolated nucleic acid described herein has activity in cochlear cells that normally express the *GJB2* gene. Use of a tissue/cell-specific promoter in the isolated nucleic acid described herein can restrict unwanted transgene (*e.g.*, *GJB2* gene) expression as well as facilitate persistent transgene expression. In some embodiments, the expression cassette of the isolated nucleic acid comprises a tissue/cell specific promoter. In some embodiments, the expression cassette of the isolated nucleic acid comprises a *GJB2* promoter (*e.g.*, a *GJB2* promoter for any species where cell specific *GJB2* expression is desired). In some embodiments, the expression cassette of the isolated nucleic acid comprises a human *GJB2* promoter. In some embodiments, the expression cassette of the isolated nucleic acid comprises at least 300 bp (*e.g.*, 300 bp, 400 bp, 500 bp, 600 bp, 700 bp, or more) of any consecutive nucleotides of a human *GJB2* promoter. In some embodiments, the expression cassette of the isolated nucleic acid comprises a promoter having 500 bp consecutive nucleotides of a human *GJB2* promoter. In some embodiments, the expression cassette of the isolated nucleic acid comprises a promoter having a nucleotide sequence at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or

100% identical to SEQ ID NO: 5. An exemplary nucleotide sequence of 500 bp of a human *GJB2* promoter is set forth in SEQ ID NO: 5:

```
ACCTGTCTCCCGCCGTGGCGCCTTTTAACCGCACCCACACCCCGCCTCTTCCCTCGGAGAC
TGGGAAAGTTACGGAGGGGGCGGCCCGCGGGCGGAGCGCGCCCGGCCTCTGGGTCTCAGA
GCTTCCCGGGTCCGCGAACCCCGACCGCCCCCGAAAGCCCCGAACCCCCCAAGTCCCCTTC
GAGGTCCCGATCTCCTAGTTCTTTGAGCCCCCATGAGTTCCCCAAGTGCCCCCAGCGCCCT
GAGTCTCCCCCGTTACCCCGAGCGCCGCCTCCCCAGCCCCCTTGGCGGCCCGGGTGAAGCG
GGGGCGGCTGAGAGTCGGGACCCCCCAGGAAGCGGGCGCCCCAGACCCCGGCTCCGGCGCTGT
GCCGTGGGCGGGGTTTCAAGGATGGCTGTGGTCGTTGTCTCTGTACTCCGCATAGTGCGAGA
GGACTTGGCATTATGAGCGCTTCTTTAATTTTTTATTGTTAGAGAAACAGGCATTCTCCA
AGGA
```

[0071] In some embodiments, the expression cassette of the isolated nucleic acid comprises a *GJB2* basal promoter (*e.g.*, a human *GJB2* basal promoter). A *GJB2* basal promoter is a promoter region of a *GJB2* gene highly conserved across different species (*e.g.*, human and mouse). The *GJB2* basal promoter has been previously described, for example, in Tu, Z. J., and Kiang, D. T. (1998). Mapping and characterization of the basal promoter of the human connexin26 gene. *Biochim. Biophys. Acta* 1443, 169–181; Kiang, D. T., Jin, N., Tu, Z. J., and Lin, H. H. (1997). Upstream genomic sequence of the human connexin26 gene. *Gene* 199, 165–171; and Castillo *et al.*, DFNB1 Non-syndromic Hearing Impairment: Diversity of Mutations and Associated Phenotypes, *Front. Mol. Neurosci.*, 22 December 2017, each of which is incorporated herein by reference. In some embodiments, the expression cassette of the isolated nucleic acid comprises a *GJB2* basal promoter having a nucleotide sequence at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% identical to SEQ ID NO: 47. An exemplary nucleotide sequence of a human *GJB2* basal promoter is set forth in SEQ ID NO: 47:

```
GGGTTTCGGGGCTTTTCGGGGGCGGTTCGGGGGTTTCGCGGACCCGGGAAGCTCTGAGGACCCAGA
GGCCGGGCGCGCTCCGCGCGCGGCCCGCCCCCTCCGTAACTTTCCAGTCTCCGAGGGAAG
AGGCGGGGTGT
```

[0072] Examples of constitutive promoters include, without limitation, the retroviral Rous sarcoma virus (RSV) long terminal repeat (LTR) promoter (optionally with the RSV enhancer), the cytomegalovirus (CMV) promoter (optionally with the CMV enhancer) (See, *e.g.*, Boshart *et al.*, *Cell*, 41:521-530 (1985)) the simian vacuolating virus 40 (SV40) promoter, the dihydrofolate reductase promoter, the β -actin promoter, the phosphoglycerol kinase (PGK) promoter, and the elongation factor 1-alpha 1 (EF1 α) promoter. In some embodiments, the promoter is a chicken beta-actin (CBA) promoter. In some embodiments,

the promoter is an enhanced chicken β -actin promoter. In some embodiments, the promoter is a U6 promoter. Since the CBA promoter is constitutively active in all cell types, using a CBA promoter in the isolated nucleic acid described herein leads to promiscuous expression of GJB2 protein in all cell types, including cells that do not normally express GJB2 protein (*e.g.*, hair cells of the cochlea). Accordingly, in some embodiments, a CBA promoter is not used in the isolated nucleic acid described herein.

[0073] Inducible promoters allow regulation of gene expression and can be regulated by exogenously supplied compounds, environmental factors such as temperature, or the presence of a specific physiological state, *e.g.*, acute phase, a particular differentiation state of the cell, or in replicating cells only. Inducible promoters and inducible systems are available from a variety of commercial sources, including, without limitation, Invitrogen, Clontech, and Ariad. Many other promoters have been described and can be readily selected by one of skill in the art. Examples of inducible promoters regulated by exogenously supplied promoters include the zinc-inducible sheep metallothionein (MT) promoter, the dexamethasone (Dex)-inducible mouse mammary tumor virus (MMTV) promoter, the T7 polymerase promoter system (WO 98/10088); the ecdysone insect promoter (No *et al.*, *Proc. Natl. Acad. Sci. USA*, 93:3346-3351 (1996)), the tetracycline-repressible system (Gossen *et al.*, *Proc. Natl. Acad. Sci. USA*, 89:5547-5551 (1992)), the tetracycline-inducible system (Gossen *et al.*, *Science*, 268:1766-1769 (1995), see also Harvey *et al.*, *Curr. Opin. Chem. Biol.*, 2:512-518 (1998)), the RU486-inducible system (Wang *et al.*, *Nat. Biotech.*, 15:239-243 (1997) and Wang *et al.*, *Gene Ther.*, 4:432-441 (1997)) and the rapamycin-inducible system (Magari *et al.*, *J. Clin. Invest.*, 100:2865-2872 (1997)).

[0074] In some embodiments, the isolated nucleic acid comprises a gene regulatory element (GRE) (*e.g.*, GJB2 GRE). Gene regulatory elements, as used herein, refer to a variety of DNA sequences that are involved in the regulation of gene expression. For example, a GRE may rely on the interactions involving DNA, cellular proteins (*e.g.*, histones), and transcription factors to regulate gene expression.

[0075] In some embodiments, the isolated nucleic acid comprises gene regulatory elements which are cis-regulatory elements (*e.g.*, cis-regulatory elements for the GJB2 gene). Cis-regulatory elements are regions of non-coding DNA which regulate the transcription of neighboring genes. Cis-regulatory elements are found in the vicinity of the genes that they regulate. Cis-regulatory elements typically regulate gene transcription by binding to transcription factors. In some embodiments, the gene regulatory elements impart cell-specific gene expression capabilities (*e.g.*, cell specific GJB2 gene expression). In some

embodiments, the gene regulatory elements are cis-regulatory elements associated with the *GJB2* gene.

[0076] In some embodiments, the cis-regulatory elements of the *GJB2* gene are enhancers. An enhancer, as used herein, refers to DNA sequences, which are located more distal to the transcription start site as compared to a promoter, capable of interacting with site-specific transcription factors to regulate gene expression in a cell-type specific manner. Enhancers confer cell-specific gene expression regulation by binding to the collection of transcription factors in a cell, which leads to transcriptional activation or inhibition through various mechanisms, *e.g.*, recruitment of epigenetic enzymes that catalyze post-translational histone modifications, and recruitment of cofactors that promote DNA looping. Enhancers can be identified in the vicinity of the gene they regulate, or at a distance of hundreds of kilobases from their target genes. Multiple enhancers can act additively and redundantly to regulate gene expression (*e.g.*, Doane *et al*, Regulatory elements in molecular networks, Wiley Interdiscip Rev Syst Biol Med. 2017 May; 9(3)). In some embodiments, the enhancers described herein are enhancers capable of regulating genomic *GJB2* gene expression. In some embodiments, the *GJB2* enhancers are identified in the transcriptionally active sequences of the *GJB2* gene. A transcriptionally active sequence, as used herein, refers to a region of DNA in a chromosome in which the DNA is in open chromatin confirmation such that the sequence is exposed, thereby allowing binding of transcription factors and transcription to take place. In some embodiments, the *GJB2* enhancers are identified within approximately 1000 kb of a genomic *GJB2* gene (*e.g.*, within 1000 kb, within 900 kb, within 800 kb, within 700 kb, within 600 kb, within 500 kb, within 450 kb, within 400 kb, within 350 kb, within 300 kb, within 250 kb, within 200 kb, within 150 kb, within 100 kb, within 95 kb, within 90 kb, within 85 kb, within 80 kb, within 75 kb, within 70 kb, within 65 kb, within 60 kb, within 55 kb, within 50 kb, within 45 kb, within 40 kb, within 35 kb, within 30 kb, within 25 kb, within 20 kb, within 15 kb, within 10 kb, or less upstream or downstream of the *GJB2* gene). In some embodiments, the *GJB2* enhancers are identified within approximately 200 kb of the *GJB2* gene. In some embodiments, the *GJB2* enhancers are identified within approximately 95 kb of the *GJB2* gene (*e.g.*, regions C-M listed in FIG. 3C) In some embodiments, the *GJB2* enhancers are within the regions of DNA sequences near the *GJB2* gene (FIG. 3C) listed in Table 1.

Table 1. Human and mouse DNA regions that include *GJB2* enhancers.

Region	Human	Mouse
A	CTTTGTGGATGGCTTGGTGGCCTCACTGTCA GGCTGGCACTGATGGCTCAGTTAGCATATCT GTTTTGATAAGTGCTGCAACAGTGCATTATA ATTGTGGGCTGTGGTTTTAATTTCAAAGTGT TTCTTAAAAGACACATTATTTTAAAATGACA GAAAATTCAACTCCCTCGGTACTGGCCCAG CTAAGCGACGTCACTGCATTGCAGTTCAGCG CTGAAGCTTGGGAGAGTCCCACACTCCTTAC TGCAAGCGGATGTGGAGAGGCCAGTGGATAA TCTCCTGTGAGCCCATGGCCTTCTTTTCATC CCAGGATGTGAATTGTCTTCACTGATTCATA GTTACACCTGCCTGCCACAACCAACGCTCT CCTAAACAAGATTCCACCCTCTCCACAATCC GGATGAATCATCTCTTTTCCACCCTTCAGAG CTGGTAGTGAATCCTCCTTCTTCTTTTCTT AAAAGCATCCTCCTCTCCTCATTTTAGGCAA GTTGCATCCCGTTTTCTGATGGACTCCAGAA GCAGGCTCGTAGTGAATGTCTTTCATGACCC ACAGTCGCTGCCACGGGGCACCAGGTCAGG CAGAAACCATCCAGTGCCACCTTGCTCAGAG GCTAACAGGAGAGAGGTGGCCACGAAAGTTA CATCAGATTGACATAGGCCTGTGAAACATTT AGCTTCACTGAGCTTGGGAAAGACAACATCA TTGGAAAAACAATATTTTAGCCCAGGTTCA GCACTGACCCATTGATAATCCAGACTGGGAG GCCCTTAGGTGAGCTGGTTGTCTGCTACAG CACCCACAGCTCAGGCCAGTCCCGTCCCAAC AGCAGAACACCGAGGACAGCAACATTCCGA TTTTAACAAAAGCATCTTATGGAATTAGACA TTCTTCATTGGCCCTCACTGAGTGGAAAACA GGATACTCCCCGAAGTAACTCTCTCCTGGT TTACAACAATACACCTGGCCAAGAATATGGG GCTGCAGGAGGAGGGGTTTATCCTTTGCCCT CTTCCACCTGCCAAACCCAGGTCATACACCC TTCTACAGACCTGTCCAGTTACCATCAGCTG AGAAAAATACAGTTCCGAGAAACCTATATT GTTATTTTATAAGCTTGAGTTGAAGCTACC TGTTTTAAAGATCCTTTTTCAGGAAGAGGAG	CCAAAAAGGGACAAAAACAGACAAACAAACAAC ACCAACACAAACAACAACAGCACTAAAACGAGT CTCTGCACCTAGGTCTTCGCACGCAGGCTGGTA GTCCACCCCTCAGGTAGGGCCTGTTTGGTTAAC GATCCGTGTCTGTTTTGATATGTGTTGCAAGTG AGTGTTCAGCTGTGGACTATGGTTTTAACCTTG AAGTGATTCTAAAATAAATATATGATAAAAAT GACGGAATTTAGCTCAGCGGTTCCACAGTTGC TGGTCCAAGGAGCCACCTGATGGGGGTTTTGCC TTGGGTGGCATCACAGTGTATCCTGTCTGAGTG ACACAGTGTCTATATATGGCCTGTGCCCTAGAT GAGCCTCCATAAGCCAATGACCTTCTATTTTCTAT CCCAGGGCAGGAACCTTCCATGGCTACACCTGG TCTGTCACAATCAACCCCTCTTTTGATTAATCC CATCTTCCCGGCTGTCTGACTCACTTGCTTCC ACCCCTTCCCTTCCAAGCTGTAAAGAATCCTCTG ACTCTTTCTTAAAAGCACCCCTACCCTCCTGCTT AGCAAGTTACATCCTGTTTCGCAGTGGACTCAC AGCAGGCGCAGAGAGAAGTCCCTCCTTGTCCT AGTGGCGGTGGCAGAGCACCAGGGAACCCACTT GCTGGAACCCACTCAGCTCTGCCTTGGACAGAG GAGATAGGGCCAGGGGCATGGGAATTAAGGAAT ACTGACATACACCGGTAAAACATCAAGTCCCTAT CCAACTTGGAAGCAGAAAACAGACAGGCTCGGC AGGTTCAGCCCTGACCCATTTATACCTAGACTG TCAGAGGCCCTTTGGGAAGCTGGTTGTCTCTG AACAGTCTCTCAGCTCCATGTGGTCTGCCCCCA ACAGCAGAAGGATTGAAAAGCAACAGTGTTCAC AGTTTAACAAAACAATCTGATTGGAATTAGACC TTCTGTTCTTCTTCCCTTCTCTCCGAGTGGAG ATCAGGACATTGAAATAACATCTACACACCTG ACCCAAATACAGAGCTGGAGGATCCCTTTGCC TGCCTATAGCATCCACAGACTAGCCCAATTATT ATCAACACAGAAAAAAAAAAAAACCCTCAATTT CTGCGTAACTGTGCACTTGTTTATAAAAGTAC TTAAGTGTGTTGTTGAATTTGAGTTTACCGTGT ACCCAGGATGGCTTCTAAATCCATGCAGTTGGA GTTAGCACAAACATGGGGGTGGGGGTAGGGGGTT

TAAATTAAGATTTACTCCCAATGGGCTAGG GGGTCATGGGTAAAGAGGGGCTCAGAAGCAG GACGAAGTTGTTTTCAATATTCAAGTCAGAG GAGGAGCTGCCCTCCTGGCCTCCCGACCCTG GGCGGTTACATGCAGCTTCTACCGGGCCCA CGCCATCCTGCACCGCCTGGAGGGCTGCCAG AGGCCAGCGGAGGAGTTGGTTCAAGTTCCCTTA GGGAAGACACTAGGTGAATCACCAGGATCCA GAAAAGGCAAAAGGGACTCTTCACCCCTTAA ATTTCTCCACCCTTAGGTGATGGGTGGTCGA CCTTGCTGGCTGTCCCGAGAGGGTTCTCTCC ACCCCTCTCACCAGTGTCTGAAATTGTGACC GACTGTGCACAGCAGTTTCGAAAGGGACTCT AAGGTCACATGGGGACACGGCCGTACCACGC TTCTCAAGGCAGTCCCAGGTGCATGGCCACG GAACCCAGCTCTCAGCAGCTGTTAGTTAGGT GAGCGCTGTTTCGGGCTGCCTTCTCTCTCCAG TGGGGCAGGATCGAGGCACTGATGGAACCGT CCTGAGGACGCGGGTCTCAGCCGCACACCAC CTCTTCGCGAACAAGGGTCTTAAAAATTTTC CTTCTAGGCGGGGAGCACAGCCCGGAAACAG ACCCCTCGTGAAGTGTTTAGGAAAAAGGGAAG CCACTGAAATCTTGGCCCCGGGGTAGGCCGG GATCGGCTGGCTCCGCGTTAGTTCTAGGCAA ACTCCGCCCAAATCTCTGCCCGGGGATTTTT CTGCAGAAGCCGCTCCAAGAGGTAAAGGTCA GTTCTGCAGCGAAGGCTTCTGCTTCACCG GCGAAACGGAGCTTTGCTTCGAAGCTAAGCT TTCGGTGAATTTAAACGTTTGGTGGCAGTG GGTCAAGTAGCCAGGCGGCTGCGCTAGAGTA CCCCGAAGGGACATCGGCGACACCACAAACC TCGCGCTGGCGGCTCGCCCGCGCCTTTTTCC CCTCCCGCGCGCGCCCGGCCCACTCGCACC CCGGGCGGTGCCATCGCGTCCACTTCCCCGG CCGCCCCATTCCAGCTCCGGAGCTCGGCCGC AGAAACGCCCGCTCCAGAAGGCGGCCCCCGC CCCCCGGCCAAGGACGTGTGTTGGTCCAGC CCCCCGGTTCCCCGAGACCCACGCGGCCGG CAACCGCTCTGGGTCTCGCGGTCCCTCCCCG CGCCAGGTTCTGGCCGGGCAGTCCGGGGCC GGCGGGCTCACCTGCGTCGGGAGGAAGCGCG	AATACATCTATAATAGCAGAACTCTGGAGGCTG AGGTAGGAGGAGTGTGCTAACTTGAGGAAACT TTTCTGCAGAGCAAGACCCTGGCTCAAGAAAAC AAACACCAAAAGAGACAAGAAAAGAAAAGAACA GAACCAAAACAAAACAAAACAAAACAAAACA AAAAACCAAAAAATGGGAAGGCCGGATTGAACA AACAAGGTCAAGAAGAGAGAGAGAGAGAGAGAG AGAGAGAGAGAGAGAGAGAGAGAGAGAGAACTC CAAAAGAAAACCAATAGCTGGGACATAGCTGT GGGTCCCGGCATATCTGATTGCAGCTGCTTGTC TTAAATGGCCTTTCTAAGTGAAGGAGAGGTTA AAATTTGACCTCACAAAGGGGTTAGGAGTACTA AGCCAGCAGGTGAAATCGTCAATATTCAACTGT GGTGTAGGAGGTGATTTCCAGGCTGGCCTTAGG ACTAGGTCACACGCAGGTCCCTACCTGGCATGG GACACCTGGAGATTGCCTTGAACCGGTGAATCA TTCGCTCCTGAGTAGAAGGGAGCTTCTCCATGT TTATAGTATATACTGCATATGACCCTTATTTGC CTTAAAGGATACTTCGGGGAGCTGGTGGACTGC CTCTAGATGCTGACCCACCGCACCTCCACCC TTCTCATAATTCACTGGCTTTGCCCATAGTTCC CAAAGGACTCCGGGGTAAGTGTAGCCATGACTG AGCCAGGCTTCTCAGGACAATCCCGTGACCTG AGCAATGGGTCCCATTTAGGCCTACGCTCCCTT CCCTTCCATTGAGGCAGCACCAAGGGGCTGATG CAATTGTCCTAAGGGACAAGTTTCTCAGCAGCA CGCCATCTGTGAACCTGTGCCTTCCCTTCCAGC TGTAACGTCCCGCCTGGACGCAAATCCTTAAAA AGCATTTAAGGAAAGAAAAAAAAAAAAAGCAAT CAAAATCTCCACCCGAGTGCAGGTTGGGGTTCC CCAGCTCGCGGGAGCGGCTACGGCCGCGCGTTT TGGGCGGTGCGCCACGTACCCCAAGTGTCTTAG GTGGTAAAGGTCAGTGTCTTCCACGGAGGCTT CCTGCTTAACAAATGAACTGAGTTTTCTGCT CAGCTTTCGGTTAGCTAAAACTTTTCAATGGC GGCAGACAACGCAGCCAGGAGGCTCGGGAAAA TTCTAGCGAAGGAATACTGGCGACACGTGCGAG TCGTGCGCGAAGCAGCCTGGCCCCGCGTCCCT CCCCACCCGCGCTGTGCGGGACCTCCCGGCTC AGGCTGTGCGCGCGGCTGAGAGCAGCCGGCTCC AACCCGAGCCGGGCCAGACGCTGCAGCCGAA
---	---

GCGGGGCCGGGGCGGGGGTCTCGGCGTTGGG GTCTCTGCGCTGGGGCTCCTGCGCTCCTAGG CGGGTCCTGGGCCGGGCGCCGCCGAGGGGCT CCGAGTCGGGGAGAGGAGCGCGCGGGCGCTG CGGGGCCGCAACACCTGTCTCCCGCCGTGGC GCCTTTTAACCGCACCCACACCCGCCTCT TCCCTCGGAGACTGGGAAAGTTACGGAGGGG GCGGCGCCGCGGGCGAGCGCGCCCGGCCTC TGGGTCTCAGAGCTTCCCGGGTCCGCGAAC CCCCGACCGCCCCGAAAGCCCCGAACCCCC CAAGTCCCTTCGAGGTCCCGATCTCCTAGT TCCTTTGAGCCCCATGAGTTCCCCAAGTGC CCCCAGCGCCTGAGTCTCCCCCGTTACCC CGAGCGCCGCTCCCCAGCCCCTTGGCGGC CCGGGTGAAGCGGGGCGGGCTGAGAGTCGGG ACCCCCAGGAAGCGGCGCCCCAGACCCCGG CTCCGGCGCTGTGCCGTGGGCGGGGTTCAGG GATGGCTGTGGTCGTTGTCTCTGTACTCCG CATAGTGCAGAGGACTTGGCATTATGAGC GCTTCTTTAATTTTTTATTGTTAGAGAAACA GGCATTCTTCCAAGGACTGAAGATCTGTTG AGTCGCGGAGGCTGCGCGGGCCCGGAGGCT CTCGCAGGGGACCTAGGCTGGGTGGCGGGG CAGTGCCCTCTGGAATGGGGTTAACGGTGG CCGAGGAGGGGGCGCCGCTGGTGCCGGCGAA GTCCCCGCTTCTTTCTCCCTCAAAATCTCA CCAATCCGAACGAACGCCTTCTCGAATTTCC GATTTTATTCAATTACTTTCAACAATGTGCC AAGGACTAAGGTTGGGGGCGGTGGGAGAGAC AAGCCTCGTTTTTGGCATGGCCGGCAGGGG GTCCCGCCATCTGCGGAGGGTGCCCCCGCG GCCCCCGGCCAGCCAACTTCTCTCTCTTTT CGCAACTGGGGAACGCAAGGAGGTGACTCC TTTCGGGGTGAGGAGGCCAGACTTTTCAGA AAGGAAAGAGGGCAGGTAAAACCTGCCAAGC CCCTTCTGCTCGATGCACACAGCACGAAAG GGGGAACGATAGGATTCTGCGGAAGACCG CTGGGGGGCTGGCTCTGCACTGCACACCTGC TGGGGGCTTTCTGGATACCGTGAACTTTGT CTCAGATTATGAGGTCTCAGTATTTGCATTT GGTTGGGGATTTTGATGTCTTGCATACAAA	GAAACGCGTTCACAGCTCGGGTCCCTATGCACG GGTGGCGGTGGCCCGTAGGGACCGCGCAGCGCG TTCCGGCCTCGGTTTCCCAGGACCGTGCGGGCC CGCACCCCTCCTCGCACCTACGCGTCCCTACT GGCTGAGTCTCGCGCCCCAGCCACCGTGGGGCG TTGCGGTGCGGGGCGGGTTACACCAGTGTGACT CGGTGGCGCGGATTGGCGGTGCGACCTGTGTCC GGAGGAGCGTGCAGCGTTGGGTGGCGGGAAGCG GCGAGGCGCTGTCCCGGTAAGGAGCAGGTCTG AAGCGGGTCCCGGGGCGCTCCTGGGTTGGTCC GAAATGGGTGCGCGGCTGATCCTGTGTCTGGTGC CCGCGGGTCCCGGTGGAGGCTGCGCTCAGTGGA CTGGAGCGCGCCGACTGGCTGCGAGTTGGGAG AGCGGAGCGCGCCGCGCGCTGCGATCCTGGACA CCTGTTGGCCGCGGCGCCTTTTAACCAAAGCCC TCACCCCGCTCTCTCACCTGGAGCGATTGAG AAAGTTGCGGAGGAGGCGGCTCCAGTAGCCCG CCACCCCGAGCGCCACGGGCGGGGCTCTCCGGG CAGCCAGAGCCGTCAGGGCCCGCGAGTCGCGA GCTCTCCTGGAGCCTAGGTCACTCCCCACCCCA CTCCGCCCCACCCACCCCGAGTCTCTTTGAG CTCAAGGCTCTTCCAGTGTCTGTCCCAGCGC AGCCTGAACAGAGCTGGTAGACCTGTGTCTTCA CCCAGGACGAGGTGCGAAAGCTCCAAGTCCCA GCTACTCGCTTTTGGGGGATTGGGTGATGTTGA AAGAGAGTTGATGTTGCTCTTACTACTCTCACT AGTGGAAGTGTGCTGTTATATTGAAAGCTTCG CTGTAGTAATATTATATATACTTGTGTGTGTGT GTGTGTGTGTGTGTGTGTGTGTGTGTGTGTGT AGATAAACGACGGTACAGTTTTTGTGTGTGGCCT GCAGCTTCCAGTAGCGCACAGGAGACTCCTCTC CCGTAGTGCAGTGAGCTGAGGCATCTAGAATTC GGGTTCAAGGCAGACTAACAGAGGGCGCCGCCA GGGCTGGCCAAATTCTGGCTTCTATTTCTTTGA ATTCCCGATTTAATTCGATCACTTTGAACAGGG TGCCAGTGGCTAGGACAGAAGAAGATGTAGAGG TGCGTCTCCAGGGCTGGCTTGAAGTGGACTTG TCACAGTCTCTGGAGGGTCTCTGCCTGTGCCC CCGCTCTCTGTGTCTCTTTTCCACAACGAAA GCATTGCAAGGAAGGGGACCCAGATTCTGCCG GTGCAGGGGATGCGGAAGGGGGGGGGAGCAGA
--	---

	TGACAGAAGACAGATTTCACAGCGCAAGCG GATGAGGGACTAAGATGTGCAGAGCAGGCTG GGTGGGGACTCCCGGGGAGGTCTCCCCAAC CCCCGCCCCACCTCGGGCACCCACTTCGCGA TTTTTGAGAGGGGAGCCAGGTCAGAGGTGC AGCCTGGTCCCCTCGCGCTCACGTTTTTACC CAGGTCAGTTTCAAGTTAAGTGGAAATGATG ATTAATCCTGACAAGTCAGATCTGGCCTCAG AATGGATTTCCCGTGATTGCCACCATTATTA GCATTGACTTTTCCTTGAAAAATTGGCGCCC CGTGGCCATGGGCCGACCTAGGCAGTTTCTG CAGGGACGAGCGTGAGTTTTGTACCGCGGTT ACCACCTACTTTCCAGCTCCAGGTCTTAGTC TAAGAGGGAGTGTCTGCTCATGAAGAGGCAA AGCCCCAGGAGCTGCGAAAAGCCTTGCAATG CCCATCTGAGAGATGTGCTGAGTCGGCTTGT TAAAAATGACAGGCAAAGCCTGTGGGGTGGG GCAGCTTTCTTGGCCTGAGCGCATCTTGTT GAGCCAGAGGTGACTTGGGGTGGGAGTGGG GCGCCGGTTGGTGGTTCTCCCTTTAATTT TCAAAGGCTGTGGTGTATGAGTCTGTTGG AATCCTGGTTGGTTGGAATGAAGGAAGGTT CTAGAACCATTGTGGGAAGCTCGCTAGTAAA GATGGTTTGGAGATCGGAAGTTGACTGACTT TCCCCCATTGAAAAATGTCACCTGAGATTTT AGTGCCGTATCACGATTATAGGCTCAACTT TCTTTTCCTTGTTTTCTTTGATTTAGTTCTC CTTATGTGCAAAATTACTGTGTGATGTTGGC TAGTCGTATTATCACAGCCACTCCGTGTTTT CAGGATTTGTAGCTGGAAGTCTATAGCACT TAAGTCTTCACTTACAGATCAGCGCTTGCTT TTATTCTGTTTTGTGTGATTTCTGCTGTTTT CCTGTGAGTTGGTGTTCCTTCCCAAGTAGG CTCAGGACTCCTCTAGGGCAGGACATTATAT GCATGTACATAGTGTCTCCAGTGTAGGGGA GGAGAAGGAGGAGAGGTGAGGTGGGAAAAGG GTGAGGG (SEQ ID NO: 6)	AGAGGTTAGGCAAGCCCATCCCTCTTGAGTCC AGGATGCTGGGAAGACCTGGGCAGCCTGCATCT ACCTCTCTCCGCCAAGCTGTTCGTGGGTTTTGA GGGCTCGGTGTTCCACATTGCTTGGCTGTCTGG ATAGTTTTGAGAGGAGTTACGGTGGACATTAC AAGAGCTAGCTACGCTTTGGGATACCTAGGCCA GCTAGCTTCACCTTACTACTTGCAACCCGAGTC CTACAGCTGCCAGGTTTGAATGAAAACGGCAC ATCCCCACAAAGTTCCTTCAGATTAGCTTTACA CGCAGTGAAGAGACTGATTCACTCTGACAAGGC CCGTCTGGTCAAGGATTGGCTTTCAATGAAAG GACCATGGCTGAAGGTACATGCTTTCCCTGTAA AGCTGGCACATTGCCGCGGGCAGACCTGACTGC TCTTGCTTGGGCAGAGGAAGGTTGCACGCTCGC TTGCTACTACCCCCACCTCCTTTCTAACTGTAA GTCTTAGTCTAAGAGGGAGTGTCTCTAAGGAAG AGAGCCTCGGATCTGTGTCCAGCCCTTCAGAGA GAGAGAGATGTGCTGAATCAGCTTGTGTGGAAT AACTGGCCAAGCAAGATGGGGTGGTACAACCTC CTTGGCCTGAGCACATCTAAAGATGAATCAAAG AGGAGATGAGGTAGTGGCAGCAGGCAGGGGTGG AAGGATGTTGGCACCTTTAGCTTCTCATGGGTC GTACAGTTTCCAGTCAATTGGAGCCCCGTGTTCA GTGAGGATGACAGAAGCTTCTAGAATCATTGTA GGAAGCTGGCCAGTAAAAGATAGGTTGGAGATC AGAACTGCTTCACCTTTCTCCATTGAACAATTT TCTGAGGGTTAGTGCCACGTTATGATTACAG CTTCAGCGTCTAGCTCCCTAACTTGCTTCTACA GATTTCGCCTAATGGCTGTGTGTTGGCTGATGGT CACAGGTGCTGGGAATATTAGGATGTATCGCTA GCTCATCTCCTCCTCTGTTCCAGCCATCCCTCC TTGTTTCTTGTTTTCTCACCACCTAGACCAGAG GCTCCTCTAGGGTAAGAAATGCTAAATTTATTT GTGTATGTGTATTCTCCAGAGGGGGAGAGGGGA GAGGGAAGGAGAAGGGAGGGGAAGAGAGGCAAG GAGAAGGGAGAAGGGAGGAGAAGGGAGGACAGG GGGACAGAGGAAGCTAGAAAAGAGCTAGGA (SEQ ID NO: 7)
B	TAATCCAGATGTTAACTGAACTTCCAAG CAGGGGAGTGAAATGAGACTTTCACTTTTGA	CATGGAGAGAGATGGATAACTGAGATTTCTGGG CAAGAGATGAAATGGGCTGAATCCCACCTCCTGA

CTTCGTATACTCCTGTATTATTTAAGTGAAA ATGTATTTATATATTCTATAATTACAAAAAT CACATTGGTTGCCCTTTTCATTTTGAAATGAG CAAAAGTGACAGGGCTGTTAAAAAGCTAAGT CACTTGAGCAATAACGTGATGTCCAGAACAG TGTTTCCATGGCTCAGCCATGTCGGGGGCTG CACTGAGGACAGGGGGCCATCTGCCTTCTAG GAGGACACTGTGGACTGGAATATTGTTCTG CCTTGAGGAGGAGTCTCCAGCACAGTTACT GCTGCTTGACTGTCAGAGCATGCGTTTTCTT AGGGAAGTTGAAGGCAGCCTGTATCTAGTAA GGTGGTATGCAGTAGTTGCTTAATGCTGAAT GTGTGAAGGAATGTGGGGCTGTGGAGCAGGA GGATAAAGTCTGAACTTGGACCTGTGTTCT CAGCTATTCTGAAGCTTTCTCAAGTGAAAAAT AGACTGACTTTGGGTCCATCAGAGGGCAGAA CAAATGCTGGAGAGCAGATGCTAGAATTCCG TCTTAAACCATGAATCCTTACAGCGGCCTG CGTGGCTGCGCCATCTGTCCCAGCCACGCC CTCCTTGCCCCCATCTCCCCCTTTCTCGCCC TGACTCTTTGGCATCTGGCCTTTCCGTCTC ACTGGGATGCTTCCCTAAGAGACTCGTGTGG TTTGCTGCCCTGTATCCTCCGGATCTCCTGA CCACCCATATGTTAGTTACATTGCAATTTCCC GTTTCCCTCATGACGTCTTATTTTCTCCAT TTAAATTACCTGCAGCAGGTACCACCTACAG GGATCTGTTGAGAGTCGGCCTCCTTCAATGT GAAGCCTGATGTTTTGTTCTGTTACAGCTA TGCCCCCAGCCCCTAACAGTTGGTGGCAGTC AGTAAATATTGCCTGGGAAAACGAATCATT GCCATGTGCAGAAATGGAACAGCGTCTCACC AAGTTGGGGTTGCCCTGGACCCCTGTGAACA CTGGGGCAGCTGGGGTGTTCCTACTGTGCTT GTTACCGGCTTCAGGAATCAAATGCACTAGA GAATTGTAGAAGTCCGGTCCACATCCTCTGT GTGGTAGGACCAGCTGCTGTTGGCCTCTGAG CAGGATCTCTTACCTCTCTGAGCAGTGCCTT CCTGTTGCCCTCAGCAAGAATAACACTAACA GCCTAGGACTTCAGAGCACTGCTGCGAGGTG CAAATGAGGTGATATGGGAAAAGCATTGGT GAGATGTATGGAAAGTGTAGAGACCCTGACC	CTGCACACACCTCTCAGTGATTTAATTAGAAAT AAAAACAAGTCTCTACATTAACATTTACATAAG TAACATCAGCCGTCTTTTCCATTCAAAGTGA GAAGGAGATGGTGTGTTAAAAAGATTGAAATTA GACAGCAGCAACACGTCTAGAAGAGCATCCCTG GGGCAGGGTTCTGCCTCAACACCACACAGCACT ACACAGCACCACACTTAGCACAAGGCTCCTCGT GGCTCCTCATGTCCCTTCAGCAAGTCACCAGTG CACCAGGAGGCGTTGGGGAGGGAACCTCTGACC ACAATCACAGCCTGAGGGTTGGAGTTGTGTTTC AGTCATCCTGGGGGGCAGGGGGAGCTTAAACTC GTTGGCATTACTAGGGCAGTACACAGCAGCCG CTCCACGTTGAACGAGTGGATGATCAGCCTGAG AATCAAGGCTGGGCTGAGCTTGGCTCTATCCTC AATTATCTGCAGAGCGCCCTGGTAGAGAACAGA TCTGCCTTTGAGTTTCCAAGTGAGAGCGGAGCA AGGCTGGGCACAGAGCAGGCTGGCAAGGTGGCT GCTGTGGGCACAGCACAGAAGATACTCAGGGGC ATAGATCTTCTGGTGGCTGCTTGGTCTCATGT TGGTCAGGTCACCTCCATTTTTGGCCTCATCAT CTTCTGACATGCACCTGCTTCATGCGTCTGCTT CCTGGAACCCATTCTGGCTTTTTGTCTTAATT CTCTGAGGCAGGTGGCTCCATTGCTTGTCTCCT TTAGGTTTTCATCTAAGAGGGACCGTCACACACA GCCTGTGTGGGCATCATGCTGGTGCCTGACAGT CCTCTCTCTCTCTCTCTCTCTCTCTCTCTCTCT CTCTCTCTCCCCCCCCCTCTGCTGTGGCTTTG GCCTCTGCAGAAACAATCTATGGGATTTGTTGA TATGCTGCCCTCCTTCAACACAAAGGCTTAAGTT GTATTTATCAGCTCCAGTCCCAGGGAATAATCA TGTCTGGTGTCTAGCTGGTGTCTCAGTAGATAGC AGCTGATGAAAAAAAATCAGGAGGGATACGTAG GAACTGACCACAAAATCTTGTGGGGGTGCAGTT ACACCACGGACTCCAGCAGTGTGCAACAGATG TAGGTTGTGGGCCTGTGGAGTTAGTCTTCAATTG TGGGAGGGGCAACTCCACAAGGCCTATCAACAT AACCTCCGAGGGGTGGACTACTCTTGTCTGGCC TTCGATCTTGACAATTACAGTGCCTTCTTCAC AACCCTCCCCCACCCTGCACAGGTGATGACT TGATGGTCTTAAAGTTGAATAAGAATGACAGG AAGCAAGCAGGAAGCAAGAGATGTGATATACAC
---	---

AGATGAGTCAATGGCCTTCTTCGTTACTCTG TTGACCTTCTTTAATTACAGAGTCGCATAG CTGTCAACCACTTATCCTTTTTTGTGCTAT ATTTGCCCCAGCCATTCTCTCCCGGCTTA TGTGGCTAGACTCACCTGCCTGTGCTGCAGT TACTCCAGGCTTTGTGTAAATGTGCATTTTT TTCCAGCCCCAGTTTATCAAGCTTTGCTTG AGTCACTTGTATCTGAAATACCATCTGTCAC TCTTCCAGGTTGGGATCTGTCTAGTGGAAAA CAGATGACAGTCATATGTTACTTAGTGCTTT ACTATGTGGAGAACGTTTACATAAATTATCT TATTTCAATTGCCACTAAGCCGGGAAAGATT CAGGAAACCCATTTTAAAGATGAGGACACTGA GGTCAGGGTAAGTGAGTGAGCTTTTACCCAC CTCTCAGCTGCTCTCTAGTTGTCAAAGACCA ACCCGTGGGGGTGGCTCAGGCCCGACCCCTG CAGCATATTCCTTGGGGCCTCCCAAGTGGGC CCGATCTGCTCAGCCAGCTGTGACTGTCTT TTGACAGGAGGAGGGAGCAGCGAGGCTGCAC CCACTGCTCATAAAAAGCAGAGCTTGTCCAC GCCGAGGGCTCGGCTGGGTGGGAGGCCGCTT CCACAAGGCTTTTTCTTGCTCCATACAAAGT GCAGACTGATGCTTTGAGATATAGTCAGGAT TATCATTTTCAGAGCTCAAGCTCTAATTTCC AGGCATGTGACCAGACCTCTCTATCCATTCC TACAAGTGGTCGAGAGTAGCCCATAAATTATT TTGGCTTGGTCTTTTAAATAGCTTGAGAGTAA TAATCTACATAGCTTGTAGAAGTGAATGTAC TTATTTTAAAGTTCTGTGTTTTTTGATGTT GTTGTTGTTTGGGACAGGATCTTGCTGTGCG CTAGGCTGGAGTGCACTGGCACAATCTCAGC TCACTGCAGCATGGACCTCCAGGTTCAAGC AATCTTCCACCTCAGCCTCCTGAGTAGCTG AGACTACAGGCACATGTTACCACGCCTGCCT GGCTAACATTTTTATTTTTTATAGAAACAAT GTCTCCCTATATTGCCCAGGCTGGTTTTGAA CTCCTGGGCTCAAGTGATCCTCTCGTCTCAG CCTCCCAAAGTGTTGGGATTATAGGTATAAG CCTCTGCACCCAGCTTAAAAAATCCTATTTT CACAGTCTATGTGCAGAGCATTTTGAAGTC AGGTAGAAACCATTTCCCATTTTCTATTACC	ATTAGGTCGTATGGAGACCCTGACAGAGCAAAC CTGTAACATTCACTTCTTACTGTATTAGCCCTT TCTTAGTCACTTATTAATATTCATTTAGTCATT TAGTTTTTGTGTTTTGCTTGATGCAGAGTCTCA TGAAGTTCAGGCTGGCTTTGAACTAAGTATGCA GCTGAGGATAGCCTTGAACCTCAAATTCCTTA CCTTCATTTCTGAGCCATTGGGAATGCAGGCAT CCACCTTGGAGCGCCATTTCTATTTATTTACTT TCTCTAAGGCTGGGGATGGAGCCTATGGCTGTG TGTGGTAGGCACAGGCTGGGGATGGAGCCTATG GCTGTGTGTGGTAGGTAGCATTTTGGCATTGAC TCACTTACTCTCCAGCCCTTGATTCTTTTGTAGT TACAGAGTGATACCATTGCCTGTCACTCATCTT TACTGTGCTTTTGTGTATGCACCCAGCCCCCT TCCTCTGTTGACCTGGCTGGTCTCTGAGGTCAC TGTGTTATGTTTATTTTCACTGTCAACCTGCACA CTCTCAAGCTTCCGTTAATTGAGCTTTGCAGG AGACATTCCTACTTACTCTGTCACTTACCATGT CACTCAGGGTCTACTGAGTGGGAGAGAGATGAC ATATTAATGCTAATATCATTTCTACTGCCCTAGG TGGAGGAGAGGGTCTGTGTGAATCACCCCATTTG CTTTTCTAGGGGTGGGGAGTATTTAGGAAGCC CACTGTAAGGTGGAGAGCCTAGGCCAGGGTAAG CACGGAGCTCCCTTCCACCCGTGGCCACCCATT CAGCATTTGCAAGCTGTCTCCCTGGTGCATCACC TAGTTAGAACAGTGGCACCTGAGACAGCTTAGG CCTGGGGAACCAATAGAACACTCTGTTGTTC ACTTGGACTAGCAGTGGCCTGTCTCTCCACAGG GAGCACCACCCATGTTGGGAGCATCACCTGTA ACCTCCAGAGTTCACCTCACACCAAGGCTTCTTC TCTTCACAACTGCCATCTGCTAGTATCAGGAT GATCATATTCCAGAGGCCAAGCTTATGGCCAGC CCTCTCCGTCAGTCTATGAAGTGGTTGTTGGC AGTTTGTAATTATTTTGGCCCTGTTCTTTAATA CCTTAAGAGTAATAATCTTCATAATGTGTAGGA GTGGAAGTAGCCATTTAAAAAGCTGTGCATTCT TTTAACAGGGTACGTCCAGGACACCCCTGGCAGG TGGGAGAGACTATTCACTTTTTTCTACTGTCCAA GTGGACGTGGGCTAAGTTGTATCCCTTTTCGAGC TAGGTTGTATGGTCTCCATAAAAACATAGTAT CACTGATGTTTAAATGCCTTGACAGCCTCAGT
--	---

TGGGTGATAGTTGACTGGTTTTTTGTTCTTTG AAATCCATTTTAAAGTGTATGGTCCTCTAT GAAAATACTTCTAATTATTGATGTGTGAAAT GCTTTGAAATCCTTGGATGGAAATCTTGATC CATGAAAGAACAGAACTGTTGGTGGTGTCTC TGGGAGAGGCTCACGAGGGCCGGGCAAGCCT GTGGGGGTAGCAGGCAGTCACTCCCATGGGG ACAGGCTGACCTGGCAGGCTTATTTCCCATG GAAGTGGGCACTGAGGAATAAAAAGCAGTTT CAGGCCAGGTGCGGTGGCCCATGCCTGTAAT CCTTGCACTTTAGGAGACTGAGGCAGGGGA TCCCTTCAGCCCAGGAGTTCGAGACCAGACT GGGCAATATAGTGGGACCTCGTTTCTACAAA AAATGAAAAAATTAGTGGAGTGTGGTGGCAC ACTCCAGTGGTCCCAGCTACTTGGGACGCTG AGGTGGGAGGATCGCTTGAGCCTGGGAGGCA GAGGTTGCAGTGAGCCAAGGTCATGCTATGA GTAACATTTTGAAGGTCCACTTCTGGGATTC ATCCAGGAGCTAAACGGGTCTATGCCAGCCA ACTCAGCATTCACCAAGGTACGTTTCCAGAC CAAACACCACATTGTCCATAGACTGATATGC CTCAAAAACCTGGTAGAGGTGGGCACGGGGT TAGGTAGAAATCATCTTCCTCCCTTCCTTCC CCACCAAACCTTCTGGTGACAGAAGCTTTTC TGTAACCTGGGGCAGAAATGGGGTCAGACACTC TGGCAACTTACCCATTGGTGTTATGAAATAT AAAACATTAATGTATTTATATAAAAAGTGAT AGATGAAATTTAAATTTGCTGTTCTATTAAA ACCATATTAGATTTTAAATTATTATAGAGAT TATATTTTAATGTTTTAAATGTATTTGATAC ATTACAAAATTATTTTAGTTACAAGCATATC ATTAAGCTATTCTTTATTATTACAAAATGC TTTTACAATGCTATTCTTGACAACAGGAAAA TACTTACCCTCACTGAAATATGTGGAGTACC ATTTTTTGGAAACCATGTCAAGCATAATGGC AATATTCAGGTTCAATCTTCCTATAGATCTG CTCAATATTTATCTAAACCTTAGCTTCTATT CTTTTCACATGTTATTAGCTATATTTTCACT TAAAAAATTGGAGGCTGAAGGGTAAGCAAA CAAACTTTTGAAGTAGACAAAGCTCATCTTT AATCAACAGACTTTAGAGTCCAGTCTTTCCA	GTGAAGCTTATAATTTAAAGGATGATAGTGTAG GTACCACCCAGGAGAGAGACGTATAGCCTGTCC CTTACCTGGGACACGCTTGCCCTGGCAAGGTCTG TCCCGTGGGAATAGACATGGAGGAAACAAGAA CATGGGCCACATGCTTCTACACACACACACACA CACACACACACACACACAGAGAGAGAGAGAGAG AGAGAGAGAGAGAGAGAGAGAGAGAGAGAGAGA GAGAGAGAGTCTTGCAAAGTCTGCAGAGGACG GTTCTCAAAGTGTAGTCTTCACAGTGGAAAGATG TTTTAATTTTAAATATAAAGAGGTTTGTGT GTTGTTTTCTGTGATACTGGTGTTCATATGG GGGCCACACACGGAGACAGGTGTTTTAGCGCT GATTACACACTGAGCCTAAGGACCATGTAAACT GTGAGTTCCTCTGCTTCTCTAGAAACGGAACG GAACTGATCCCGTCACCAGGACTTAGCATCCTC CTGCTGCACCTCTGACTCTCAGACCTTGACGCC TTAGGTTGGGGCTCACGGAACCTCTTAGAGTGC GTGGATTTGGGCAGCAGTGGTCTGTCTGTTCCC TCTCTCTTTATCAAGTTTTCTAGCCACAGGGTA TTTTTGTAACTGGAGCAGAATCCCAGAACATG TTGTAACATGTGAGCATACTTCTGGGATGCTTT AAGATATAAACTATGAAATATATGTATATACAA ATTAGTATAGCTGGGCATGGTGGTGTGCACGTT TAATCTCAGTCCTTGGGAGGCAGAGACAGGCAG ATTTATGAGAGTTCTAGGCCAGTCTGGTGACAG AGTGAGGCCCTGTTTCAAAGACAAAAACAAATC AAAGCCAGAAAACTTACCATTGGTCACGTTAG AGTTTGGTATTCTATTAAAAACCTTATTTAATT TTAAAGTATACAAAATAATCATATTTTAATAAA GGGCATTTAGGGGTTTACAAAATTATATCAGTG ACAAGCATGAAACCACAACTCTTATTTATTGTT ACAAATGGCTTTCCAATGACATTCTTGGCAGG AAGAAGTGTCCCTGTTGGATTTGTTGACTGTC ATCTTGTAGGATACACATAAGGCATAGTGGTAA TGGTTCAACTTGCCCTAGAAAGGTTACATACTG ACCTAAACTAGTTTCTTCTATTTCTTCCAAATA TCCACATTTCTGTTTCCAGTTAAGAAGGCAATG CTGAAGAGGGAGGCAAACACACTTTCAAAGTA GAAAAACTTAGTTTTAATCAACAGGATTGGGAG TCTAGAAGTTTCATTGGTCTCTGAAACCACC CCATTTGGTTTCTGCACCATTGAATTGTCCCAT
---	--

	AATCTGTTTTTAACGACAGAACTTCTCCCT CCCCTGCCCCATTTTGTCTCCCCATTAAAT GGTACTGTGTCAATAAAATTCCCAAGCGACC TCTTTAAATCAGCGTTCTTTCCGATGCTGGC TACCACAGTCATGGAAAAGGAGATGTGTTG GACAGGCCTGTCATTACAGGTAGTAGTTGGT GGTACATCCAGTCTGTATTTCTTACACAAAA TTACATCTAAATATTTGACATGAGGCCATTT GCTATCATAAGCCATCACTAGGAACCTTCTAG TCTGTCTCACTCGATTGAGGCTACAATGTTG TTAGGTGCTATGACCACAATGAATACAACAG ACAGCCTCTCAGCTGTGCTGCAAAGTATTCA TAACCAAAAGACCATATTTCAAATTAAATCA TAGTAGCGAATGACATACCATTTACATATTA CAATCTGAGCCTCTGAAACAGGGGGAACATA TAATGGTATCCAGAACATCTTTACATCAAAA TAACCTATCATACTACAAAGTTTTCACTTCC AAAAAGTGTAACAGAGTTTAAGGCACTGGTA ACTTTGTCCACTGTTAGAGATTAAACTTCC AAAGCAAATGAAAGAACCAATGTTACCTTT AACGTGGGGAAAGTTGGCAAAAAGAACCCCA GGAGGACACCCAAACCTTCTCTGTGTCCTCT GTGGAACCTGGCTTTTTTCTCTTGTCTCAG AGAAAGAAACAAATGCCGATATCCTCTGTTT AAAATATGAAAGTACCTTACACCAATAACCC CTAACAGCCTGGGGTCTCAGTGGAATAACT TAAGTGAAAGAAAATTAAGACAGGCATAGAA TTAGGCCTTTGTTTTGAGGCTTTAGGGGAGC AGAGCTCCATTGTGGCATCTGGAGTTTCACC TGAGGCCTACAGGGGTTTCAAATGGTTGCAT TTAAGGTCAGAATCTTTGTGTTGGGAAATGC TAGCGACTGAGCCTTGACAGCTGAGCACGGG TTGCCTCATCCCTCTCATGCTGTCTATTTCT TAATCTAACAACCTGGGCAATGCGTTAAACTG GCTTTTTTGACTTCCCAGAACAAATATCTAAT TAGC (SEQ ID NO: 8)	GGCAGTGAAATTCCCAAGCAAACCCATGAAGTC CCTATCTTCTGATGCTGACTGCAACATCCCACA GCTACAGAGTAGACAAACTGGTGGGGGTGGGG GTGGGGTGGGGCTGAGTTAGGCTCATGGCAGGT GGCAGTTGTCGGCATATCCTATCTGTCTCTTAC ACAAAATTACAGTTGACTATTTTAATTGAGGCC TCTTCTTGTGAGAAGCCAGCACGAGACGCTTCC AGTTTGTCTCACTTATGACAGGCAGTAGGGTTA TAGCCCTGAGCCCAGCACGCCAGTGATGAATAC AATAGGTGGGCCCTCAGCCACACTGCAGGTTTC CCATAACCCAAAGGCCAACATCTTAAAGACCCCT GTGAGATCTGGTTACACACCATGCTCACTTCAC ACACTGAACCTCTGGACTAGGAGGAATGTATAA TACTTTCCAGATCATTTTAGGAAAAAAGAGC CTATCTTATTTTAAGGTTTTTATTAAAAA AAGTACACAGCACTTGAAGTATTAATAGCTTTT TGTCCATTGTTGCACACGTAAACTATCAAAGCA AATAACAGTATGGCATTCTTTACCTTTAGCTA GGGGTAACTTGGGGGGGGGACTTTCTCAGTGG CACCTTCCTCAGGACCGGGTTCCTCTCTCTGT CCTCAGAGGAAGAGAAACAATGTGAGATCCCTT TGTTTAACTGTGAATGTATCCTCCAAGCTTGG TCGCTACCAGCACGGGTCTCAGTGGAATAAC TTAGAACCCATTAATACAGGCATAGAATTGGG CCTTTGTTTGGGAGCTTTGGGGGAAGGGAGGCC CACGGAGGCTTCTGGAGTTTCATAGGAGGCCTC CAGGGACTTCAAATGGTGGCATTTTAGATGGGA ATGTTTGTCTTGGGAACGCTGGTGGCTGAGCT CTGCCGACTAAGCGACTAAGCATGGGTTGCCTC ATCCTCTCCCTCCATCTTTGCTCTAGCAGCCAG GCAATGCATTAGACTGGTCTTTTGGACTTTCCT GAGCAATACCTAACGAAC (SEQ ID NO: 9)
C	AAGGGGACAGGACATCTCTTTCCAAAACCTTA GGTTTGGTGACTCCTGGATTTACACTCTCT GACTGCTTGGGTGAGGGTGAATGGAGGGCT	GTAAGAGCCAATTAGGAAGTTCCAGGGTTAGTA AAGGCCAATCAGTAAGCACCAGGGTAAGAGCCA ATCAGTAAGCTCCAAGGTTAGTAAGAGCCAATC

GTCCCCACCCTCGCACCTGCACGGTGGCAT GCTTTCCTCCTACTCCAGGGAATTCCTCGTG GCCTCATGGCCTGGGCTGTTTCTGGCTTCAA GCTCCACGTGGCCTGGCCCCAGCGGTCTGGT CCACCTTGTA CTGGTGCCCCCGCTGCCCCC TGGCCTCAGCTGGAGTGACGCACCTCATCCA TGGGGGCTGGCGTCTGGAAGGTGGCTGGGT CTCTCGGGCTTGAGCACCATCATCTTAGCTC CAACATGTCATTATTCCTTCCTCACTGAGGA CTTTTCTGCTTCCTAATTGGTTGTTGAAGAT GAGGCCCCCATGCTCTTTTAAGAAAACCTGT TGTGCCCCAGGCTTGGCTGTGATGGGCACTG ACTCATACAGAAGTAGAAAGGCCTGCTGAGT CATCAACTCTGTGCGACGCCCTCGCATTTT CATTAAATGATGGCCTCCCTGCCACACGTGAA TCACTCCAGCCGAGATCTGAAACCAGGACA CACCCCAGGGGCGAGGTGACGCTGACTGAGC CCAGCTGTGTCCCTTTCATGAGAACTCAGAG CACAGGGCTCTGTGTGCATGGCCGTCCCTC CAGAGAGGAGGAAGTAAATGCCGGGATTAGT GGAAGATCATTTCTTCTATTTGCCCTGGCT TACGTCTTTCAGAATTCAAACACGTGCACTG TTGACCCGTCAATGGTGGAGTTTTTGGATTT TCCTTCAGTCCGATTGCTAAAATACTTCCCT CTCATGTGAGCTGTTGTGAAAGTCATCAGCC AGATAACATTCTAAAAACAAAGAAATGTGCTT CTCGTATGTTGCATGCTGGTTACTGAAATAT TAGGGAATTACATAAAGGTTTTCTGGGGCAC ATATTCAAGCTGAATGATAAAATTGAAGGTC ACACAAAGCTAAGGTCCTTCAAATCCTGACC CAATTAGCTCTCTGTTAGCTCTCTGACTTTG GACAAGCTGTCTGGTCTCTGAAGCATACTT TGTTCCGCCCTGGGTAGGGGCCCTCTGTTTTA ACAGCGTTTGGCAGATGAAAACATTTGCAAA GCCAAAGGACAATGAAATCTACGGAAGCCTA CCATATGCCAATGACTCCACCAAATGTTTTT TCTTCTTGGGATCTTCTAAAATTCATCTGAA TACTTATAAGTTATGCAAATTTTGGTTATTA ATCTAGGTTGTATTACCTTGGGGGAAGTCAG TTAATCTCTTTGAACTCAGTTTCTTTATCTG TGAACCTGAAAGAACACCTTCAAACCTCAAG	AGTAAGCTCCAGGTTAGTAAGAACCAATCGGTA AGCACCAGGGTTAGTAAAGGCCAATCAGTAAAC TCCAGGGTTAGCAAAGACCAATCAGGAAGTTCC AGGGTTAGTAATGGCCAATCAGTAAGCTCCTGG GTTAGTAAGAGCTTCTGGTTTTTGGTCTTCAAT CACTGGCCTGAGCACTCATGTGATTGGCTAGGC TGGCTAATCAACCAGCTGTGGGAATACTATCCA GTGATGGGCTTGACAGACAGATGCCACAGCATGT GGCACCTTTAATGTGGGTGCTGAGGATACAAAG TCAGGTCTCTCCACGCTTGATAGGAAACACTT TACCAAATGAGCCATTTTTCTCAGTTTCGATTT TATTTTATTTTTTGAGACAGGGTCCCACTGTAT AGCTCAGGTTGGACACAGACTTGTGATACTCCT ATCTTGGCCTCCTTGACTACTGGAATTGCAAGT GTGTGGCACCATGCCAGCTGGAAAGGTAACTTT CTAAGGTACCTCTTTCTAAAATAGATGTTGACC TTTTGTAAAGGACAGACTAAACGCCCCCTGGGCT TGAGGCTGGCGCCATCCAGAACAGGGTAGAGCG TATTGAGCCTGGCAGGTTGAATCCATCTCCCAA ATGAAGAGGGCAGGTGGGTTTTTGGGGTTGATG ACGAGGGAGGGGCAGAAAGAGGGAGACAAGACA GAGAGTGTTACTCAGTCCAGGTACTCTCTTGAA CTAAGAGCACACAGGGAAGAAGGGCCTCATCTG AGGCCAAGGTGTCATTGTATCCGGTATAAGGGG ACAGGATCACCTCCTTTTCATGTTGGAGCTCGTG GATCTTACATTCTCTAATGCTTGACTAGATGTG AGTGGAGCTAGAACACGTATCTTCTCCTGGTCA CCGCCCAGGGTTCTGTGCGCTTTTCTTACTCGGT ACATCATCCTCATCGCAGTGGGCTGGTCTCTGG CTGCCTCATCCAGTTTGTGCTCTCAGTTCATAC GGACACCCCTGGCTTGTGAGTGTGGCCAGT ACCCTCGGGCCTGAGCACCTGTGATGCCCTGTC CTCCAGCTCTTCTCCCCAGAGTCTGCAATGCT ATCATTCCCTTCCCGGCCAGAGACTTACGCTTC CTCATTAGATGTGGGAGATGAGGTTCTCAAGCT CCAACAAACCAGTCTGACCTCGTTTTTGGCAGG AACTCAAAGAGAAGTCAGAAGCTTGCTGAATCA CCCACACCGGCCGCGGCCGAGCATCCTGGCA AGGCCTGTAATTAGAGCCTCTCTTTCACACCTT GAATCTTGAGGGCCCCACGTCTGAAATGAGGGG TGTCCAGTGCTGTGCAAGTTTATGAGCAGC
--	--

GGTGGCTGTCAGAATTAAGTATAGAGGTGCA GGTATCAGATGAAAGCTATAAAACAGTTTAC AGATCTTAGATATTATGATGGATGGCTATGA TACGTTTCTCGAATCACTGCTTGCCAATGAG CTGTACAATCTTCCTGAAGGGGTCTGCCTTT CCAATCTGGGCAGCAACAGTTAATGACGGTG TGCCAGGATATCTGTGTCTCCTTTTATCTGC TCCAGACTTTAAACACACCCCTCTGATTACAT CACACTATCAATTTGAAAAAGGGCTCAGAGC CAAAATCACCCTGTTAGCGAGTTCTCCAGG GCTGCCCTCCTATCCTCTGGAGGTGGGGCTCT CGTCTGCAGAAATAGGCATAAGGGTTTTCTA TGGTTTTTGTGTTTTTAAAGACGAAACATG TTTTGGGATCTTTTAAAGATCCTAATCGTTG TGAAAGAACTGAAGTAAGTTACTGTTCAAG TGACTCTCATTCTGTGTGAATAGTTTCTCC CACGTGAAGTCAGCTCAAGAGACTGTGAATT GCTTCAGCCTACCTGAGACCTGGTACACAGG GAGGCTTCCTAGCCACGGAAGAGGAGAGCGT TTGCAGGAGGAGAAGGAGGAGAGAGGGCCCA CGCAGGTGACATTCTGGAAGGGAATGCTGG TGCGAACTGCCTCACCTACTTTGCTCCTTG GATGTTTCAGGAAAAGCCAGCCCCATCCGCCC CAGTCCGAGGGCCTCACTCATGGAACAAATG AAGCTGAGAAGAGGAGCTTCTGTTTTCCAG CTGCTGGGGTCATCATTATCTTCAGGAAGGA CCCCGAAAAGCATCGTGTGTTGTTGCAAAAG CCTGCCTTATCCTGGCCCCCAGGTCCCTCTC CGCTGGCCCTGTCTACTGGATAAGGTGAGGT TGCACGAAGTAGGTCCAGGCCTAATGTGACA GTGAATAATATGGTGTGTTGGCCACACAGAGA TGTGTGTAGGTACAAAAACCACCATGCTTTT GGCGGCAAAGTAAAAAATGAAGATGTCGTCA AACGATCTGAACTCTGATGGAGACTGAGCGA GAGACCTGGCCCCAAAACAATCACTCCATGG CGGATGCGCTCTGGGGTAGACAGCTACTGCT CTCAGAGCAGCTGTTTTTCAGGCCA (SEQ ID NO: 10)	ACACAGACTCCTTTTCCTTTGGAACCTCAGGGGTG CTGCCTGCGTCTGGCTTCTGTGGAGGAGGAAGT AATGTGTGTGGATTAGTAAAAGATCATTTCCT GCTGTTTGTCTTGGCCTCCGTGCTTCAGAATTC AAGCACTTGTACTCTTGACCCTGCAGTGGTGGC TGGTTTTGAGTCCACTTCTGTCTGATCGCTAA ACTGCTCCTTCTCTGAGGACCTTCAGCTGAAGC CACTTACCTGCTAACACTTAATTAATTAATAAT TAATATTGTAATTAATTTTTTGTGTCAGGATTG GCAGTGAAACCCAAAACGTCACACATGCTAAGC AGGCACGGGGCCATCAAATCATTTTCTTAATTT TTACTTTTTTATTTTTTGTGTGTGACAGGGTC TCAAGTAACCCAGGTTGACCTTAAACTTCCTGT GTGGCCAGAATGGCTTTGAATCTCTGGCCCTTC TTCTCCCTCCCATGGTACTGAGATTACAGGTAT GTACCACCATGCCTGACACCCTGATGCTGTGGT GGACTCAAGGAATGCACATACCTAAGCTTGAAT GCTCGCTGTTGAAATACTAGAGACATTTAAAT AATTTGCCAGTTAGGAAAAGCTTTCTATGGCAC ACAGTCCAATTGAATCTTAACACACACACACAC ACACACACACACACACACACACACACACACACA AGACTTAGGTCTTTCAAATTCAGCTTGGTGGC TTGTTCCATGTCTTCTTTGGACAAGCCCTCCAG CTCTCCTCTCCTCTGCTCTCCTCCTTGGTAACT AAGGGGAGGCCACGCCTACTTTATTGGCATCCT AGAGATGCCAACATTGGCAAAGAGAAGGGACAA TTAAATTCATTGAGGCCTGTGTGGTGTGTCAGC AACTCTGCCAACCCTTTCTTATCTTGGTATCA TTTAAATTAGTTTGAACACTTAAAGGTTGTGT AAATGTGGCTGTCTAGTATTAGAAGCTGTTTTG TATTATTGTTAGTTGTGTTCCCTCAGGGGAAGT GAGCTGCCCTGAGCTCAGTTCTTTATCTGGAAA CTGGGCCTAATACCTCCAGACTCAAATGACTGT CACAGGACTTAGCTATGAAGGAAAGGGTTGAGG CAGAAGTCAGAGCACTTTACAAATATTAGGCGC ACTTACTAATGCTCATGATAAATTTCTCAAATT GTTGTGCGATAAAGATCTGTGTCAGGGTTTCTCA GGCGGCTATCTTTCCCATCAGAGCTGTCTGTCC AAGTTAAAGACAGCTTACTGGAATATTTCTGTA TCCTTTTGTCCAATACAGGATTTAAATATACCC TGCGATTAGATTGTAATGCCAATAAAAAGAAAA
---	---

		GAGGGGATGTCAGAGCATAAGCCCAGGGTGACA ACCCTGGGACTGGCATTCTAGATTCTGGGGAGG AGACTCTTTCTGGGAAGAGAGGGCTCATGGCGTT TTGCAGTTTTTGTCTTTCTGTTTAAAGACAGGAG TTGCTTTGGGGAGCTTTATCTTAAGAATCCGAA CGGTTGTGTAGGCAAGCAAGCAAGGCAGC TACTGTTGCGTTGACCTCGTTCTGCTGTGAAGA ATTTGCACTGTGTGAAGTGTGTTGAGGAAACCC TGAATAGCCTTGGCACACCTCCGACGTGCTGCT TCGTGGTAAAGTTTCTGTCTCAAAAGAGAAG ACATTTAAAGGAAGAGGAGGGACCAAAGACGG GTCACCTAGACAACAGGGATCTGGGCACCTGGT AGGAAGGAAACCTTAGCTTATTTACTCCTTGAA TGTTGGGAGAGAACAGCCAGGACCTGCCCTAG AGCCTCACTCATGAAAGCTGAATCTGGGACAGT GAGTCCTCCCTCTAACTGCTCCAGTTCCACT GTCTCCAGGGTGGATCCCAAGTGGATGCTGTGT ACATGGCCTTCATTCTGGTGCCTAAGCTCCACT CTGTGGACCTGTACCAAGTTGGTGTGAGGAA ATGTAACATTTAATATTATGGGTCTGGGCCACA CCAATAAACTACGAGGCATTGTAGTCAAAGCTG CTGCCGCCTTTCAGTCACCTGACCTCGGTGGCC ATTGAATAAGTGACCTTGGTCTAAAACAATTGC TCCAATGTTCTGTTCTGATGCTCTGGGTGGATC GCTGCTTGTGTCAGAGCAGATGTTTCCAGGCTG TTGCTGGGGCCAATGTCACCATTCTGTAGTT TCAGATTGTCTATTAGTTCTAGATAGGTCTCA TTATATGAGACACCCACCTCCTGCATGGCTC AAAAGTTTACTGATTTTTATTCTTTGTGTGTAA GTGTCTTGTGTGCACGCACATATATGTGCACCA TATGCATTCTGGTGGTAGGAAGCTAGAAGAGG GGCTCAGATTCTCTGGAAGTGGAGTTACAGATA GTCGTGAGT (SEQ ID NO: 11)
D	ATCACGCAGCCCATACCTGCGGTTCTCCGG GGACTTATGCATCGGCCCAAGTTGAGGGTTT GTCTGAACTGAAACCCGCATCCTAGACCTGG CTTTCTTCTCCCCAAATCCAAGGGGACACCC CGGTGACCACAAAAGCTTAGAAAAATCCAAC ACGCAGCAAATGAAACGGGGGAAAGGGGCAC CGGCCCTCACTCTGGCCTCTTAGACACACGA	AATCATGCAGCCTGAATGGGCATTTCTCTCAA GTCGCAGGGTTTGACTGACCATAAACATCATTC CTTGCTGTGCTTTTCTGCCCGCTCCCCAAATCG ATGACAGCCCCAAACCAGCAAAGGAAATGAGAA AAGGGACTTAATCCGACTCTAGTCACTTTAAA CAGCCTGGTGTGTTTATAAAACCTGTCTGCA GTCAGAGGGGCATGGTGCATGCAGAAGTCAAAC

TATGAAACCTTCATAAAACCTGTTGTACAAG TCAAAGGGGACCACGCTGGGGTAAAAGTCAA ACCAGTCCATCCTCGTTCTCTGCGTACAGA GAGAGGGTCCAGCGCGGGCGGCGCCCACTGC CATCGGGCCGGGGCCGGGGCGCGTGGACAGG AGGGTGCGGATAGAGGCAGATCGGGGGCCCG GTCGCCCCACGTGCGGCCAGACACCCATCCC GGCCGCGCTCTGCGGCTCTGATCCGGTGCC AGACAGGAGCGACAGGGGCGAGGTGGGGACC AGCCGCCGACCTCACCTGTTTTGTTTTCTTG GAGGAAATTCCTCCGCTGGGGGGCCGAGGTG GCACCGCCCGCTCGCCCCCGCAAGACCCAG CCGGTCCGCGCCCGCTTACCTGCTCTGCGGC CGGCGGCCCTGGCGCGGGCTCTGCGCGGGG GGCGCCCTTCGCTCCGGCTGGGCAGGCAGGT CGGGCTCGGGCGCCGCGGCTGTGCGGCTCT CGTCGGGTTTCGGGTGAAGGCCCGGCTCCC ACCTGCTGCGCCTTTTAACCGCGCCCCACCC CGCCTCTGCCCTGACGCGGCTCGGGCGGGCT GCGGGAGGCGAGCGCTGTCACTCGACGAGCC CCCCGCCCCACCTACCGGGGCGCACTAGC CGCTGGGCGCGACCGTCCCCCTGAGGAGCA AGGAGTGCAGGACCGGGGCTGTCCCTCCGG GCCGATGCGCAGAGCGGGGACCTTTTTCCC GTGGCGGGGCGCAGGGTGGGGACCCCTAA GAAGTGCACAGTGC GCGGGGCCCTCTTTCCG GCCCTTGAGGGAACGGGGTACCGGGGATGC AGGGGGTAGGGCTCTCCCTCGGGAGCGCAGA GGGCGGGCCAGCCCCCTCTGCACGGGTGCA GGTGTGGGGCGCCTGCTCAGGCCCTCGAGGG AACTCTTCCTCCCTAGTGCACCCGTGGGGAG CAGTGTGAGGGGCGAGCTGTGTTTTTGCCAG GACACATCCTCAGTCTTTCTGGGTGATCCAG CCTTCTCATAGCCCGGGGGTGACAGACCT CTCCTATAGGAGCCTGGAGGTTCTTTATTAA TTAATGACCACTTAGAGGAGGTACAGGGGTT GTTTTTATTAATTACCTCCATCCTTTGAAGA CTCCTCCGGGAAGCGGAGCAGGCCTTCCTC GGGACAGTGCACCAGGAGAGACCACATTGCC TCCCCGCTTTTCAGTCAAGACTAGAAAGCTC AGGGCCAGTACAGGGAGTGGTGCAAGGGCTG	TAGTCCATCCCAGTTCCTACTGCAGGGCACGAG GGAGGGGGCGGCGCGGGTGACAACCACCCTGCC GCGGTTCCAGTTCCTCGGTGGGCTCGCAAAGGCG GGATGCCGATGGGAGGCAGATAAGGATGCTGGC AAACCCCCGCCTCCCCCCCCCACCACCCGCA TGGTCAAGACTGTCTGTAAACCGCCGGGCGCCT GGAGATACTTGCCACCCCTCGTCCCAAAATC TGGCGAGAAAGGGAACAGACCACTTCCTTTACC TGCCCGGGTTTCTCGGAGGAAATGCTCCCACTC GCGCTTACCTGCTCGGTGGGAGCCGGCTCCAGG CTCGCAGCGCACTCAGAGCTCCTACCTGAGC GTAGGTTGGATCAGGCGCCGGCGGTTACAGCG GGAATGGAATCGGGACAGTGC GGGTGGAGCCC CGGTTTCCACCTGTGGCTTCTTTTAACCGCGCC CCCACCCGCCTCTGCCTGACGCGCACGGGAG GGCTGCGGGAGAGGAGCGCGGGCACTCGACGCG CCTTCTGTGGTGCGCACCGCCCTCTCTCCGGGA CAGAGGAGCGGGGCGGGTCCCCTTCTGTGGAGC AAGGGGACAGGGGACCTTCCTGTAGGGCCAGG TCTTAGTGGTACTATATTAGGGCACTCGTTGGG ATCCTTCTTCTGAAGCCAGGGACCACTGCGAGT GTCCCCTAGGAGAGACTCCAGGTGTAGGCTGGT CTTCCCTTGGGTTGGGGACAGAAGGCTTGTCCC TTCTTGTGGATGTGGGTGGAGCGTGACCCGGA TGGGAAGCTCAGCCAGATCCCATCAAGGACAG GGAAAAGTTGCCGCTGGGGCCTTGCTGGGGCT GGACACTGGAGGGCCCTTAATGAAGTGAAGGCT ATCCAGAGTACGGGGAACAGGCTTGTGGACCCA GCTAGTAGTGAGTCTCTCCTGTTGGTCACTCTG GTAGGAAGACAACCTGGTTTGTTCATCCTTTC TAGACCCTTTGGGCACCCCTCTCCTCTAGAGCAG CCTGGAGGTTCTTTATTCCTTAATGACCACTTA GGAGTCTCAAAGGTTTGTTCCTTATTAGTCATCT GAATCCCTTCTGCACTTGCCAGGGAAGGGGAG TGGACTTCCATCTTGAGAGATCCCACTGTGTCT GCTGTACATCAAGGGCAGGGTAAGGTCAAGGC AAGCATAGAGGGTGGTACAGGGGCTCCTGGGCT GGAAATGTTGGAAGCCATGTAAGGACCTAGTTT TACAGGGCCTGCCCTGTGCTACTTCAGACAAGA CTTGTAACATGTGTAACCTGGTTATTTTACAAA ATTGGCTGGCAGGTATGTTCTTACCTGTGGGT
---	--

	GTGGGGTGGAAACGTTGGAAGCTATTTAGGC ACCTGGCTTTACAGGTTCAAACCTGTCACGC ATCGGACAAAAGATGTGTGACTTGCTTATTC TACAAAACGTGTTCCGTAATTAAACGTCCCCA CCTAAACCATATGCCACTTGTTGGGTCATAT TCTCCACGAAACAATTAAGATGTCTGTAA AGGTCATGGAATTTGAGCCAAGACTTCATAA AAATCCGCTTTCCAAAATATTTTATTTGAGG AGAACAAGGTTCTTAAAGAATTTGCCCAAGT C (SEQ ID NO: 12)	CATATTCTCACTTTAGCTACATTCTACCTGTTG GTTACGTTCTCTCACAAAACGAGAGTAATAGT GCTTCCTAAAATGTCTCTCCAGGTCATGGAGG TTGAGTCAACGCTTTATAAAAAACCCACCTAAT AAAATACTTGAACCAGAGTTCTCGGAATTGGAC CC (SEQ ID NO: 13)
E	TAAAAGTGAGCAAACAGCTTGAACCAATCTA AACAGCTTATTTATTTGAGGTAATAAACTTT TCCTTCTTCCTGAGTTTTCTTAAATCTTCT CTATCATGAAAATAGCATTAATAGCTAAAAT TTTAAGTGTTTAGAGGTTTTGCCTTTCAAAT CCAGTAAGTCTCCAGAGTCAACAGGTGCTAC AAGATGCTACTGGCAGTAACAGTGCTTCTCC AGGATTGTGGTAGGTGGTGTCTAAGGTCTT TTCAGCTTGAAGGTTCTGTTTCCCAGTTCTG TCTCACTTAAGATCAGATCTTGGTGAGTATA TTGGCAAACCATTTTCAATTATTTAAATTTGTA AAATACAGGCTTTAGGCCGGGCGCGGTGGCT CACACCTGTAATCCCAGCACTTTGGGAGGCC CAGGCGGGCAGATCACCTGAGGTTGGGAGTT TGAGACCAGCCTGACCAACATGGTGAAACTA CGTCTCTACTGAAAATACAACTTAGCCAGG CTTGGTGGCACATGCCGTGTAATCCCAGCTAC TCGAGAGGCTGAGGCAGGAGAATCGCTTGAA CCCGAGAGGCGGAGGTTGCTGTGAGCTAAGA TTGTGCCATTGCACTCCAGCTTGGGCAACAA GAATGAACTCCATCTCAAAAAAAAAAAAAAC AACAACAACAACAAAAACAGGCTTTAATTGT ATTTCTACTCTTTAACTAACTAGATATTAA CTATAAAATATTAACAATTTCAAATTTTTGT TAAAGGAATACATTTACACAGCTTAAAAATT CAAGTGGAACATAAAGGTTTACAAGGCAATA TTTCAGTCCTCTGCCCCATTCTCTGCTCCTC CCACCCTGTATGCTGTCCAGAGGCAACCAA CGCCTTTTCAATTTTATAGAGCTCTTCTGACGT TTACCTTTATGTTTCAAATAATGTGCTTAT	AGGAGGTGTGTCTTCCTGGAGGAAATATGTCAC AAGGGTGGGCTTTGAGCATTAAAAATTACCC CCTTTCAGGTTTTTCTCTCTGCTTCCTGCTTA TGGTTCAAGATACAACTCTCAGCTTCCAGCTT CAGCCCCTCTGCTCTCAGAGATGCTCATCTCTC TGGAACCATGGGTCCAAATAAACTCTTTGTTCT ATAAGTTACCATGGTCACGGTGCTTTACCACAG CAACAGCAAAGTAGCTAATATAATCTTTCAAG GCCACGAAAAAGAGAAAGGCAACCAAGAGTTT GGCTGACCAAATCAGCTGAGAACACAAACCTTC CCATCCTAAATTCCCCAATGTTCTTTTATTTTT CATCATGCAAATAGCCACTGATATTTAAATTAT ATTAATGTGCTCATTATGGCAGTTTCATATATT TATATATTGTACTTTGAACATATTACACACCT CCAAATACCTCTTCTGTCCCCCACATTTTAAG ACTGGAAGTCTCGTTTTTTCAAATCCATTATTA GGTCCTTAGGGTCAATGGGGTCATATGATGGTG TCTGTGGTTCTAATTAGTGGCCAGCTGGATACC TGCAGAATCAATGACTAGTGGGTAAAAAGTGAG CAGTCAGGGTCAGCAGCTCACAAAGCGTCAGTG AGAGGCGGACAAAGAGAGCTTTCAGCAACCCCT AACTGGGTGGGCAGCATGTGAGCCAAGTGTGAG TCCCTCCTTTTGGACCTGGGAGACCAGCAGAG TGTGCAGGCCCTCCGTTGGCTTGGCCAGGTGA TAAGCTGACCTCAGCAGGAATTACCTCAGTCTT AGTCCAGCTCCTGATGTAAGTCTCACTCAAAAC AAAACAAACAAGCCTAGACAAAACAGCTTGTT GTCTTTTTTCTGTTGTGGAACTGCTCCCACTC AGGAATTTCTCAGTGGCCCCCTCAAGGAAGTTT GCTTCTCTCTGCTTCCTTCCACACATCTGTGT

TATGCCATTTACTGATTGCTGGACTTTAGAC CTGTTGACTTTTTCTGCTATGGTAGTGGAGG CTTTAGCTCTGACCTGAGCCCCACTGCTCCT GCTCCACCCACACCTCTTCCCTCACCTCAT GACATGATCATGGCTCATACTCTGGTCAAAT ACATATTGTTATTTATATTATTTTACTGCG AGCATAATGACGTCTGGACCAAGTTGTATTC TATGTTACATTTTCTTTTGGTTGCAATTGCC TCCCTTCCCTGAGAGTGAACCATGACTGGGG TTTTCATTTGCTTGGCTTTCTATGTGTCTAT TGTTGCGCTTTTCTACTCTTCCAACAAATC TGTCATATGCCCGGAAACAATTTTTTCAAGT TCCCAGACATGGTTCCGCACAGTCCATCTAT TCCATCTGTTTCTTTCCCTTTTCCCGGGGGC TGTTGGTCTGGGCAGGGTGCTCTGGCCCTCTG CCCAGTGGTCCCTGGGCTCCCTTGCCTTT CCCCTGGGCCAGAGCTTGTGCTTTCTGGAGT CCGTGTCTTCTGTCTTGGTCTCTACCTTCA TTTTGCTGAAGCACACACCTTCCAGGAACTT CCTCAGGAGGGGAATGTGGAATAAATTCT ATGCACATAAAGTCTTCATATCACCTCAAA CCCGATCTGTCTCCCGCCTCCAATGTACTT TCCTTTCCCTCTCTTATTTTCTCTGTTTTAT GAACTTACACCTTTTTTCTTCACTATTGTGT AATTGGCATTTAAGATGGGAGTAGAGATAAA TGCACCTGTGTAGGCTCATACTAACCACACG CCTCAGTGCATGGGTGTTTATCAGACTTCTC TCAATCAAGAGCTGCGCTGAGTACTTGTGAA GGCCCTGCAGGGCTGGTGCTGAGTAAGTTCA GGATTGGGCACCTCTGAGGGGTGAGGAAATG GAGGTTTACAGAGACGAGAAGGAACTTCCCCAA GGCCACATGGTTAATGATTGGAAGATCTGAG ATTCTAAACCAAACCTGAGTCGATCACTTCC CTTTCTGTCCACTGCACTGATAACTGAAGCC CAAGGGCTGAGGCCACACCTCAGCGTGTGAG GATCAGCAGAGGAGACCTGCTGGCTGCGGG ATGTGGATAGGCTTTGAGGAAGAGGAAAAGC ACAGGCAAAATGTCAAAGATAAGTGGGAATG AGGTTCCCTGGAGCATGAGTCGAGGTGCTC AGGAAGGTGCTGGCAGCTCTAGAGAAGGCCA GAGAGAAGCACCCAGTGGTGGGAGCCACAGC	CTTTCTGGTTGGAGACCATGGACTTGAGAGTTC AAGTTGAGCTTCCACTACCCTAAGTGCCTGGGT CAAGCACACCTGCGCTGAGAAGGGTCTGCCAG TCTCAAACTGCATCACTAGATCAGCAGTATAC TCTCTCACTTAAGCATGGAGTGGGGAGGTGCCCT TTGTATGTCTTAGCAATAGTCATCTACGTGATT TTGAGGTCATTTTACTTTTAAAGTATATAATCT TCAAACCAAATTCAAAGACTAGGCCAAAATTTT AAATTAGCTTTTAAAAAATGAGCTGGTTTGCTT ACTTCCCTGATCTTAATTCCTATAGGCAGTATT GTGAGGTAACCTATTTAGGTTTAGGGATGATAG AGAAATAATGTCTTAGGGTTTTACTCCTGTGAA CAGACACTATGACCAAGGCAACACTTATAAAGA CAATGTTTAAATTGGGGCTGGCTTACAGGTTTACG TTGTTTCACTCCATTATCAAGGCAGGAACATGGC AGTGTCTAGGCAGGTATGGTGCAGGAGGAGCTG AGAGTTCTACAGCTTCATCTGAAGGAAGCTACG AGAATCCTGGCTTCTAGGAAGCTAGGATGAGGA TCTTAAAGCCACGCTCACAGTGACACACTTCT TCCAACAAGGCCACACCTCCAAATAGTGCCACT CCTTGGGCCAAGCATATTCAAATCAGTATGGGT ACTCTTAAAGAATGCATGTTTTAGCTTTAAAC ATTGTTTCACTTATCCGTGTAACAGACTGGTTTG AGATCTCTCAGCAAAGGGAGTTATCCTTATACA GGGACTCTTTTCACTTCTTTTCTTAGTGCATAT TCATTGTAGATAGTGCTGAGTTGTATAAAGGCT TTATCTATCTATCTATCTATCTATCTATCTACA TCCCAAATGTTGCCCCCTCCCCGTACCCCTC AAAGAGTTCTTTCTCCACCCCCATTCTCTTTG CCTTTAAGAGGCAACCTCCTCTTATATCTCCCC AACCTGATGCATCAAATCTCTGCAGGATTAGGC CTCAGGCCAGCCCATGTATGCTCTTTGGTTGGT GACTCAGTCTCTGGAAGCTCCAGGGGTCCAGG TTAGTTGACACTGTTGGTTTTCTTGTGGGGTTG CCATCTGCTTGAGGGCCTTCAATCCTTCCCCTA ACTCTCCACAGGGGTTCCCAACCTCCAGTCAG TCCAGTGTATCTATGGGTATCTGGATATCCC CCTCTGTCTCATCAGCTGCTGGGTACAGCCTCT CAGAGGCCTGCTATGCTAGGCTCCTGTCTGCAA GCACAACATAGTATCATCAATGGTGTGAGTGAT GGGTGCTGCCCATGGGATGGGTCTCAAACGA
---	--

CCCAAGACACAGGCTAAAGCCCCAGCCCAGG GTGGGTGAGCTCCACCCTGTCACCTATGGGG TTGCATGCAAGTGGTTCTCTAAGCATTGGC TTCATCTGGGAGGCGGGGTGACATCGCTTC TTTGAGCCTTATTTGGAGGACTAAACAACAC ATGCATTTTGTCAATTAGGCTGGTGCAAAAGT AATTGTGGTTTTTTTTCTATTACTTTTAATGG TAAAAACCGCAATTAGTTTTGCAGCAACATA CTAACTTTAAAGTTCTTAATACATATGAGAT ATTATTTCTATCAGCTTAGAAGGATCCATTA TGATTGTAGAAGACCTGGGATGCCAGTCTGA GGAACCTCTCTTTTCTTAAGCAAAGGAGAAA CAAAATAATTCTGATGGGGGAGTGACTGACC CCAGTCTGGCTCACC GGCGGCTGTGAAGTCC TGAGTGTCTCTGGCAGCTGCCTTTGAAAGC GCAGTGGTGTCCGGGGCTCGCCACTGAATAG CGTTTGTCTCAGAAGGGAGCCCGGTGGAAA ATTTGAAGCTGCAGTTAGGAAGTGTGTGTAT GGCCTTGAAACTGAAGATGTTCCTTTAAAA GAAAAATCACAGTGTTTTTTAAACTCAGATG ACAGCTTTGACCATTATCTGCTTTCTCTCC TGCCAGCTCTAGAGTTTTCTTGGGATGTTAT CAAGGATGATATCACAACAATGCCCACTTCT GTTTTGTTTTTAACCTGAATGACAAATTACC AATCAGCAGATGTAGGCCATCCAGGGAAGTT TCTTTTAAATGCTGGACTTTTGCAAAAATGT AGAGCCTTGGTGGCAATTGTGATTCTTTTTT TTTTCTTTTCTTTTCCCCAATGAAGTACTT TTTTTTATGTCCAGTTTGGGAAGGTCCTGA AGATTGTTTGAGAACTTGACTGCTGTGTGAG GGCAGTGCTGACACTCTCTGTTGCCAACTGT TATTCATTATTCCAAAAAATCAGAGAAGCAA AAACGACCCCTCCAAACAACCTCAAGACAAA CTCCAAGCAAAACAACAACACACACACAAAC CCACAATTTTCTTTGGTTGCTTCTGAGAAG GAGTTTTAATGGTATAGTAAATACAGCATTT ATCGGATGATTTTTGCTGCCATTGATATGTT TCTCTTCTTG (SEQ ID NO: 14)	TCTGATCACTGGTCAGCCATTCTTCAGTCTTT GCTCCATCTTTGTCCCTGCCTTTCTTTTAGACA AGATCAATTTGGGGTCAAATTATAAAGGCATTT TCATGTTAAGTGATAAATGATTTTTGACCATGT TTCCCCATATCCTCCTACCCTCCCATTTGCCCT CCCCCTTTCTCATTAGTATTTCTTTGTTCTAGAC AAATTTACTCTACTTTTATGGCATATGACACAT ACATGATTTAATGAAACATAAAATGGAGAATCT ACAGACAAAAGAAAGCATGAAATATTTGGCTGA AGCTGACTCAACTCATTTAATATGACAACCTCC ATTTCCCTACAAATAAGAGAATCTCATTCTTTA TTGCAGACTAAAATTCCACAGGTGTATATACCA CATTTCTTTCCCTATCCCTCTGTCTTTGGACAC CTAGGCAGGTTCCACCGTGTAGCTATTGTGAGT AATGCTGTAGTCAACATTGACATGCAAGTGTCT CTGTGACATGTTGACACAGAGTTCTCTGGATAA ACACATAGGAGTGTCTGAGCTGAATGGCAGTCG ATTGAGAAAACAAATAATAAAAGGGTTGGTGAG CAGGTGGGAAAAGGAACTTTGAACGCATTGCT GGTGAGAAGGAAAGTCAGTCTAGCTGCTATGGA AATCAGGGCGAGGGTTCTCAGGCCCTAAAACC AGAACTGCCTTATGACCCAGGCAGTCTTGACAG CTGTTGTTGTCTGTGCTTAAGTTCTTGACTCTG TCAGACATAGAGAAACCAGATCTCAGGCTAGAA GTTCCTTCTTTCTCCATGTTCCCTTAACCACCC TCTTCTCTCCTGCCTCAGCCTTGTAGAAGTGTG CCTTCCATTAGGCACCTAAGAAGAGGAACTTGA CAGTCAGCTGCCACCTTCTAGTGACTGGAAGAA CCAAATATTCTGGATCTGAATAAAAGATTTTAC ATTCTGCTTTGTGGCTCACAGGAGACTCAGTGA CAGGCCACCTAAGCACACACAGAACAGTAGAG CGACAGGTTGAAACAGCTTCCAGGAGGAGTGGG GGGAGGACGGGCTGAGGAAGTGGGATGTGTAAT TCCAGTAGAGAAAGTCATTGGAGGTACGGAAGG TGCTGGCAACCCTGAGAAACAGCAGCTGATCCA CCAGCTGCAGGGCCAGGCCTCTGGATGCAACAG CCAAGTCAGAGCCCAGCTGGGCCTGGCTGTGTT CCACCTGCTCCCTGGGTGGCCCCAGGCAAGTGA CTCCCCTGAGAACTGGCTTCAGTAGTGAGAAGA GGGGTGGGGTGACAATAGCCTCTTTACAGGGTT ACCTAGAGGACTAAATAATGCACATACGCATAC
---	--

	ACACACACAGACATGCACACATAGACGCACACA TAGACACATAGACACAGACACACACACAGAAAC AGACACTGACACACACATACACATACACAAAGA CACACAGAAACAGACACATACATATATGTATAC ACACAGAGATATACAAATATACATACACACATG GACACAAACACACACATACAGAAACAGACACAC AGACACACACACCAACATATAATACACACCCAT ATAACACACACATATAACACACACACACAGGCA AACACATGGGTTTATGGGCTCTGCAGTACAATA AGGCTTTATTTTCATCAGCTTAGTCAGCAGTAG CCTACAAATATTAGTGTTCAAAAGTATTTTCTA GGCAAGGGAGAGACAGAAAGTGGTTGTGGTGGG GAGTGAGGCTGGTGA CTGTGAGTGGGCAGTGTC TAGTGTCTGGGGACAGCTGAGATTGGCAGCCCA CTGGCCACTGACTAGAGTTGCTTCCCACAAGTG AGTCCAGTGGAATTTTTAGTTTGCTCTTAGAA ACTGTGCCTTCAGCCTTGGAACCTGAAGATGTT TCTTTAAAAGAAAAATCGTGCTTTTTTGAACTC AAATGAGAGCATTGCCTGCGGTCTGCTTTTCTC TCTCTCTCTCTCACCAGTTTTCTGGGATGTTA TCAGGGCCAATCATCAGAACAATGCTCACTTCT ATCTTGTGTCTAACCTGGATGACAAATGGCCAG TCAGCCGATGTAGGTCACGCAAGGAAGTCTGTC TTTCGGGTGGACTGAGGTAGCCGCAGTGCGAT GGCTGCTTTGTTGTTTCTTTCCCTTTTCTTGTC CCAACTAAAAGCGCTTCTGGTCTGGGAGTAGGG GCGACTGAAGGCTGTTTGAGAACTTGACTGCTG GGCCCCCTCTAACATTTTCTGTTGCCAACAGCTT ACTCCTTTTGCTAAAAAAAAAAAAAAAAAAAAA AAAAGCAAACAAGCCCAACTACTTCTTCAAAC AATTCTAAGACACCACACAAACAGAACAGACTG AAGCCCCAGTAACCCAGCTTCCAGGGATGTT TGTGAGAACCAGGTAGTTTTTGATCACTACTA AATTCTACTTAAACATTTTAAAGGATTTCTTT TTCTTCTCGTTTTTAAATTTGTTCTTCGAATAC AATGTATTTTGTATCATATGTGCACCCCTCCCC CAACCCCTCCTTCTATCAAGCCAACCTGGTGTT CCCTCCCTCCCTCTCCCTCCTCCTCTCCCTC CCCTCCCTCTCTCCTTCCCTTCCCTCATCTCC
--	--

		CCCTCCCCTTCCCCTCATTCCCCTCCCCTTC CC (SEQ ID NO: 15)
F	GTTTTAATGGTATAGTAAATACAGCATTTAT CGGATGATTTTTTGCTGCCATTGATATGTTTC TCTTCTTGAAAAGAGGAATTCAAATGACAATG AACATTTTTGGGGTCCTCTTTTATGGAGTTT GATTTTCAGGGGATTGTCAGGCATGTCGTCT CCGGGTTCCTATGCTGCACAGTCCCAGCACT CTCTGTGGCTCAGCCTTCCCCTCCCCTTGCCC TCTGAATACCTTGCCGTTGACTGAATGGTCA TCGTTAGCACAGGTCATCACAATACATGACT CCTGGGCAGGAGGAACAGAGGAGCGGAGGTT GTGCCATGCATTTAAACCCAGTTAGCATCC CAGTGGGTCTTCCAAGGCCGAAGATGGCAAA ACGTTTTTATTTTACTTTGTTGAAATCATCT GTTTCCCTCCAAATGGTGGGCTGTTTGGGCA CAAGGTCATGTTGTCTTCAATTTCATAGCCC CGGTACCCAGCAAGGATGGCTGCCCATAGGC TCTATTAAGATGCCGAGTGCATCCGTGGCAC GGCCAGGAGGAGTGTGCTGTGGTCAGCCTTC CAGAAGGAATCAATCTCCTGGGAGAAGTGGA GAAGTTGGCCTGCAGCAGGGGCCTCGAGAAT GGCGGGTCTCATCCACCACCAGCAGGCTCGT CTGTTGCCCAGCAGTGTGATCCTAGCTGAGG TTTATCTCTTTCCCCTCATTAGACTGCAGTC TCCTGAAAGGCAGGGTGTGCACCTGACTTGT CTTTTTGTCCCCTTCATCCTGCGCCCTGCACG GTTTGATCAGTAAATGGTGGCTGAGAGACAA GGGAGTGGGAAGGAAGGAGGTGAGGAGGGGA GAGAGGTCTGAGTGTGAAAGAGTCCCTCC TCTGCTTCAGGGGCTTGTCTGGGGTTTTCT GGATCTTCACTACTTGCGGGTAGGATCTGAG CTCTCCCGGCCCTGGTGGTTGTTGGCCAGG CCTGGCCAGCTTCCAGCAGCACAGGTCATCA TAATATATGACTCCTGGACAGGAGGAACAGA GGAGCGGAGGTCTGCCATGCATTTAAACCC CAGTTAGCATCCCACTGGGTCTTCCAAGGCG GAAGATGGCAAAACGTTTTTATTTTACTTTG TTGAAATGCAGGTTGTTCCCTTTTTTTTAAAC CAACTTTTATGTTCCAAGGCTAAAACATAGC	GGGTAGTTTTTGATCACTACTAAATTCTACTTA AACATTTTTTAAAGGATTTCTTTTCTTCTCGTT TTTAAATTTGTTCTTCGAATACAATGTATTTTT GATCATATGTGCACCCCTCCCCAACCCCTCCT TCTATCAAGCCAACCTGGTGTTCCTCCCCTCC CCTCTCCCCTCCTCTCTCCCTCCCCTCCTCTC TCCTTCCCCTTCCCCTCATCTCCCCCTCCCCTTC CCCTCATTTCCCCTCCCCTTCCCCTCCCTCCT CCTTCCCCTCCCCTTTCTCTCCCCTCCTTTACCT CCCCTCTCTTCCCCTTCCCCTCCTCCTCCTCCC TTCTCCTTCTTCTGAGGTTATGGTAGCACTA GGAGTCAAATCCAGAGCCTGACACTCAACTGCT GATTGAACCCCTGACCTTCTTATTTTTTCTGT CCATGTTTATTTTCTTGAAGGAGGAATTACATA AAAAATGAGCCTTTCGGAGGTCTTCTTCTCTTG AGTCTGCTGTTAGGGATGAGTCCCGTTTGAATT TCTGTCCATGGCAGGGTCTAGCGCCGATTTCTC TCTGATCCCCAGAACCTCACCTGATGAGGTTT GTGCGATGGGTGACACTAAACAGTGTCTTCTAC TAAACAGTGGGCTTTGTGGGGACAGGGTGACAC TGTCTTCCACTTGCTCTGAGTTCCCCGCAGGCA TCACCCCTTCTCTCCCCTGCTGCCCCACTCT CTCTATCTGGGTAGGTTGCAGGCCCCCTCACAG TTCTACCTGGAACGTGCTGTGGTCAGCGCAGGC AGGAGCTGGCTGGCCTTTGTAAGACTGGCCAAC TAGAGCGATGCAAAGCCGGCCTGGCACCAACCC GGGCTGCTCTGCAGAAAGCTAGCTGATTTCAG CCTGAGCAGGTGCCTGTGACTCCAGGGGCAGGG TCTCTGTGACACGCACCTCTATCCATCCTTCAT CTTATCCCTATGTTCTGACTGTAAATGGCAAC TGAGTGAGGAGGGGAAGGAAGGCAGAGGAGGG TCTGAGAGGATTTGAGTGTCCAGGCCCTTG CAGAGGCTGTCCCGGTCTGGAGGGCTTCAGCC AGGGTGTCTATGTAACACAGGATCCTCAGATA GCAGGTACTGTTAAAGAGGAGGCATCACACCT GTGCATTTGAGACCATGCCAAAGCAAAAGGTGT CAACACCCGATTTTACTGCATGGAAATGTAGT TCGTTCCCTTTCAACCTTTTGTATCGTGGGGCT

ATAAAACAATTTGAAAAAGTCGGTTTCAATG TTTCCCATTTGTTCACTGAGAGAGGGTCACAC AGGGTGCAAGGCAACAGAGGACACCATTGCT TACGTAGTACCTCGTGAGCTGCACTGCGAGA GGCCTTTCAAAGGAAGGTTTTATTTAGGAAG CAAGGAATGATTAAAACTGATGGCTCTAAT CAAATGAGATTTAAAAATTTTCCATTAAACCT TCATAGTTAGGCTGCATGCAGTGGCTCATGC TTGTAACCTCCAGCACTTTGGGAGGCTGAGAT GGGAGGATCACTTGAGGCCAGGAGGTTGAGG CTGCAGTGAGCTGTGACTGGGGCACTGCACT TCAGTCTGAGTGACAGAGGGGAGACTGTATCT CAAAAATAAAAAAATTAATAATTAAGA AATAAACCTTTAACATTGGGTGTAATTTTAC TTTCCATCTACTCCTTCTTCCCTCACCTGCAA CGTTCAAGAGCAGGAGGGAAGATGTGAACAC ACATTTGTGTGTGTGTGTAAACATGCTCATG TGTTTCTAAATTATCAAGTCAGGATAAGAAC TTCTACTGTGAAATACAGATATACAACAATA TGTCCCAAGCTATGTTTAATGCACCTTTTATT ATCCTGCTAGTTCTTCTAAATATGATCATTA TACAATAGTTCTTTTTTTTTTTTTTTTTGAG ATGGAGTCTTGCTCTGTACCTAGGCTGGAG TGCAGTAGCGCAATCTCGGCTCACTGCAACC TCCGCCCCCAGATTCAAGCAATTATCCTGA CTCAGCCTCCCAGTAGCTGGGACTACAGGC GCGTGCCACCACACCCAGCTAATTTTGTAT TTTTAGTAGAGACGGGGTCTTGCCCTCGTGG GCCAGTTTGGTCTCGAACTCCTGACCTCAGG TGATCCACCCACCTTGCCCTCCCAAAGTGCT AGGATTACAGGTGTGAGCCACTGTGCCCGGC CCATTATACAATAGTTCTACAAAGAAAATTT AAGAGCAAGCTCTGGCTTAGTCTTTGAAAAA CAAGTTTGGAATTTCTATACGAGTGGATAA AATGTCAGCTCTTGGTATTGTCCTTAAGACA CAGTACATGGTATTTACTCTCTTTTATAGG GTAAAGATAGATAAATCCCCAAAGGCTTGG CATTTAGGAAACAATCATGCTTTATCTATTA ACTTACTCTTTAAGCTCTGTCAATTTTTCG TCTGAGTGAGACACTCTATTTACTGAGCCAC AGACCACCTGCTAGATAAGCAGAGACTCTTC	GAAGAGATGATGTGAAAGGACTTTAAAAACTCC ACTAGGCTTCTCTGCTTTGTTCACTGTAGAAGG TCACAGGGAGTTCAAGAAAAACAGGCTAGGGATA GGAGGATGCTCATGTGCTTCTCTTGTGAGCGGT GGCAGGGCCAGCTCCGTCTCAAAGCAGGCTTTA TCTAGAAACTGGTGAGGTGGCAGGAGCTTAGGA GGAGGGAGAAATTGATTTAAATATTTTCATTAA ACACTCCCTCACTGATGGTAATTTCACTTGCTC TCTCCCTCTTAGCCCCCACACTTCAGAACAGG AGAGAGAGGATACTCGCATACACACACATTTAA GTGCAGGCACACACATAGATATGTATTTCTAAA CCATTTTTCTGTGAATACAATGATGTGCTCCG ATATATACTTAAGCCAGTCTTACTATTAAACCA TCTCTTCTAAAAAATATGATCAAAACACAGTTG TTCTAAAAGCAAACCTCTAAAAGACTGACCTAGT CTCTGACAATGAGTTTGAAAAAGTGCAGCTCTT GGTGTTGTCTGCAAACCCAACTATTTGTTGA CTTGACAGGCAAGACAGACAAACCTCAAAGTT AATGGTTTCTCTATTCTGTTTACTCTGTAAGTGC TCTCTGCATTCAAGCGAGATACTGCATTGGCTG ACACATTAAATATGCTGAGACTCTTCCAGAACG CAGCAGGCAGACAACCCACGGTCAACAGTGGGG GAATGGTATTTGTCTGGCTTAGTTATCTCCAAA TGTCTAGAGAGAGAATAATAGTATATAATGGTG CATGGAAAACACCCATGAGCCTTGGTGTGTTAT TAGTAGTAGTTACTTTATAGTGGGTAATGACAA AATAAAGGTAGCTTCCAGTTTCTGAAGGTTTAC TATGTGTGGATGTAACCCCTTGCTAATCACCACC TTAGTTAATCCAAACAACAGTCCCATGAAGTAT GACTATTATTATCCCCATTTTACAGACAAACAA AATGAGGACTACAGAGGTAAATAACTTGCCCCA AGTCATGGTACCAAAGGTTTGGGAGCCATTAT TTCAGTCAAATTCTAACCAAGTGTGCTTAGCCA TCGTGCCAGAGGTTCCAAGGAAGGAGTTTGCTT GTTTGTTTTATTTATATCACTTGATGAAATAAA ACTACCATTCCCATTACATATAAAACCTCCTAT AGATGCCTCCTTAGCATGCTGTGTGATTCCACT AAGCTGTTGATAGACACAGTCCTCGGGGCTGGG GGTGTGGGTCAATTTGTTAGCATGCATGAGGTCT TGGGTTTGATCCCCAGCACTGATAAAGCTGGCA TGGTGATGTATGCCTGTCACCCCAGGACTTCAG
--	--

CAGGGCACACAGCCTGGAGAAAAACGCCTG AATGCACAAC TAGAAGTATTAGCAAGTCTGG TTTAACTGTCCCCAAATGTCTAACTAAGAAT ATTAGTGGGCCAGGCGCAGTGGCTCAGCCT GTAATCCCAGCACTTTGGGAGGCCGAGGCGG GCGGATCATGAGGTCAGGAGATCGAGACCAT CCTGGCTAACACAGTGAAACCCCATCTCTAC TGAAATACAAAAAATTAGCTGGACATGGT GGCAGCCACCTGCTCTAGTCCCAGTACTCG GGAGGCTGAGGCAGGAGAATGGCATGAACCC GGGAGGCGGAGCTTGCACTGAGCCGAGCCCG CGCCACTGCACTCCAGCCTGGGCGATAGAGC GAGACTCTGCCTCAAAAAAAAAAAAAAGAATA TTAGTGAATGATTAGTATATGGGAAACACCT CCGGACCACCTACATTATTATTAGTCTTCA CTTTGTGGTGGGTAAAGATAAAATAAAAGTA GCTACCGTTTATTGAATGTTTACCATGTGTG GATGAAAACCATGTTAATCATTGTCTTCTTT AATCCTCACAGCAACCTAATGAAGTAGGTAC TATAATTTTGCAGATAGCCACATTGAGGGTG AGTGAGGTAAACAACCTGCTCATATGACTC AAAAGTTTGAAGCCATTTTCAAATCAGATG TGGACAAAGTGTGCCTTTTAAACCATGTAT TATTCAGTCTTCTATGAAGACACGCTCTA TTTGGGGCATTTACTTCTATATAACTTGAT GAAAAAAACCCAGCATTTTTCATTGCTTGCC TATAAAACTCTAAAGGTGTTTCTGTGGGAG GGTGTGTTATTCCACTCAGCTATTGATAAAT ATAGTCTGTCTTAATGTTTAAATGTGGATCT TTTTTCTGTTTCATGCTTTTCTGAATTTTTG AGTGACCATGTCACTCAGAAAAGCTTTGAAT CAGCAACATTTCCAGTGGACTGTAGGGAAAG CCTGTGTTTTGGTGGAAAGTAGAGAGTCAC AGATCCCCAACCTTCATCTGAGCCGTGGTTC TGCATCAGTACAGACAGGAAACCAACTATTA GGAGCCACTACATGAAATAGTATTTCTCAG GTGAGCAAAAAATTCTTTTGCTTTTGTAGAT TGGCCCTGTCTATACGTGGTAGCCACTAGTC ACATGTGGCTTTTGACGTTTGCATTTTAATT AATTAAAGTGAAACACAATTTAAAGTTCAGT CACCCCTGCCACACTATAAGTGCCAGTATT	AGATGGAGGAAGCCATTTCAGTGCCATCACCAGC TACATAATGAGTAAGAAAGAGACCAGCCTGGAA CACATGGCATTATCTTAAAAAAAAAAAAAAGA CATTCGTTTTGACATGTATATTTTTTGCTTTTG TAAATTTTCAAGGAATGTTTCACCCAGAAGCT TTGCACTGCTGATGGTACAGTCTGAAATGTCA GCAATCCAGAGGCTGAGGCAGGAGGATTATTGA GTTCCAGGTCAGCTGGGTCTAAACACAGGAGGA AAGTAGAGCTTTGAGTGGACACCATGTTTCAGAT GCTCAATGATCTTCAGAGTTATGCTTTTGGCAG ACACCACACCAACAGAAAAACAAGAACAACAAT TGCCTTCAAAGGGAGGGCAGCCTTGTGAAGCTC TGATTCAAAGGAGAATTGCTCTTGGAGTCTGA ATGAATTTGGACCGCTCTTCTGAGCCTTTCCA ATTCTACTGGCATCCACAACCTGAAAAACAACAG CGGTGCCCTGATTGCCACAGACACTCTCTGCTG GGCAGACAGCACACCGCAGTTCACAGGCTGTTT TGCCAGCATCTCTCAGGTGTTTCAGCCTGGGTGG GGAATTGCAACATGTGTAGCAAGCCAGGTGGCC CTGCAGAGCCTGTCTCCAACCTTCGATGCTGCTG GGGACACAAAGAACATTAGGGCATGGAGTGGCT CTGTCACTCTCTGTGAGGGAAGCCCTTGCTCAC CACATAACATCATTCCCTAGGTGTGTTCTCTGCA CATATCCTAATTTGTTTTAACTCTGTATTTATA GTGAGAATTGTTAAGAGAATCTTAGGACTGAGC AGGACTGAACCAGACAGAGACAGCAGTTCCATG TTGCCAGACAGATCTTACACAGGCTTAGCCTGG TCGCAGCCACCAGACCAGGTCCCTGTTTCAGTGA GAGGTGGAAAGAAATACACATGGATTTTTTTTT TCATTTTTTGCTTTGTAAATCATGTGGGAGATG GAAAAGTTTACACATAGATTTTTTTTTTCTTTT CGTTATTTGTTTTATAAGTCATTACTCACTAGC CTAGGCTAGCTTGAGCACTCTCTGTAGCTCAG GCTGGCCTTGAACCTCTTAGCATCTCAGCTTCAG CCTCCTGAGAACTGGGATTACATAGCTATGATA CTATACCTGGCGCCAGATGTGTTTTAAAGCCT CAACTTCCCAATAGACCTAGACGCTCCTTTCTC AGTCTGAAGGACACAAATGTACCTCAATCTACA AACTTAATCACAAATCTCTCAAGGGTGTCTCTG AAACTTCAGAGCACTTTGGAACAACTTTCCTA GTGGGGAGGTTGTTTCTTCACTCATTTAACTG
---	--

CAATACAAC TGCCAGTGGCTGCCATGCTGG GCGGCGCAAACGTAGAGCACTTCTGTCTGCTGG CTGAAAATTCTACTAGACAGAGCCATCCAGG AATTTGGACTAGCAAGCACCAAGTTCACAGT TAGAGAACACAGTTGCAGGCCAGGCGCGGTG GCTCACGCCTGTAATCCCAGCACCTTTGGGAG GCCAAGGCGGATGGATCACGAAATCAGGAGT TTGAGACCAGCCTGGCCAGCACGGTGAAACC CCATCTCTACTAAAAATACAAAAAATTAGCC AGGCATGGTGGTGCTCACCTGTAATCCCAGC TACTCGGGAGGCTGAGGCAGAAGAATCACTT GAACCCAGGAGGCGGAGGTTGCAGTGAGCTG AGATTGCGTCACTGCACTCCAGCCTGGGCAA TAGAGCAAGACTCTGTCTCAAAAAAAAAAAAA AAAAAAAAAAAAAGGAAAGAAAAAGAAAAA AGAGAAGACAGCTGCTTTACAAAGCAAGAGG GCTTCAAGAATCTGGAAACCAAAGGAGCAAT GTCCTTTGAGTTTCTACAAATTTGGGCCACA CTGATTGGGCCTTTCCACAGCCAATTCCATT TGCCTTCATTATGGAAGTAAACAGTTTAAC TTCCTACTGACATGCTCTGCAGTGCAGACAG TAAACAGTAGCTCACCGCTGCTTCTGCCAGC TGCTCTCGGGTGTTCTACTTGGGTGGGGAAC AGCAGCACTGGCACTGGCACTGGCCCCGGTG GCCCCACAGAGCATGGCTCCATCAGGCTGGG TGCTACAGAGGGATGCCAAGAACATTTGGGC ATTGAATGCCTCTCTCTCTCTCTCTCTGA AATGAAAACCTCATCAATTCAACAATAGTT TCTCTAATAGAACATATAGTGATTTGTTTCA TCTCAACTGTTCCCATACAATAATAGAAAGG AGGGAGTCTGTGCTGAGAGTGCCTGCAAAC CCCAGGGCACACCAGCCCCGTGGAGCCATAA CAGTTGCTCACAGAGACAGCCCCTCACAGCA GCCCCCGGCACAGTGA CTGTAATGAAAG CTGGAAAATTGCCAGGAAAACCTGAAGATG CATTCTGAAGCTCCCACTCCAACGCACG CACACACAGACTTCTCTCCTGGCTTTAGGAA CATGAATTTACCTTGAATCTTTAACTTAAT TGAAAATCTTGCAAAATAACGAGCTTTCCTT TGAATCTTCATGGCACTTTGTAATAAAATGT CTAAAAGGGGGCCATTCCATGAAATCATTTA	GCAAAGTCACAAC TATACAAC TTCATTTATTTA TATAATTCTATCTAACTAATGGAAATAAGAGGT GAGGTTAGAGAAGAGGAATAACTTTTAAATATTC TG TAGTAAAGTAGTGAAG (SEQ ID NO: 17)
--	---

	ATTGGCATTAAATAGTACACTATTACTTCATA TAAAATCATAATCATATAAATGTACTTATAT AACTCCATGTAAATTAATTTATATAA (SEQ ID NO: 16)	
G	N/A	GACTTGCAGTCTTCAAGAACGGATGATGCCCA GGCAAAAGGGGTATCCTACCCTGCCACTTAGTG GGCCCCAAAGGAGAGGCTTCTGCTCTAGGGCAA AGCTTCATTTCCCTCTTCCTTTGAGCTCACTTA TTTGAATGAGTATGTCTGCCCTTGCCCTGCC TATCATGGTCTTTTGGGAACACACAACAAACCT GGTTTTGCCGGTTCACAGCCAGAGGACGGATT CCTTCTACATGGGTCTGCCTATACCAGATGATG TGATACTGTGTTGACTTGGGACTTGGAGTGGTT TGGGCATGGGTAAAGACTTTGGGCCAGTTGGGA TGGGGTAAGTGCGTTTAGCATGTGAGGATGCTA AATATGAACCTGGGGGACATAGAGAATATGGAG TTATAGACCCAGTGGTATCCTTCCAGATTTGTA ATTAAATCTGTACAGTTCAATACCTCAAAATGT GACTATATTTGGAGACAGGGCTTCCATGGGGAG ATGACATTGAAATGGGGCCGTCAGGATGGACTC TAACCTGAATGATGTCTTTGTAAGAGAATCATT AGCTACAAAGAGAGCCCAGGGGCACACACTTAG AAAGGATCCCACAAGGACACAGGAAGGGAGTGG ACATGTGCAAGGCAGGCAGAGGCCTCCTGAGAA ATCGGTTCTGTCTGCACCTTGATCTTGGATATC CAGCCTCTAGAATTATGAATGCATTGCCTTCTT TGACAAATCTGTATCTAAAAGAAAGGAGGGTGT TATTTGTTTTAGCTCAAGTTCTAGTACAAGGTC ACTTGGCCCCCTTGTGCTTGGGTGGAGCATCATA ACATTTGGCAGAAGACAGCCATTTCGTGTCATAG GAGATAGGATGCAGAGGACAAGTGAAGGGGAG GGGACTGGACACATAGGCACAACACCCGTGGTG ACCTGCTTACCCCAGCTGGGCCGATACCTCCTG AGATTCCAGCACCATCCAAAACAGCACCATGAG CAGGAGAACAGATTTGAGAGCCATTATGCATGC AAGCCATAACAGTGAGGGAATACATTTCTGCTA AGTCATAAGTAATACTGACTTCAATCTTAAAAAT CCCAGGGAAGCTGATGAAGCTCAGCGTAAGGC ACTTGCTGGCGTGCTAGAGGCTCTGGGTCCCA TCCCTCCCAGACAATTTACCAGAGTCTTCCCTT

		GGTGT TAGCAGTTTTGGGTCTCTTGCTTCAC ATTAAACTGACATTCACATGGAATGATTTTTG CTAATGGTGAGAAAGGGTTCATTTTATTCTCAT TAAGAGGGTCAACTAAGTACCACACACACACAC ACACACACACACACACACACACCCACAGATTA TTTGCAGCCCCCTCGGTCTTAAGTGATGCAATTG CTGTGCACTCCTGTCTTGCAAGGCTGTGCTCTGT TCTATTGGTGGTTCACCAGCCTGTGCCAACACT GACTGGAAGAACAAGCTCTCTCTGGTTCATCTT CACAGTCTTGGTTATT (SEQ ID NO: 18)
H	GAATGTTTACATGTACATTTCAAACCCAGTT TTCTAATTGTGCAGTCTTAATTTCTAGTTA ATTTCACTTTACAGATAAGAAGCTCTGGAGA CATGGCCTTTCCGGTTAAAGACACAGAGCCC AGGCACTGCCCACGGCTTCCTCCACACTCAT GCTGCTTTCCCTTAGGTAAGACAAACCTCAC CAAAGCTGAGACTGGCTCAAGAAACGGGGAA GCCTAATGCTTGTAACATTCCCTTAATTGG AAGCATTAGGCACCAAAATTCTTCTAAAAA ATATGTAAGCCCCAAGAATGAAAGGCCATG GTTAGCACAAACCGCACCTCCTGAGCCAGC AAAACCAACAGGCACAGTGCAGCACAGCCT GGGCGGTCTCTCAGGTGAGTCTCTGCCTCGC TCTTGCCCTGTCTGTACCTCATCTCTGCCA AGTCTGAAAATCCTGAGCTCCAGGGACTGTG GGAACCTCACTAGACATGTGTGAACAACTCT ACATTCTGATCCGTAGCGTCTCCCTAATGAT GCACATCTAGGAAGGAGAGGGAGGGAGAGGG AGCGTGTGCATTCTTGGAGCAACGAGGACA GCCTAGTGATTTGCAAACCTCTTTGCGGCCTC CTGGTGGGCTTCAGAATCAATTTGTGAGTCC CAACCAGAATTTTCTACATAATTAGAATAAA ACAGAGTTAAGATATGAGTGCATCGTATGTT GCAAGATACTGTTTTGTAAACGTTGTTTCAG ATATTGTGAGTGACATGTGTGTGTGCAGT AATGGGTACAAAATATATTTACTCTGGGTC ATGTTTTTAAGAGGGCTAGAAGGCAACACTAA CATAGGATGGTTGGAAGATGGTCAGGCTCAG AACATCAGATTTTGCTCCTTCCAGGGTACC ACTTTTATCAAGTCACACATTCTTCCCGCT	GAGTATATATGTTTTCTAAGCCAGGTTCTAACT ATGTAGTATTAATTTCTAATGAAACACCCCTT ACAGGTAGTGAGGCCTTTGGAGACCAGGGCTTT AAAGGCCAAGTAGCTGAAGCCAGGGTCTTTCC ATGGCTTCTTCTATGACTGTTTATCTAATAGA TGAGACAAACCTTTTCAAACCTGATTATCAGTT AAGTTCCAAGAAAGCACCAGTGTAAATGTTAAT GTTCTTTGAAATGGAAGTATTTAGCGCTCTGT GTGTGTGTGTGAGTGTGTGTGTGTGTGTGCAAGT GGGTACATATATGCAGATATGCACAATTGTTTG TGTTTGTGGGTCTTTGTGTGTGTGTGCAAGTCT AAAGTTTTTCTTTTCATTAGTTATGGTCTAAAG TGGTTTTAAAAAAGAAAAAGAGAGCAGAGAA GGCTATGATAGCATGAGGTTCTTTGGGATTGT CTGGCTTAGAACGCTAGGTTTTCCCATGTTTTA ACAGCTTCCCATGTCTTCCCACTCTGCCTTTG TCTTTCTCATTGTGATCCAGATTTGCCCCAGAG GGGAGAACCAGTAGGTAAGAGTTCACGCTGT ACTTCCATGTTAATTAAGTGATGTGGAAGTCTT GGAAAGGCTGGGCAGTTTTTCTGTCTTCCCAG GAGCTGGGGGAGGTTTATCCTTAATGGAACCAG TTCCATGCCATCCCCAGGAGCAAGAAGTCTGG AAACATCAATAATTATTAGTCACAACAACCCA CTTTCCTCTCTCCCCCTAATCCTCAACTGCTGA CTTCAGGACAAAGTCCATCTGATTTCAATCAGA TAGGAAGACTAGTTAGAGGCTGCCCCAGTTTA CTGGCTGCAGCAACAGGAAGCACAGGTTACAAT ACCAAGTGATTCCACGCTGAAAGCTTCACTCTG ATCATCCTACCAGGCTGTACATGAGCCCTTGA AAGCGAATTATCCCCGAGACTTACTTTCTATA

	CTGCTTTTGTGTTTCTCAATCGCTATCCAAA TTTGCGCAGAAGTCAGGAATCACGTGGGTAA AGATTTAAGCTGTACTTCTGTGTTAATTAAG CACGTTGAAGAAGAGGTGCTCTGGGGGAACG TGGAGAAGGTGGGTAGCGAGGGCTCCAGGGG CTCAGAAGGTGGCCTCGAGGGGCTCTCATCT GCCATCCTTGTGAGGGAGAAAGTCCTAAACC AGTCGTAACATTGCCAGAACAAGGGGTCCCA ATCCAGACCTCCAAAGAGGGTGCTTGGATCT CTCATGGGAAGGAATTCAAGGTGAGTCACAA AGTGCTGTGAGAAGAGAGAGTTTTTTGGAAG TTACGCAGATACAGAGTAGGGTGTCTCAGA AAGCAAGAGGAGGAAGTGCCTCGTCTTAAAG TTTTTCTTACATAGGAGTCTCTCTATGTAA AGACAGAGCTAAGCTGTGTCTCTATGTGGGT GGGCTGACAGCGTGACAAAATTTATTATTCT GTTGATTTAAAGAAAACATACTCAATATTT TAATGTGTAAGTACATCAAGTCATAATTATA ATTATCTTGAAAGCATATATTGTTATGGGTA TTGGGACCTCTGGACTTTTCGTTGTCATATG ATTGTATCCTTGCAGGTATCTTTAGGCTGTT TCTTCAACTGTAAATATCTTATGACTGTGGG TCGTGACCGGCAAGGAATGGAGTTGGTTTTT AAAATGGTGTACCCCTGGCTCTTCTATGCTC CTGTTTCCCTAACAGTAATAGCCCAGCCATT CTCTCCCATGTTCTCCTCTGCCCTCAACTTC AGAATGAAGTCAATTTTTATTTCAGCCAAAA TAGGAGGATTCTATTCTGTCTGTTGAGGTCT GCTGTGGTCTAATGATGTTAATAACCAGTGG CTGGGCATGATTACACGACGAGGATTCTAAA TCCTGTTTCATGTTTCCCTCTGGGCCCCACTG GCTATATGACCCCTTAA (SEQ ID NO: 19)	TAACACATATATACTTACATATACATGTCGACT TTGTTTTTCTTGTATGCTGTAAAGATGCCTAG GATACATTTAAGGATGCAACATAAAAGTCACTT TCTTCATGGAGTAATTATTATAATAGTACTTGT TTCTGGGGGAGCAAATTGAAATGTTTCCCAGTG TGAAGTGCCAAGTTAAAACAACAAAAAGCTAGT TGGAGCTCCCCCT (SEQ ID NO: 20)
I	CTAACATAGGGTCGTTAGTGTGAGAAGTGA TTAAATTGTAGGACATGCAGGTGGTGAAGTGC AGAGAATTGGAGCATTGCTTGGAGTGAAAAC CAAGCCCACATATTTGGTGTCAAAAGTGTTA TACAAGTAGAAAAACAGGTTCTCTTTAATGG AATATTATTACCCGTATTAAGGAATGAGGT TCAGACCCATACTACAGCACATATGAATCTC CAAAATATTGTGTTTAGTGAAATAATATAGA	TCCTTGGCTACTTTCTCTAGCTCCTCCATTGGG AGCCCTATGATCCATCCATTAGCTGACTGATGA CACTGCATTCTTTAATATATGGGGTTTGCACTA ACTTGGGGTAGTTATTGTGATGTTTGAAGTAAA TTATAGGACCTCCAGTTGCTGGAGAATTGCTCT GTGTGACTGTCCACACATATTTGGTTTCTAAA ATGTCATATAAGCAGACACTGCAGTTTCTCCAC AGTGGAATCTTACCCGGGCATAATAAGGAAGA

CACAAAGGACAAATACTGTATAATTGCACTT ACATGAGGTGCCTGGAATAGGCAAATCCATA GAGACAGGCAGTAGAATCATGGTTGCCAGGG GCTGGGCGGGAGGGAGAATGGAGAGTTAGTG CTTAATGGGTACAGAGTTTCTGTTTAGAGGT GATGAAAACAGTTTGGAAATAGTGGTGATGA TTGTACTATATTGTGAATGTATGTAATGCCA CTCACCGAACACTCTAAAGTGTGTTGAAATAG CAAATTTCTATTATACGTATTTTACCATAGT TTTTAAGTTAATTACCATAGTTTTTAAAAGT TAATAGGATAATATCCCTGAACCACTATAC ACTTTAGATTGGTACACTGTGTGGCATGTGC ATTATATCTCAATGAAGTTGTTAAAAACAAG ATTTAAAGCAGAGATTGGGTAAAGTAAAGG TTTGCTCTGTGCTGAGCTGTGTGGCATGTGG ACCTGTTTTCCAGGAGGGAGCACTCCTGGG GTTTTGGCCGAGCTGCACATCAGCCCCCTG TGCAGAGGAGGTATGGTGTGTGATCTGGAGA TTAGCTGTTTCTAGTGCAGTATTACATTTA AAGACATTGCTGAGTTAGGCAGAAATTTCTA TATCCATTTGTATTTTGCTTGGCATTCACTT TCTTACAAAAATGGACAATCAAGACAAAGAA AACAAAAGGTCCAATTACTACTCTTCATTTT ACCCCAAAGCAAAACAATATTAGTTTTCAAT TTTTTTTTCCCATAGAAAGCAATAACAGTCC CATACTACCTCCTCTTCCATGAAAGTAGTGC TTGAGATGCCCCAAGGAAAAACCATTTCTTTC CAAAGATGAAAGACTTTGTACCTGTCAGGTG AAGAGATGGAATAAATGCCACTCCTAGTGGG TGTGGGACTTGTGCAGCCCCTGGTCCCCAGT TATCTGCTTATCAGAATGTGGTTTGCATATC ACCTTTAGCGGAATTCCTTGGGATGCTTGTA ATTCTGGGGGAGATGTCTGGAGTCTGCATTT TTAGCCAGTACTCCTATGACTTAGGCACAGT AGGGAACCACTGGTGCCATTCTTCCTTCCT TTCCTTCCTTCCTTCCTTCCTTCCTTCCTTCC TTCCTTCCTTCCTTCCTTCCTTCCTTCCTTCC TTCCTTCCTTCCTTCCTTCCTTCCTTCCTTCC TTCCCTCCCTCCTTCTTCTCTCTTCTTCTTCC TTTCTTCGGAGTCTCACTCTGTCAACCAAGC TGGATTGCAATGGTGTGATCTTGGGCTCACTG CAACCTCTGTCTTCTGGGTTCAAGTGATTCT	CATTCGGGCACAAGCTTCAACACAGGTGAACCTT AGAAAACATGCTAGTGAAATAATCCACACCCCA AAGGACAAACAGGAAATGATTCTTATACAAGAC ACCTGGCAGAGGCCAGCTTAAAGAGACAGGCAG AAGATGTGAGTCCCAAGGACTGCGGAGGGGAAA TGACAGCCAGTGTTTTGTGGGTGCTGAGGGCAA CAGTTTGGAGTAGACAATGGTGATGCAGGGCTG TGAACGGGCTCAGTGCCGCTCACTGAACCAAAC AGCCTAAGTGTTTATAATAACAAAAGTAATACT GACATACACCTTCCGTTGTTTGAAGAGTTAAT AAGGTAACATTCCCCAAATCACTTTAAACAGGC AAACTATGTGAAATATAAACTCTGTTTCTGTGAA GCTGCTTTTTTAAATGCTTCTCCTATCAGAGGT CAGAAGAAAGAAGGCTTGCTGGGAGTGGAGTTG GCTGTGTATCTCAGACCTGTTTTTGCAGGAGGA GTGTGCGCTCCGGGATTTGGCAGCGGCTCGAGT CATCCCTGTGAGAGGCAGGCATGGTGCGTGATC CTGGGGCTTTTCTGTTTCTAGTGTTCTATTTAT TTTAAAGACATTGCTGAGTTTCAAGCAGAAATGTT TCACATCCATTTGTATTTTCCCTTGGTACTCATT TCCTTACAAAAATGACGATCAAAGCAAAAGAAA CAGAGAATCTTCATTTTACCCCAAAGCAAAGTG AGTGCACTTCTAATACCATAACAGAAAAACGC TTCGGGCCCTTAGGAAGTGCTGAAGAAGCTGGG CAAGGTGGTGGGTGCCTTTAGACCCAAAGGAAA GTGATTTTCTCCAAATGTGAGAGGCCTGCGATG ATGGGGTGAGTGGCCCCCAGAGGATGTGGGGAC TGACTAGCGCTGTCTCCGTCTGTATGCCAGTG AAGCTGTGGGTGGGACACAATTAACAGCACAAAG TCTGAGTGGTGAGACCCTCTGCTGTGACGAACC CTGCACTGATGTTACTGTTGAAGGTATCTCTCA AGTGCTCATGCTGGAACCTAAGCCCCCAGTTTC TAGTTGATGTTGTTTGGAGGTGGGATCTTATGG GAGGGGATTAGGATTAGATGATGTATAGGGGT GGGGCTCCACAATGGCATTAAATTGCTTTAGAG GAAGCAGACAAGACCAAACTAGCACATTTACGC TGTCTTACCGTGAGAGTAATCTGCCATCTTCTG AGGCAGGTGAGTTGATATCACCAGATGCCCACA CCATGCATTTGGGCTCCACAGTCTCCAGAATCA TAGGTTTTGAACCTTTATCTTTTATAAGTTTTTC TAGACTGGGGCATTCTGTTACAGCAGCAAGAAC
---	--

CCTGCCTCAGCCTGCTCAGTAGCTGGTATTA TAGGTGTGCACCACCACACCCAGCTAATTTT TTTGGATTTTAGTGGAGGGGTTTCACCACGT TGAGCAGGCTGATCTTGAACCTCCTGGCTTCA AATGATCCACCCGCCTCAGCCTCCCAAAGTA CTTGGATTACAGGCGTGAACCACTGCGCCCT GCTGCAATGCTTTTGCTTTCCGTATACAAGG AGGGGTTGCAGGCTTGACTCTAAAATGATTG ACTTTATGGAGGACCGTCTCATGTCTGGATG GTAAGTGATAGGGGAGGGGCAACCCTAAAT GGGATCCCAATGACTTGATGAAAGACTGGAA GATGAGACACTTTCAGGTGTGCATAATGGAA GACTTACGTAGGACTAGGACCAAGCCTCTCA ATTATACTAAGTTGTCCATGATTGACCAGGG ATTTGATGAAAATCCCACTGCCTTCCTAGAA AGGTTAAGAGAGGCCTTGGTAAAGCACACCT CTCTATCTCCTGATTCAAGGGACAGCT AATCCTAAAGGATGAATTTGGCTGGGCATGG TGGCTCATGCGTGTAAATCCCAGCACTTTGGG AGGCTGAGGTGGGAGGATCACCTGAGGTCAA GAGTTTGAGACCAGCCTTGTCAACGTGGTGA AACCCTGTCTCTACTAAAAATACAAAAAAA TTAGCTGGGTGTGGTGGCAGGTGCCTGTAAT CTCAGCTACTCGGGAGGTGGAGGCAGGAGAA TTGTTTGAATCTGGGAGGCAGAGGTTTGCAG GGAACCTAGATCGCACCATTGCACTCCAACC TGGGTGACAAGCAAAACTCCATCTCAAAAAA ATAAAAGGGATAAATTTATTACTCAAGCTGC CCGATATCAGGAGGAAGTTGCAGAAAGGGGC CCTGGGTCCAGAAAGTACATTAGAGGACCTC CTGAAAATGGCCACCTTGGTCTTTTATGATT GAGACAGGGAGGCCTGGGAAAGAGAGAGGAG ATACAGGTATTCCAGGGTGACCTGTAACT TCTAAAGATATGGCAAGAACAGTTCTCTCTC TTCTAAAGTTTATCTGCCCCGTACAAGGTT TAATTTCTTTCACCAGGGTGAAACAGCTTGG AGTACAATGTTGTTGTTAGTATATTTCACTT ATCTCTGTTGGCACTAAATTCTTTCCTTGTA TAATACACATGTTTAACTTATGCATACTTGA CCTTATAAAACTTGTTTTTCTCTCATGCC TAGAAGCCATCAAACCTCAAATGGTCAGGCA	TAGACTAATATACATCCCTCCTTCCATCTGCCC A (SEQ ID NO: 22)
--	--

ACTGGAGCCTCAGATGATAGCTCCCCTTTGC TAGGAACCCTTAAATAGACCTCTGGGAGGAC TCTGACTGCCATTTTCTCCAAAACAACACCC CTTGTCAGCAGGAAGCAGCAAGACTGGTCAT CAACCATATTCTAACGGCAGTATTCCTATGA TTTAGCCAGTGGGCCGTGACCGGCAAGGAAT GTGCCTTGTTAGTTTCAAGATGGAGTTGATT TTTAAAATCATGTCACCCTGGCTCTTCTATG CTCCTGTTCCCCTAACAGTAATAGCCCAGCC ATTCTCTGCCATGTTTTCTCTGCCCCAGC TTCCGAATGAAGTCAATTTTTATTCTTCAA CGTACCTCTTCAGAGGGGAAATTATACAGGA GGGGGGCAGGGAAGTGCTGGGTAGAGAAAGG TGGATCCCCAGCTAGGGTTCCACCCCCACAG ACCTAGGTGAGGAAAGGCACTTCTGGCTTCA CACCCAAATGTTGCATTTTCTGAAGACCAACC TGGCCTGCCATGCCCCCATTCTGGGCCTATA AAAACCCACCACCCTAGCGGACAGACACACA GGTGGCCAGACGTCAAGAACAGCACATCAGC AGTTGAAGACACAAAAGGGTGGACGACAAGA AGGCATCACAAGAGAACGTCAAGGGAGCACG CCGATGGAAGAACCCTGCTGGCAGGCTATCCA CTGTTGGCATGAGGGGGAGTTTGGCTGGGGC AGTCAGAGAAGAGCCCGGCTGCATAGCGGCC CAATTCCAGGGGAAAACCATCTCTCTTTTGG CTCCCCCGGCAGAGAGCTACTTCTGCTCAAT AAAACTTGGCTTTTATTCACCAAGCCCAGGT GTGATCCGATTCTTCCGGTACACCAAAGCAA GAATCCCTCTGTCTTGTGACAAGGTAGAGG GTCTAATTGAGCTGGTTAATACAAGCCACCT ATAGAGAGCAAACTAAGAAAGCACCCGTGTAA CACAGGCCCCACTGGGGCTTCAGGAGCTGTAA ACATTACCCCCTAGACACTGCCGTGGGGTCG GAGCCCCCAGCCTGCCTATCTGTATGCTCC CCTAGAGGTTTGTGCAGTGAGGCACTGAGGA AGTGAGCCATACTCCCATCCACGCCCTACAA AGGGGATAAGGAATCTTTCCTGTTTCATAA GTAGCAATCTCTGTGGTAACAGCCCCTGTGG TGATGCCGTCTCTCTCGGTTCTGCCCT (SEQ ID NO: 21)	
---	--

J	N/A	TGTGTGCACCAGCTTTGACTGCTGCTGGAGGCT GCCCATTTCTGTGATCTCAACCAGCTTTTCTG ATAGGCCAGTTTATCTCTGGACTCTGGCCTATG CCTGATACAGATGTAATCAGGCATCCAGGAAGC TATCTATATGGAGGCAAAGGTCCTTTTATTAG GCCACTGGAAGCCTCTTCCATAAAGTTCAGTAG TACGAGTACAGTGTCTTTCTGTGTACAGCCC CTCGCTTTCTCTTCTGGACTCCCAGCTGAGCCA GTGTTTGAGCCACCCATCACTCTGAAAAACAGCA TCTTCATCTCCTTAGGCTCAGCTTCTCAAGTCA CACAGGCTACATTGCTGCCCTCAGGGTGAGCCT CCCTTCATTATCTCGGTGATAATTCTAAACAA TGGCCTGTGTGTTATAGAAAGGCCCTGCAAGCA TACATGTTATCAACTTACTAGCTGTGCCCAAGG TTGCATAGCTAGTAAGTGGTAAGACTGAAATTT GAGCCTAGGGGACCATAACTCTAAACAATGTTC TATCCACTAGGCGGTACTGTGTAGACCATGGGC TCACACACACACACACACACACACACAAAAAT GTATTGAATAAAATAATTGTGGGTTTTGCATAT TTCTCTGTTTTATGTCTAGCTTGACACAAGCTAG AATCATTTGTGAAGAGGGACTCTCAATTGAGAA AATGCTTCCACTTTTTGTGTTTTGTGTTGTGT TTTTGCCTGTGGAAAGTCTGCACT (SEQ ID NO: 23)
K	CTGTGGAGTGCCTATAGCACTGTGTGTAGGC AGAATGCAAAGGGGACAGTGTGGGTGGGGAC AGTGTGGGTGTAGAAATGGCGGGGAGGTTAG ATTGCAGGCACAGAGGGCCTCAGCCATCTCG AGAGCCCAGACTTCTCCCTGAGGTGATGGC ACTTGGGGAAGTCAGTCATGGAAGGATTTTA AGAAAGATGTGAAAGGGGCAGGTTTCTATTT TCAGAAAACCATTTCTGGGCCAGTGGAAGATG GAGTACACAGGACCACACCTTGGTGAAGGGA GATTGTAGGAGCCTGGGCTTGGTGGCGGGGG ACAGTGGAGAGAACAGCCTGGGATGTATGAA CATGGCAAGTCTCCCTTCTGGACAGTGGGG TTTGCCATATGGTGGACAGAAGGTGAGATCAT CCTTTGAAAAATGCCACTTCATAGTGTTC CCAGCTGTGGGCCTTCACTCATTGGAGGGTC	TCCCAGAGAACCTAAGCCTGATTCCCAGCACCC AAAGGACTGCTTACAACCAACTGAAACTCCAGT TCAGGGATCCAACACCCTCTTCTGGCCTCTGTA GGCACCAGGCTTGCATGTGGTACCCAGACATTC GTGCAAGCAAAACACTCATACATATAAAAAATAG ATAAATAAATGCCTATTTAAAACCTTGCCCTCA TCTGAAATTATCTGAATGTTGATTTCTTTGGAT TCCCTTTCTTTTGGCCTTGGGAAAAATAGGTC ACCCCTGTGTCAGTTACTGTATGTTTTGGTTCAC TGTTTCATAGTTTTAGAGAGGATGTCTAGGAGGG CAGGGTCACCTGTGGTGTGGCAATTGGGAGCTC CATGTGCAGAAGGAATGCAGACACAGCAGCAGA GAGTGCAGGAGGCCCGGAAGGTTCCACCATCCC CACAGCCCCACTTCTCCCTCTGCCGAAGGGGT TGGGGGTGAGGCAGAGGCTTAAAGAGGGGCGTG GACAGGGTAGATTTCTGTTTTGGGAAAACCATC

	AAATAATCAATGTATTAGGTTGCAA (SEQ ID NO: 24)	TATCAGAGGGCAGAGGACAGGGTGGAAACCAAC ACAGCTGAGAGCTTGCAAGGGGCTGGGCTGGGC AGCAGTGAAGAGGAACCTCACAGGGAGGAGCCC CTGGGGTGCAGGGGCTCTGAAACTGCCCTGTGA AAAACACTGCCTCATTGTCTTGGCAGTTTGGGC CCTGACCCAGTAGCAGCAGGTCAGACAATTGTT ATATAAAGTTCCGAAAATTCAAACCTCCCCCTT CCTCCTTCATCCTTCTTAGCTACACGTGTGTCC ATGAGTGGCAGAGCAGGCACTCACATAGAGGTG TGCCCACTGCAGCGGTACAGCACTAAAGAAAA TCCCTCTCTCCCCCTTCTCTCCCCCTTTCTTTT ACTTCAAAGCAGAGTCTTACTATAGGGCCCGGC CCCTGTGGGCTGCTCACTTTTAATCCTCTGCCT TGGCCTATCTAGCACTGAGATCACACACCTGCC TGTGTCACTATGCCTGGCTTCCAGCACTTCTTT GAGTGCTGACAGACACCTCAAGTGGAAAATTCT TGTCTTGCTTCATTTGACAGATCACAGTGAAA ATGGGAGCCCACTAAAAATACTTTATAGGATTA CCCTCGGGCTGTGTCTGAGGCGGGTAGGTAACA TAAGGAATTTCAAGGTTAGACTTTAGTCTGTCT ACCAAGACATCTATCTCTTTATACATATAAAAG TATTCCACAGTCTGAAAAAGCTCTGAAATAGA GAATGCTTCTTGTCCATAGCATCATAGATAGAG ACCCCTCAGACTTGTATATAAAACAGAATTGAA AAGTCAATTCAGGTGTGCACACACACATGCATG CACGCACCAGCACGCCTGACATCTCTCAGGGCT GCCGGGCATCACTCAGGTGACTGCTTGACGTGT TGATGTTTGTGTCTTTGGCTTCTTCTTTGAGTC TTTTGTTTTTCTTCTTTTATTTATTTATGAGA CAGGGTTGAGTTCATTGCAT (SEQ ID NO: 25)
L	CACACCATGTCATGCTTCAGCCGTTGCCCGT GCTATTTCTCCTTGAAAGCCCTCTACTG TGAGGCCCTCAGCTCTCAACCTCTCCCTGG CCCCCATGTTGTCTATGTGATTTCTTGCCAT TTAAAAATCTACCCAGGTGTCAGCGCTTGGG CAGTTTCCTCACACCTCTCACCAGTTCATC CTCCCTTGCTTGGTGCTATTTCTGCCCTTGT CCATATCCCCACCACAGCATGCACTTTGGAT TCCAGGCACGCTCCTTGAGTGTGACCCCGAG GCCCTCTGTGGGCTCTTGGAGCAGGGCAAAG	TAAGCCATCACATGCTTCAACCATGGGCTACTT CCACCTGCTCCCCCCCCCCCCACACACACAC TGCTACCCCTCAGCTTGGTGCCTCACT TCTCAGGCTATAATGCTGCTTTCATGGACATTC CTGTTCTTTGAAAACAAGGGCCCTTCCCTCTG CAGAGTTCTCCTGCCTGAGGCTGTGTGTCTTG GTTTGTGGGCCTTTGCCAGCTGGTGCCAGTG CAAGGTGCCCTGCTAACTGAACAAATGACCTTG CTCATCGTCATCTTCTTGGTCTCCATCTTGTG GTGGAGCCTTCTGGACCACCGGCAGGTACCCCTT

CTGGGTGTGCTGGGGCGCAGCACGGGCTGA TGCCCTGAGGTTGTTTGTGTGCTGGGCTGG AGGCGTTCGAAGAAACGTCCAAGGAGGCTGC TAGACTCAGTTCTTTCTTTCTGTTTTCCCTC CACCTCTCTGCTAGTGAAGCTCCATGTCT CCCAGGCTCGTGAGCTGGCAAACACCCCGCT TGCATGGTTCAGTGTTGTCGTTGGCGGCAGG CGTACGTGGAAGGCCAGTTACAGAGGGTCTC TAGGGCTAATGCATTTCAACAACACCCGCC TCTGACACTCCACGCTCTGCTTTTCTCCAG AACCCTCCCTTTGCAAACTCTGTTTCAAA CAAAAAGAGCACAAAGAGGCTGACCGTGCCT TCCTCCAACCAAGCTCCCCTCTCCACAGGTG CACAGCAAGAGCCCTTTGTCTGTGATGGGAC AGGCCTGGGCTCCAGTGAGCAAGACAGGCAC TGTGGGCCCCATCCAAATATTAAGTGTGGACA CTTTCTACTTTGAAAACATGAGACTTTGTA CTCAGAGCCCTGCCCTCCAGAGAACACAATT ACTTCTGTTTTCTTTTCTAGTGAAGGAG GCTTGACACTGGTGTGATGGCCTTGCTTTTACA ATGCTCAGGGTTTGGGAAAGTCAGGGCCTAG GGCTGCTGATCTCCAGGCACTGTCTGCTTTC CATCTATCCTCTCTGCTTGGTCCCTGAAAAG CAGGAGGGAGACAGGAGGAATGGGAGCATGA ATGCCCTCAGGGTCCACGGGGGATCCCGGAA GGCCTAGAACACCAGGGGTCTGGGCTCCACC CATGATGGATCATGCCCTTGGGGGAAGATTG GCCTACACTCATGTCAAGTAATAAGTTTTAC TTCTGACCTGGTGTAGGTTGGTTCTAAG ATGCAGCTGTAACTGTGACTAAGATCAATA TTTTTTCATGTCATCTGATCATAAATGG TCAATTTATCGATTTAGAAAATTGTTGCACA ACGAGGCAACACCGAGTCATGACTTAAAAA AAAAAAGTGGATCTAACCGAAGCTAGATTG TGGCTTATCACCTTTGATTGTGAGTTTCTTG GGTCAAATCTTAATGCCACATTGACCACTGT GTCAAGAGAGGCCAGGTTCCAACCTAGCTCC GTGTATAGTGTTTCATGGAATCTCAATGCTCA TCAGGCGCTGCTGGGGCTGGGCCTCGGGGAG GGGCAGGCTCCTGTGAGCACAAGTCACCAGC ACAGGTTTTAACCAGCCAGTCTGGGCTACTT	TGCAGGACAGCCTATCCTGCCCTGTCTCCCTAC AGAGCCACTCCCTGAAGCTGCAGAAAACAAGAG AGCATAGAGGTGACCCTCTCCACAGGTGTGTGG CCAGAGCCACTCATCCACAGTGGCCAGGCCCAT CCAAATATTAATGATGGGTGTTTTCTGCTTTGA AGTTGAGAATGTGCGTCTCAAGAGTCCACCCT GAAGAGAACACAACCACATCTGTTTTCTTCCAG GGAACAGGGGCTGCACTGCCCTTCTTCTCTGTC CGTGCCCGAGAGCATGTATCTGAGCATGCCCAGA GCCAAACACAGCATCTATTTCTACTGATCTTC ACAGCTGGACAGGCTCCACACAGCCAGATGCT CCCTGGGGAGCCTCAAAAGCAAGGTTACCAGG TGGAGCTCTGGGGAATGCTTTCAACTCTGTC TTGGCAGGGCTTGCCTTCTGCACCTGGCTTTAG GAGGGCTCCAAGATGCAGCATAACATGGGACGG ATATCAACGCTTCTGTCTGATCTTATAACAAAG GTCAATTTGTAAAGTTGATACCACCAAGTCCTT TCTTCTTCTTTCTTCCACACCCCGTCTCTC TGAGAAAATGGATCCAATAGAAGCTAGAGTGTG ACTTGTAGGTTCTGACTGTCACTTCTTTGGGGT GAATTTTAAATGCCAAATCAGCCAGGGGCGAAGC TGAGGAGAGCCAAGTTCACACACAGTTCAGCAC GAAGTTTTAATTCAGTCCCATCCGTCCGAATCT GCACTGCTGTGGGTGGGTAAAGGGAGAGCAGG CTCCTGACAGCATGTGCTCCAGCACAGGTGAGT CTGTACACTTTTTCTTACAGCTGCCAGGCAAG ACGTCAAGTCTACTTAAGGTTTCTTATGCCTGG AATCGCCTAAAACGTAAAGCAATCAAAATGTCT ATCACCCAAAGAGTAGCCAGACAAAACACAGCA GGTCCTTTTATGAAGAGTCTGTGTCAACAAGAC ACAGGAATATCAATTCTCAGCCATTAAAAGGCA CGCTGTAATGACACTGGCCACGATATGCCACAT CTTAGAAATATTACAATAAGTCAAAGAAGCCAG CAGCAAAAGGCTAACTAATGTATTATTTCCAT (SEQ ID NO: 27)
---	--

	TTACCACTGAAGCAGTGGGGCGAGAACTCT ATTTTACAGTGTCTTCTAAAACCTCTGTGAGC TAAAAGTAGAAGCAACTCAAATGCCCTCAC CTGATGAATAAACAAACACAGTGTGGCATCC TCGTACAATGGAGTATTATTAGCCATAGAA AGGGAGGAAATAGTTGTGCTCGATACAGTAT GGATGAGGCTTGGAGACATGATGATAAGTGA AAAGAAGCCAATCACAAAAGGACAAATAATG TATGATTCCAT (SEQ ID NO: 26)	
M	CTCTAGGTGGTGAAAAATGACCAGATTGTT GTGGGGTCATAGTGGACACTAAAGATCAGCA AGGGAAAAAGATGTGACTATAAACTTTCCA TTCTCACAGTTGTTTTGAGACCCGAGTGTAC GTTTAATGTTTTCAACAGAAGAGGCTGCATG AAGAAGAGTAAGTTAACC GCGGGGAGGCTGT GAGAATTTTTCTGCGCGGACAATGGAGCTCA GTGTCTGTTTCAGTGTGTTGTGCTCTCTATAG ATACCTGGATGATTCTTGGGCCTCAGTGTGT TCTCGCTCCCTCCCTGCCGAGACTCAAAGGG ATGATGCACGCTGCCCAGCCAAAACCAGGAC AGAACGTCTTTTTCCCGTGGAATGCGCTC CCGGCGCCAATTCCAAGGCCTGCCTGGGTCC TATTACAGCAGTGTGGGGTGAGCAGCAGGC TCGGGCCCAGCTGACACGGCCAGAGATCCCC AGTGACTIONTTCTGACATGGCAGAGATGG CAGATGGAGAATCCATAAGCCCCAGTTACAC CCGGGAGCTCACACTGTGGCTTCAGTCTCCA AGGAGAGTGGGGAGAGCCCTGGCCCTCCGTG AAGGATTGCTTCCGCCCAAGGGGGCCAGTG AACCCGAATCACTCTGCTGGATGGTGTGGG GGGCTGATGCAATCTGCATTCTTCCCCTCG CACCCCTTACCCCTCGCTACCTCCCCCTTCT CATCTCCCCACTCGCACCTCTCTTCTCCC ACACCTGGCTGACACCCACTCTTGAGTCACT GTCAGCTCCAAGACAGAACC GGCACTCTGGG TGCTTGGCAGGAGCCAAAGGAGCATGTTACA GGATCTCTGGCTTACAGATGGGGAGAGAGC AGTTCAGAGAATTGCGGGTTCCACATTTGCT TGAAGTCACTCATCAGCCTTTATGTTACATT ACAACAAAGCAGCCCAGGGGACATGGACTCA	CCTCAGCTGGAATTAACCCTACACAGTTCCTCA GAGCCTAGGGCTTAGTAAAAAGGCCAAGCCTGA CCTATGACCTCTCTGACATCTGTCTTAGCACG TGTCTTTTCTTTCCAAGTACATTGTACCACCA TGATGGCCTGTGCCCTCCTCCCCATCACCTCCA TACAACGAATGAGCTCTCATGAGAGCAGAGTGG AGGCTGGTGTGTGGCCTCCACTCAGGAATTGT GAACCACTCCAACCTTCTTTTGTAAACATTAC CTAGCCTCAAATATCTTGTGATAGCAACAGAAG AGACTAAGATACTTAAAAATATCTATGGATGAA GAAAATGACCAATGTGAGGACGTCGTGGATATT GGCCATCAGCAAAGAAGAGAGCATAAAGTTCCC ATTCTCACAGATATTCTGAAACCTGTGTATTTCT ATTTTTGATGGAAAAGAGCTGCACACAGAATAG TAAGTTAGCTGGAGGGAACCTATGAGCCTTTTT TTTTCCCCCTCACATAAACAACAATGGAGCTTA GTGTCCATTTCACTCTTTGTGCTTGACTGGG ACCCAGATGGCTCACTGTCCCTCAGTATGTCCC TGCTCCCTCCCTGCTGAGATCTCATTGGCTGTG ACGCACTGCCCTGCTCCAGCCAGGACACTACTG TCTTTCTTCCCCGTGGGAATGTGTTCTCAAAGC CAACTCCAACAACGCTGACCTGGGCATCACTTG GGTGGTGTGGAGTGAGCTGTAGGCTCTGGTCC TGCTGTTGTAGCCTGGGGTCTAGTTGTCATTCT CCCTGACACAGCAGAGAGAGCAAACAACAGAAC CAATGGCTGTAGCCACATGGTGAACAGCTAGAC CTCCAGAACAATAGGAGTAAATGCTTCTGCCAC GAAGTGATGGAGAACC TAAACCAATCTTCAGG CAGAACTGGGGCCAGGTACCACACACAGCCCTG CCCCTTTCTCAGCTGGCTGTGCCCATGCCAGA GTCATGATCACCCATAGGATTCTCAGACCCAGG

TAGGGTACCTGGTGTTCCTCCCAACTGTAGGG GGGATTCCGGGACAAATAAAGTTTGCCACTG GGACCTCCCGGAAGTGTGCCCTGTCCAC TCCTGTGACACACTCTCTGCCACAAGAGAG TGGCCAACAGTGGAGGCTGAGAGTGACCACC TGCCTGCCCTCAGTTATTAAAGGCTACTGGA GAACAAGCCTTGAGTGCCTGCTGAGAACACA TGCCCTAGCTGCCATCAAAGAGAATCACTT CATATGATTTTGACCATAAGCAAACCTCTTC ACCTTCATTTTTTAAATAACGGCTTTATTG AGATATGCATCACTTACCATGAACTCACTC TTTTAAAGTGTACAACCCAGGGTTTTCAGTG TATTACCGGAATTGTGCAACCATCACCCATC ACCCCTAATTCAGGACATTTTTATCACTCC AAAAAGAACTTTGACACATCATCTCTCTC TCCCCACAGCCTCTGACAACTGCTGATCTAT TTTGTCTCTATGGATTTAGCAGTCATGGACA TTTTCATATACATGGAATCATACACTATATGT CCTTTCATGACTGACATCTGTCACTTAGCAT GATTTTATGAGATTCATCATGTTGGAGCATG CACCCATGCTTCCATCCTTTCTTTTTTTTTT TTCACAGTCTTGCTCTGTCTGTCAGGCTGAA GTGCAATGGCAGATTTTGGCTCACTGCAAC CTCTGCCTCCCAGGTTCAAGCCATTCTCCTG CCTCAGCCTCCCAGGTAGCTGGGACTACAGG TATGTGCCACTATGCCTGGCTAATTTTTTTG TATTTTTAGTAGAGATGGAGTTTCACCATGC TGGCCAGGCTGGTCTCAAACCTCCTGACCTCA AGTGATCTGCCCGCTTCGGCCTCCCAAAGTG CTGGGATTACAGACGTGAGCCACCACATCCT TTCTAAGGCTGAATAGTATTGCACTGTATGG ATAGACCACATTTAGTTTATCTGCCTGCTGG CTTATGGACAATGAGTCACTCCACTTTTTTG CTACTATGAATCATGCTGTTGTGAGCACTTG TGTACATGTCTTTATATGGATGTCTGTTTTT CCTTCCATTGGGTTTGCTTGGGGTGGAATT GCTGGGCCACCTTCTTTCTCCATGAGTGGAG CATGCCATATGCGCCCATCCCGCATCTCCCA TGTGTGGAGGCACTGCCCAAGCTCGTCTGTA CTCTGAGTCACAGGGCTGTGCACCATACCG ATCACCATCTATGGGTCAGGGACTTATCAAT	GCATTGTGTAGCTGGAGCTCAATGAGTCTTACG GGCCGGAAGCAGCCAATTCAGGGAAGTCTGGGT TCTGCGTTTGCTTTGCATCTATTTGGTGAGAGA CAGTGTGAGTTCTTCCATTACAAAATTTCAATG TTTAAAGAGCAAACAGTCAAGAAACAAGAAAA AAAACCCAAGGGTGTGTCTGTGTGTGTGTGT GTGCATGTGTTTATGTATGTGCAGGTACATGTT GGGGACATGTGCATGTGCATGTTTACATGTGCA TAGAGAGGTCAGAAGACAACACCAGCTGTTGTT CCCCAGTACAATCCATAGTTCAACCCCTGTG TGTGTGTGTGTGTGTGTTTATGTGTGCATATGC TATGGAAGTCAAAGATTGAGTCTGGTGTCTTCA ACTGCCCTCTACCCTATTTTCTGAAACAGAGTC TCTCACTAAATCTAGACCTCACTGGTTGGGCAT CCTTGTTAGCCAATGAGCTCAACTATCTGCCCG TTTGTTCTCTCTCTCTCTCTCTCTCTCTCTCT TCTCTCTCTCTCTCTCTCTCTCTCTCTCTCTCT CCATAAATGAATGAATGTGTGTTTTTAAAAAGA GAGTTTAAAAAACTAAGGTGGCATGTATCCC AGCTTCTCTCCACAATCCAAGTGAACGGCTCA GGCCAGCCTCATTTACGCAGCTCACTCTATCA ACACATCTGCTGCACAGAGCATGCTTTGTGAGT GACTCAAAGATCAGAACCCTGACTTCCAATGGC TTATAGCCTAAGGGTAGAGAAGTTACCTGTATT CTGGCAAGATACCAGGGATTGTAGGAGGGGTAG CAACCTGGGAGGAGGGAATGCACTCTGTGTAG GAGATGCAGAAAGGATTGGAAGAGCTGGTGAGT ATTTGAGTTGGATGTTGGACTGATAAATGCAGG GAGCATCTCACAGGTTGGGATCAGGCACACCGG TAGGATGTTTCATCCATCCGAGTCAAAATGGAGG GCAGGTGTAGGGATTTACAGGTAGAGGGCAGGG AAAGAAAGTAGAGAGGAGGCCTGGGGTTGTGC TGGAGTGTGCACAGAGCACTCAGCTGGCACTTT GAAGAACAAAGTGGACTGTCCCTGGACGTGAGA CTGAGCAGGTAAGGTGGGTTAAGAGACGGTAAG ATCACTACTGCAATAATCCAAAATAAGAACCTT TATGATCTCTAGGTGGGATAACAACAGGGGGA GGGACTTTTAAACACACAATTCAGTTCAACAGGA ACTCGCACATCCTGGAGGCAACACGTGAACTGC GCAGGCTCAGCAGTCATTGTCTGTTCTGCGTGG TGCTCTTCCAAGTGGCACAGTGTCTTCATCAGA
--	---

GAGCAAGACATAGCCCCTGCCATCACTAACT CACATTCTGCATCGTCCTGTGCCATCCCCAC CACCCCACCTTGGTCAGGCCCAGTGTCAGG TGTCTTCAACTGCTCACCTTCCCCCTATTTT GTTGCCCTGAAGTTCATCCAGACATCAGGGT GCCCTATTGAAAATGCTAGTTAATATGACCT CTCTGCTCTAACCCCAATGTTGGAGTCTTGT CATCAGTGGGATAGAGCTGGTGTGACTGCAC CAGACCAGTCAGGTTCAACTTTTATGAAAGG AAGTTGTGAGTTGCTTTCAGTTGCCATGGAC CCCAAGTCGTAGGTCAATGTAAGCTGAGCATG CCCAAACGGACCAAGCATGCAACCATGGGCA GAACCTGAGTGCTCAGACTGAGGAGCAGGGG CTGAATTAAGAAGCAGAGCATAACATGGCAGG ATCCAGGATCCAGGAGCCAATCAGACTGAGT TTGGCATCACTCCATGGCAGGATCCAATCAG ATCACACCTCCCTGCAGCACCTCATTGCAAG ATCCAATCAGACCACACCTCATTACCCTAGG CTTATAAAATCCAGGCCAGCCGCTAGCTTGG GGAGGCAGATTTGAGTGTTTTTTTTTTTCTG TCTCCTTGCCAGACTACCAGCAAAAAAGGTT TTCTTTTCTCAAAGCCGGTGTCATGGTATT GGCCTCTGTGCACATTGGGCAGTGAGCCAC TGATTGCTCAGTAACATGGGCACACTCTGGG GCCCACACAAGCCAGGAATGATGTGGCCTTT ACCTGCTGCTCCAGCTGCATCTGAGCCCAGT ATCCCCTGAACACAAACCCCCACCTGCATGG AGCTGCATGCGGTTCTCGGGTACCTCCTGGC TATGTTTCTAGCTCCTGTAGATTCTTCAGATC CACTCCTTCCCATTTCCTCATCCAACCTGCCC AGCAGAGTGCCTACTATGCGCCACACACTGG GATTGAGCAGTAAACGACACAAACATGATCC CCACCCCTATCCTTCTCCAGGACTCTTATT AATCTAAGGCTCACCTCCCTTCTTGTAACCT CCATGAACTCATATGCTCCCTCTCAGCTCAG GGACGTTGCTGGAGGAAGCAAGAGAGCAGCA GATGAACCCCTTATGTTTCTAGGAGGCAGATGGA GCTCATTCAAAGCCCACCTTGGCCTCTTCTT AACCCGAAGATTTTAGCAAGTCATATAACCT TTGAACTGCAACTCCCTGGATTGTGGAATGC CCAAAGTGCTGAGCGTGAAGTAAATAATG	CCTGGTGCTCACATGACTGATCTAGTCACAGAA CAGGCCATGTATCAAGTTTTGGGAAACAGGAAG CAATGGGAGAAATGTATTTTATTGGTGATTAAG TGAAGTGCAAAAGATAGGACGTGCTA (SEQ ID NO: 29)
---	---

CAAGTGTAAGTGTGCGGCATGGTCCTGGTT CATCTCAGGAGGCCGTTAGGAACTAGCACT TATTTTGGCAGGGCTTGAGCATAGAACATA CTAATTTCCCAATGGCATTATCACATTGTA TTACTTTTATTTACATGTTCTTTCTCCCT ACCAATCTCAGAGAATCTCAAGGCAGCAAT GATTAATTATTAATTTTGAATCCTTGGTTC CTGGCACATTCTTGAAAATAAATCATTGGC TTACTTTCCACTGATTCTCTTAATTACCCCT GAGAGGCAGAGATTGGAATTATACTATGCTG AGCAGCTCAATGTTTTCCAGTAACAGCAGG AAAATCCCAATGCACAGAGAAGGAACCTGAA TGACTTAGGTGGGACACACCAGGACAGACAC CCGTGGTGATGACATTCTGTGCCCTTCATCC CACAGAGTGGTCTGTCTTACAGTGGTCTCC CCTCACCACACTGAGCCCTCAAACCTCCTCT TTCCGCTGACCAAAGTGACCCAGGCCTGCT TGTCCATTCAGACAGATGCCAGGGCCCTCTG CACTCCATCTGACCTCTGCAATATGCCGGTT CCTAATAAGGGAGCAGGATCCAGGTCCAGTT GTTTACACTTCTAATTTTATACCGGCAGCCT CAGTAAAGTTCTGCCATCAGGCTAAGGCCCC ACTGATCGTCGACCTTTTCTGCATAAAGATT CACCTCCAGGGCTCTTAGAAAATACTGCTGC CTGGCTACCACCCCATCCTTAGTGTGACATA GGGTTTTTTTTTCTTCTTCTTCTGTTTTTTG TTTTTTTTTAGAATAATTAGGCAGCTCTGTTG CCCAGGCTGGAGTGCAGTGGCATGATCTCAG CTCACTGCAACCTCTGCCTCCTGGTTCAAGC AATTCTCCTACCTCAGCCTCTTGAGTACCTA GGACTATAGGCACACGCCACCATGCCCGGCT AATTTTTTGTATTTTTAGTAGAGACGGGGTT TCACCAGGTTAGCCAGGATGGTCTCAATCTC CTGACCTTGTGATCCGCCCACCTCAGCCTCC CAAAGTGCTGGGATTACAGACGTGAGGCACC ACACCTGGCCTGCCCCGGGTTGTTTTTTTTT TTAAAGCTCCCCAGGGATTTGTAAGTGATA CCAAAGACTGGGAACCCCTGGCTTAGCTCAC AGAGCAAAGAGCCTTTTGAGGGTTCCCTCG ACAGTTGCTCCCTCACCTCCAGCTGTGGGGC CACACAGAGCGCTGGGCCATTGTGGTGTTAG	
--	--

AGACCAGAGTTAAAGGGACTCCATCTGTAAT ATCCAGGACAAATGGGCTGGCAGGTGCTGCT CAAACCCCTTACACACAGATAGTATTGGGGA GGTGAGGTCAATTCCCCCATTATGGAACGCT GCGGTTTTAAAGCAAGCAAACAAACAAAA CAGGAAAAAAGTGAGCTTTTTAAACTAAGG TAAAATTGTCTCAACTTCCTGGCCTTGAT TGGGCTCTGCTACTAGAGCGGCAGAAGCAAC TCACTTCCCTGCTTCCACGGACCTGTTTCAT GTAATGCATTTTGAGAGATTTGAAGACAGG GTCCTTGACTTGGGCAGCTAACAGCCTGAGG CTAGAGGCAGCCACCCCTGAACAGTGAACAA TTCTGCAAGGCGCCTGGCAATAGTACTATGC GGGGAGGGGGTAGGAACAAGGTGCTGCAGGG CGGGGTGAGGAGGAAATGAATTCTGCCTGG GAGAAGCGGGAGTGCCTATTTGAGTGGGGTC TGGAGCAGGTGCATGCAAAGAAGCACCTCAA AGGCACGGGCAGGTGTGTGCAGGCGTGGGCA GGCGTGGGCAGGCGTGGGAAGGCGTGGGCAG GCGTGGGCAGGTGTGGGCAGGCGTGGGCAGG CGTGGGCAGGCGTGGGCAGGTGTGGGCAGGT GTGGGCAGGCATGTGGGCACGGCACAGGGCT TGTCCAGGCCAGATGCCATTAAGCACAGGTA TCTGTGGTGGGCAGGGGACACAGTGAAGCA GATAGAGAAGGTTTGTGGGTCCCATGGAG GGGCGCCTTGTAGGCCATGGTCACTCTAGGC TGATGCAAGGTGCTCAAGGTTGAAGGCAGAG GTGACTGACCTGTGCTTGAGAGAGGGTAGGG AAGAGAAGCTGCCGGACTTGAGGGGCTGAAA TTGTCTGTAAATAGTCCAGGTCAGGAGTGTT AATGATGCCCCAGCTCGGGCAGTGACTACGG CAAGGAGAGTTTAACATGTGGTTCAGTTCAG CAGACATGGGGAACCTACTATGTGTGAAGCA GGACACATCACGGAGGCAGCCCTCAAATGCT TGAAGACAGTAATCCTGCCCTGTGCTGTGG CGGGTTCCTTAAGGGGTGTGACTTCCTCATC AGACCCATTGCTCTCACACCTAATGATGCTG CCATGTGGCAGGGCTGTGGGCAGAGCCATGC CCTAGCAGGGGAAGTGGAGGACAGCGGCGGG GAGGGAGTGTGGGCAGGGCTTTCCTGCCCTC TGGGTCTCTCCTCTCTTTCGTGGCAGGGCC	
---	--

	TTGAGGTCCATTTCGCTGGGCTGCACAGAAGG AGGACTCCAGAGCCCCCTTGGGTTTCAGGAT TTTATACACGCAGCATTCCAGACAGATGGAC CCGTGTATTGACAATGAAAGCATGGGAGAAC TGTATTTCTTTGGTGATTAAAGTAAATGCAA AAGTTATGATGC (SEQ ID NO: 28)	
--	--	--

[0077] In some embodiments, a *GJB2* GRE (e.g., a *GJB2* enhancer) sequences can be identified from the regional sequence listed in Table 2. In some embodiments, a *GJB2* GRE (e.g., a *GJB2* enhancer) comprises at least 200, at least 250, at least 300, at least 350, at least 400, at least 450, at least 500, at least 550, at least 600, at least 650, at least 700, at least 750, at least 800, at least 850, at least 900 at least 1000, at least 1100, at least 1200, at least 1300, at least 1400, at least 1500, at least 1600, at least 1700, at least 1800, at least 1900, at least 2000, at least 2100, at least 2200, at least 2300, at least 2400, at least 2500, at least 2600, at least 2700, at least 2800, at least 2800, at least 2900, at least 3000, at least 3100, at least 3200, at least 3300, at least 3400, at least 3500, at least 3600, at least 3700, at least 3800, at least 3900, at least 4000, at least 4100, at least 4200, at least 4200, at least 4400, at least 4500, at least 4600, at least 4700, at least 4800, at least 4900, at least 5000, or more consecutive nucleotides in any of the regional sequences described in Table 2 (e.g., human *GJB2* regions A-M or mouse *Gjb2* regions A-M). In some embodiments, a *GJB2* GRE (e.g., a *GJB2* enhancer) is identified with the transcriptionally active regions of the *GJB2* gene (e.g., regions A and/or B). In some embodiments, the *GJB2* GRE (e.g., a *GJB2* enhancer) comprises at least 200, at least 250, at least 300, at least 350, at least 400, at least 450, at least 500, at least 550, at least 600, at least 650, at least 700, at least 750, at least 800, at least 850, at least 900 at least 1000, at least 1100, at least 1200, at least 1300, at least 1400, at least 1500, at least 1600, at least 1700, at least 1800, at least 1900, at least 2000, at least 2100, at least 2200, at least 2300, at least 2400, at least 2500, at least 2600, at least 2700, at least 2800, at least 2800, at least 2900, at least 3000, at least 3100, at least 3200, at least 3300, at least 3400, at least 3500, at least 3600, at least 3700, at least 3800, at least 3900, at least 4000, at least 4100, at least 4200, at least 4200, at least 4400, at least 4500, at least 4600, at least 4700, at least 4800, at least 4900, at least 5000, or more consecutive nucleotides in within regions A and/or B. In some embodiments, the *GJB2* GRE (e.g., a *GJB2* enhancer) comprises at least 200, at least 250, at least 300, at least 350, at least 400, at least 450, at least 500, at least 550, at least 600, at least 650, at least 700, at least 750, at least 800, at least 850, at least 900 at least 1000, at least 1100, at least 1200, at least 1300, at least 1400, at least

1500, at least 1600, at least 1700, at least 1800, at least 1900, at least 2000, at least 2100, at least 2200, at least 2300, at least 2400, at least 2500, at least 2600, at least 2700, at least 2800, at least 2800, at least 2900, at least 3000, at least 3100, at least 3200, at least 3300, at least 3400, at least 3500, at least 3600, at least 3700, at least 3800, at least 3900, at least 4000, at least 4100, at least 4200, at least 4200, at least 4400, at least 4500, at least 4600, at least 4700, at least 4800, at least 4900, at least 5000, or more consecutive nucleotides in within regions C-M. In some embodiments, the *GJB2* GRE (e.g., a *GJB2* enhancer) comprises nucleotide sequences out of the regions listed in Table 3.

[0078] In some embodiments, a *GJB2* GRE (e.g., a *GJB2* enhancer) is located on the sense strand of the *GJB2* coding sequence in the genome. In some embodiments, *GJB2* GRE (e.g., a *GJB2* enhancer) is located on the reverse complement strand of the *GJB2* coding sequence in the genome. It is within the skill of one in the art to select the appropriate sequence (e.g., GRE sequence on the sense strand, or GRE sequences on the reverse complement strand) when designing a vector using the enhancer sequences as described herein.

[0079] In some embodiments, a *GJB2* GRE (e.g., a *GJB2* enhancer) comprises at least 200, at least 250, at least 300, at least 350, at least 400, at least 450, at least 500, at least 550, at least 600, at least 650, at least 700, at least 750, at least 800, at least 850, at least 900 at least 1000, at least 1100, at least 1200, at least 1300, at least 1400, at least 1500, at least 1600, at least 1700, at least 1800, at least 1900, at least 2000, at least 2100, at least 2200, at least 2300, at least 2400, at least 2500, at least 2600, at least 2700, at least 2800, at least 2800, at least 2900, at least 3000, at least 3100, at least 3200, at least 3300, at least 3400, at least 3500, at least 3600, at least 3700, at least 3800, at least 3900, at least 4000, at least 4100, at least 4200, at least 4200, at least 4400, at least 4500, at least 4600, at least 4700, at least 4800, at least 4900, at least 5000, or more nucleotides. In some embodiments, a *GJB2* GRE (e.g., a *GJB2* enhancer) comprises 200-500 nucleotides or any number of nucleotides in between, 300-600 nucleotides or any number of nucleotides in between, 400-700 nucleotides or any number of nucleotides in between, 500-800 nucleotides or any number of nucleotides in between, 600-900 nucleotides or any number of nucleotides in between, 700-1000 nucleotides or any number of nucleotides in between, 1000-1500 nucleotides or any number of nucleotides in between, 1500-2000 nucleotides or any number of nucleotides in between. In some embodiments, a *GJB2* GRE (e.g., a *GJB2* enhancer) comprises 700 nucleotides.

[0080] In some embodiments, the *GJB2* GRE is a human *GJB2* enhancer. In some embodiments, the *GJB2* GRE (e.g., a human *GJB2* enhancer) comprises nucleotide sequence at least 60%, at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%,

at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% identical to any one of the GRE sequences as listed in Table 3.

Table 3: Human *GJB2* Enhancer Sequences

	Sense strand	Reverse Complement strand
<i>hGJB2</i>	TCATCCATGTCCCTACAAAGGACAT	AAGAGAGCACTTGGGAAGAGCCCCCG
GRE1	GAAGTCATCATTTTTTATGGCTGCA	AGGGCAGCCGGGGCTTGCCGCCTCAC
	TAAGTCGTTCTTTCAAACACCCTGC	CCTTTTGGTTTTCACATCCCAGAAATC
	AGTCAGCTTCTCCTCACGAGAAACC	AGTAAGGCAGGAATTGGAGGCTGCTT
	ACATGAAAGCCCTCGGGGAAATGCC	CTTGCCCTTAGCAACTCGGTGACCTTA
	TCTCGGGATCTACTTTTCTTTGTGT	GGCAGAACAGTTCAGCCTTCTGAGTG
	GTATCCTACTTAGCCTATCGGTTTC	TCCTTCCTCTTCTGTAAGGGGAGCGT
	TGCTTCCTGTGGGGCTACAGCCGTC	AAACCGTCCTCCATGCAGAACGTGTA
	TCGTCTTTTTCTGCTGGCTCCTTTG	CTGTGCCTGGCACAGCACTGGGGCAT
	CTCTGTTCTCCAGTGGCTATCTTCT	TAGGATCTCCAAATTAAAGGCTCACT
	TTCTCCTTTCTTTCAAATGTTCTCC	CTGCGGGATGGAGGCAGCCACAGCTG
	CTTATCTTCTCTGATACAGACAGAA	GAAGAAGGAACATTTGGGGCCAGAAG
	GGTCAGGAGCCACGCCCATTAACACT	TCCCCCTACCTCCGTCTTAAGAGAGA
	GACAGAACCCGATGTCCTGATGCGC	AGATGGGAATAACGACCCTCGCTGAA
	TCTGTGCCTCCCAGATTTGGATGTG	ATGATTGCTCTCTGGCCAGCTCGCCT
	GATGCGAGGCGAGCTGGCCAGAGAG	CGCATCCACATCCAAATCTGGGAGGC
	CAATCATTTTACGCGAGGGTCGTTAT	ACAGAGCGCATCAGGACATCGGGTTC
	TCCCATCTTCTCTCTTAGGACGGAG	TGTCAGTGTAATGGGCGTGGCTCCTG
	GTAGGGGGACTTCTGGCCCCAAATG	ACCTTCTGTCTGTATCAGAGAAGATA
	TTCTTCTTCCAGCTGTGGCTGCCT	AGGGAGAACATTTGAAAGAAAGGAGA
	CCATCCCGCAGAGTGAGCCTTTAAT	AAGAAGATAGCCACTGGAGAACAGAG
	TTGGAGATCCTAATGCCCCAGTGCT	CAAAGGAGCCAGCAGAAAAAGACGAG
	GTGCCAGGCACAGTACACGTTCTGC	ACGGCTGTAGCCCCACAGGAAGCAGA
	ATGGAGGACGGTTTACGCTCCCCTT	AACCGATAGGCTAAGTAGGATACACA
	ACAGAAGAGGAAGGACACTCAGAAG	CAAAGAAAAGTAGATCCCGAGAGGCA
	GCTGAACTGTTCTGCCTAAGGTCAC	TTTCCCCGAGGGCTTTTCATGTGTTT
	CGAGTTGCTAAGGCAAGAAGCAGCC	CTCGTGAGGAGAAGCTGACTGCAGGG
	TCCAATTCTGCTTACTGATTTCT	TGTTTGAAAGAACGACTTATGCAGCC
	GGGATGTGAAACCAAAAGGGTGAGG	

	CGGCAAGCCCCGGCTGCCCTCGGGG GCTCTTCCCAAGTGCTCTCTT (SEQ ID NO: 55)	ATAAAAAATGATGAGTTCATGTCCTT TGTAGGGACATGGATGA (SEQ ID NO: 56)
<i>hGJB2</i> GRE2	CCATGATATGTTAAGAAAAGCAAAG TGTGGAATAGTAGGTAAAATATTCT ATCTTATGTGCAAAAGGGGAAATAA AAGTCATCAATATTCATGTAGATT AATTCACATATAGATTCATATCACA TTCCTATATATATAGAAATTCTGGA AAGACACAAAATAAATTAATAAAAG TTGTTACTTCATTGTAGTTTTTAAA GTTTTTTGAGTCTTAAGACTTACTT TCCACTTCTGTAGAAAGGAATTACA AATCCTTTCTTTATAGAGCTATGTG ATGAAATAAACATAAAGCATTGTC ACACTTCAGGATAGCAACTTGTGGA TTAATGATTAACACAGTCACCTTTG CACCAGATTACACCCAGAGATTCCT TCATTTATATTTATGTGGTTTTGTG TGTCAGTTATGCAGTCTAACTCAGT CATTCAACTATGTTACAGCTGCAAC ACTCTATTTTTTTCTTTGGTACAGG AGTCGCCCTCTTATCCACTGTTTCA TTTTTGTGGTTCCAGTTACCTGTAG TCAACCACAGTTGGAAAATATGATA GCATTTTGAGAGAGAGACTGCATCC AAAACTTATATTACAATATATTGT TATACATTGTTATAAGTGTTGTTTT ATTATTCTTTATTGTTAATCTCTTA CCATTAAGCCTTATGGTAGGTTTGT ATGTATAGGAAAAAACAGATTATAT (SEQ ID NO: 37)	ATATAATCTGTTTTTTCCTATACATA CAAACCTACCATAAGGCTTAATGGTA AGAGATTAACAATAAAGAATAATAAA ACAACACTTATAACAATGTATAACAA TATATTGTAATATAAGTTTTTGGATG CAGTCTCTCTCTCAAAATGCTATCAT ATTTTCCAAGTGTGGTTGACTACAGG TAACTGGAACCACAAAAATGAAACAG TGGATAAGAGGGCGACTCCTGTACCA AAGAAAAAATAGAGTGTTCAGCTG TAACATAGTTGAATGACTGAGTTAGA CTGCATAACTGACACACAAAACCACA TAAATATAAATGAAGGAATCTCTGGG TGTAATCTGGTGCAAAGGTGACTGTG TTAATCATTAAATCCACAAGTTGCTAT CCTGAAGTGTGCCAAATGCTTTATGT TTATTTTCATCACATAGCTCTATAAAG AAAGGATTTGTAATTCCTTTCTACAG AAGTGGAAAGTAAGTCTTAAGACTCA AAAACTTTAAAAACTACAATGAAGT AACAACTTTTATTAATTTATTTTGTG TCTTTCCAGAATTTCTATATATATAG GAATGTGATATGAATCTATATGTGAA TTGAATCTACATGAATATTGATGACT TTTATTTCCCCTTTTGCACATAAGAT AGAATATTTTACCTACTATTCCACAC TTTGCTTTTCTTAACATATCATGG (SEQ ID NO: 38)
<i>hGJB2</i> GRE3	GCAGAGACCTACAGACAGAAGTACA TTTTACACTGGATCCAGGACACACA	TAGGATTGACAAGGGCAATAGAGCGA TGACTCCCTGGCTGTGTTGTATTGA

	TCAGTCTGAAAACACACACATGAAC CAAACGTTTTCCTAAAGCATTACTTA TCCTTGCTAATAGCAACACATTCTC ATATTCTTTTATACTTCATTTAATT TCATATAAAAAAGAAAAGGAAAGGA AAGAAATCTATTTCTCAGCCCATTA ATAAGGTCAGGAGCAGCAACACCAG ACTAGAAGAAAAGCTTACCTATAGA TTTTTCTGCCACCTCTTGAGTGCGT CCAGCTTTCCGACAAGTCTCAGTGC CATCTACTGTGCGCTCTGGGTATTG CAATTGCTTTTTTTTTTTTTTTTTT TTTTTTTTTAGAATGAGACTAAGTC AGAGAACACAAAGAACTTCTTTCCC CACAGTGGAGATGGCTCTGAAAGCG TTTAAGGAATAGCTTAGATGAGTGG CTAACACATTCTCCCGGTTCTGAAT TCTAAGACCACAGACTCCATGTCCA GTCCCCAAAGAGAGGCTTTGCAAGC TACAGAATACCCCTCTGACTGGGAC CTCAGGAGCTAAACTGACCACGTAA TTGGTTCTAGAAAGTGAAACGTTTT AATTTGAAACATCCAAATGAGCATT TTGTGAAAAGCTACTGCCGTCCATC AAATACAACACAGCCAGGGAGTCAT CGCTCTATTGCCCTTGTCATCCTA (SEQ ID NO: 39)	TGGACGGCAGTAGCTTTTCACAAAAT GCTCATTTTGGATGTTTCAAATTA CGTTTCACTTTCTAGAACCAATTACG TGGTCAGTTTAGCTCCTGAGGTCCCA GTCAGAGGGGTATTCTGTAGCTTGCA AAGCCTCTCTTTGGGGACTGGACATG GAGTCTGTGGTCTTAGAATTCAGAAC CGGGAGAATGTGTTAGCCACTCATCT AAGCTATTCTTAAACGCTTTCAGAG CCATCTCCACTGTGGGGAAAGAAGTT CTTTGTGTTCTCTGACTTAGTCTCAT TCTAAAAAAAAAAAAAAAAAAAAA AAAAGCAATTGCAATACCCAGAGCGC ACAGTAGATGGCACTGAGACTTGTCG GAAAGCTGGACGCACTCAAGAGGTGG CAGAAAAATCTATAGGTAAGCTTTTC TTCTAGTCTGGTGTTGCTGCTCCTGA CCTTATTAATGGGCTGAGAAATAGAT TTCTTTCCTTTCCTTTTCTTTTTTAT ATGAAATTAAATGAAGTATAAAAGAA TATGAGAATGTGTTGCTATTAGCAAG GATAAGTAATGCTTTAGGAAACGTTT GGTTCATGTGTGTGTTTTCAGACTGA TGTGTGTCCTGGATCCAGTGTA GTACTTCTGTCTGTAGGTCTCTGC (SEQ ID NO: 40)
<i>hGJB2</i> GRE4	CTTGCTTACCCAGACTCAGAGAAGT CTCCCTGTTCTGTCTAGCTAGTGA TTCTGTGTTGTGTGCATTTCGTCTT TTCCAGAGCAAACCGCCCAGAGTAG AAGATGGATTGGGGCACGCTGCAGA CGATCCTGGGGGGTGTGAACAAACA CTCCACCAGCATTGGAAAGATCTGG	GACACTGCAATCATGAACACTGTGAA GACAGTCTTCTCCGTGGGCCGGGACA CAAAGCAGTCCACAGTGTTGGGACAA GGCCAGGCGTTGCACTTCACCAGCCG CTGCATGGAGAAGCCGTCGTACATGA CATAGAAGACGTACATGAAGGCGGCT TCGAAGATGACCCGGAAGAAGATGCT

	CTCACCGTCCTCTTCATTTTTTCGCA TTATGATCCTCGTTGTGGCTGCAA GGAGGTGTGGGGAGATGAGCAGGCC GACTTTGTCTGCAACACCCTGCAGC CAGGCTGCAAGAACGTGTGCTACGA TCACTACTTCCCCATCTCCACATC CGGCTATGGGCCCTGCAGCTGATCT TCGTGTCCACGCCAGCGCTCCTAGT GGCCATGCACGTGGCCTACCGGAGA CATGAGAAGAAGAGGAAGTTCATCA AGGGGGAGATAAAGAGTGAATTTAA GGACATCGAGGAGATCAAAACCCAG AAGGTCCGCATCGAAGGCTCCCTGT GGTGGACCTACACAAGCAGCATCTT CTTCCGGGTCATCTTCGAAGCCGCC TTCATGTACGTCTTCTATGTCATGT ACGACGGCTTCTCCATGCAGCGGCT GGTGAAGTGCAACGCCTGGCCTTGT CCCAACACTGTGGACTGCTTTGTGT CCCGGCCACGGAGAAGACTGTCTT CACAGTGTTTCATGATTGCAGTGTC (SEQ ID NO: 57)	GCTTGTGTAGGTCCACCACAGGGAGC CTTCGATGCGGACCTTCTGGGTTTTG ATCTCCTCGATGTCCTTAAATTCCT CTTTATCTCCCCCTTGATGAACTTCC TCTTCTTCTCATGTCTCCGGTAGGCC ACGTGCATGGCCACTAGGAGCGCTGG CGTGGACACGAAGATCAGCTGCAGGG CCCATAGCCGGATGTGGGAGATGGGG AAGTAGTGATCGTAGCACACGTTCTT GCAGCCTGGCTGCAGGGTGTTCAGA CAAAGTCGGCCTGCTCATCTCCCCAC ACCTCCTTTGCAGCCACAACGAGGAT CATAATGCGAAAAATGAAGAGGACGG TGAGCCAGATCTTTCCAATGCTGGTG GAGTGTTTGTTACACCCCCCAGGAT CGTCTGCAGCGTGCCCCAATCCATCT TCTACTCTGGGCGGTTTGCTCTGGAA AAGACGAATGCACACAACACAGGAAT CACTAGCTAGGACAGAACAGGGAGAC TTCTCTGAGTCTGGGTAAGCAAG (SEQ ID NO: 58)
<i>hGJB2</i> GRE5	ATCCATTATTTGATTAGCCATTTCA AAAACACATTTACGGAGATCTTCAT CTGGGCAGAGCATTATTCAGGCCT CTGAAGAACCAAAGATGATTTTGAA AGGAGGTCACAGTGCAGACAGCAGG TGTGTATATAAGGTGGCTACTTTAC AAAACAGGATATGGCAAGCTGGACA TGACAGGCACAGCAAAGTCTCTGAA CAGAGTTCGGGGCATGAAATTGTTT CTTTTGGGGTCTTCAGGAACAATT TCATGAAAGCTAAATCATGAAAGAT AGCAGGCTTTTGCCAGGAAAAAAA	GTAGTGATGTTTGTGTGAATTTTTG TTTTTAATTTTTTATGAGTGCCCTAA CAAAGATTACAAATTGGGAATACAAA CTCCAGAGCAATGGAGACAGTGACAC TTTTGTGGAGGGGTACATGTGGCTGT TCGGGTGGTTATTAACACAGGCTGCT GCCCCTGCCCTGCAATGGGAATCCCC AGGGCATTGGAGGATTCAACCTCTTG CAGTTACCTCTTGTAAGACAGCAGAT GGCAGCAGAGAGAGGCTTTGCACATC CCTGCAGGTTCTAGTTTGCACAAAGG GCTTCTGAGAGACCTATCAACCAATT

	AAACAAGACTAGTGATTAGTTTGGC GTTTTCGGTTTTCTTTGAGAAGCGAA ATAACTTATCAAGGACTCTTTTTGC CACTTGATGTTATAATTGGTTGATA GGTCTCTCAGAAGCCCTTTGTGCAA ACTAGAACCTGCAGGGATGTGCAA GCCTCTCTCTGCTGCCATCTGCTGT CTTACAAGAGGTAAGTCAAGAGGT TGAATCCTCCAATGCCCTGGGGATT CCCATTCAGGGCAGGGGCAGCAGC CTGTGTTAATAACCACCCGAACAGC CACATGTACCCCTCCACAAAAGTGT CACTGTCTCCATTGCTCTGGAGTTT GTATTCCCAATTTGTAATCTTTGTT AGGGCACTCATAAAAAATTAAAAAC AAAAATTACACAAACATACACTAC (SEQ ID NO: 41)	ATAACATCAAGTGGCAAAAAGAGTCC TTGATAAGTTATTTTCGCTTCTCAAAG AAACCGAAAACGCCAAACTAATCACT AGTCTTGTTTTTTTTTTTCTTGCAA AAGCCTGCTATCTTTCATGATTTAGC TTTCATGAAATTGTTCTGAAGACCC CCAAAAGAAACAATTTTCATGCCCCGA ACTCTGTTTCAAGAGACTTTGCTGTGCC TGTCATGTCCAGCTTGCCATATCCTG TTTTGTAAAGTAGCCACCTTATATAC ACACCTGCTGTCTGCACTGTGACCTC CTTTCAAAATCATCTTTGGTTCTTCA GAGGCCTGGAATAATGCTCTGCCAG ATGAAGATCTCCGTAAATGTGTTTTT GAAATGGCTAATCAAATAATGGAT (SEQ ID NO: 42)
<i>hGJB2</i> GRE7	GCTAATTGGGTCAGGATTTGAAAGA CCTTAGCTTTGTGTGACCTTCAATT TTATCATTCAGCTTGAATATGTGCC CCAGAAAACCTTTATGTAATTCCTT AATATTTTCAAGTAACAGCATGCAAC ATACGAGAAGCACATTCTTTGTTTT TAGAATGGTATCTGGCTGATGACTT TCACAACAGCTCACATGAGAGGGAA GTATTTTAGCAATCGGACTGAAGGA AAATCCAAAACTCCACCATTGCAG GGTCAACAGTGACGTTGTTTGAATT CTGAAAGACGTAAGCCAAGGCAAAT AGAAGGAAATGATCTTCCACTAATC CCGGCATTTACTTCCTCCTCTCTGG AGGGGACGGCCATGCACACAGAGCC CTGTGCTCTGAGTTCTCATGAAAGG GACACAGCTGGGCTCACTCAGCGTC	ATCTTAGCTCCAACATGTCATTATTC CTTCCTCACTGAGGACTTTTCTGCTT CCTAATTGGTTGTTGAAGATGAGGCC CCCATGCTCTTTTAAGAAAACCTGTT GTGCCCCAGGCTTGGCTGTGATGGC ACTGACTCATACAGAAGTAGAAAGGC CTGCTGAGTCATCAACACTCGTGCGA CGCCCTCGCATTTTTCATTAATGATGG CCTCCCTGCCACACGTGAATCACTCC AGCCCGAGATCTGAAACCAGGACACA CCCCAGGGGCGAGGTGACGCTGAGTG AGCCAGCTGTGTCCCTTTTCATGAGA ACTCAGAGCACAGGGCTCTGTGTGCA TGGCCGTCCCCTCCAGAGAGGAGGAA GTAAATGCCGGGATTAGTGGAAGATC ATTTCTTCTATTTGCCTTGGCTTAC GTCTTTCAGAATTCAAACACGTGCAC

	ACCTCGCCCCTGGGGTGTGTCCTGG TTTCAGATCTCGGGCTGGAGTGATT CACGTGTGGCAGGGAGGCCATCATT AATGAAAATGCGAGGGCGTCGCACG AGTGTTGATGACTCAGCAGGCCTTT CTACTTCTGTATGAGTCAGTGCCCA TCACAGCCAAGCCTGGGGCACAACA GGTTTTCTTAAAAGAGCATGGGGGC CTCATCTTCAACAACCAATTAGGAA GCAGAAAAGTCCTCAGTGAGGAAGG AATAATGACATGTTGGAGCTAAGAT (SEQ ID NO: 43)	TGTTGACCCTGCAATGGTGGAGTTTT TGGATTTTCCTTCAGTCCGATTGCTA AAATACTTCCCTCTCATGTGAGCTGT TGTGAAAGTCATCAGCCAGATAACCAT TCTAAAAACAAAGAATGTGCTTCTCG TATGTTGCATGCTGGTTACTGAAATA TTAGGGAATTACATAAAGGTTTTCTG GGGCACATATTCAAGCTGAATGATAA AATTGAAGGTCACACAAAGCTAAGGT CTTTCAAATCCTGACCCAATTAGC (SEQ ID NO: 44)
<i>hGJB2</i> GRE8	GCCTGACACAGTCTGAGCCTCCTCA GGCGGCCTCAGGGGTGGGATAGAG TGGAGAATTCAGGCAAGAATGCCAA CCCTAGCTCCAGGCCTGGGACCCAC AGGCCTGGGGAAAAGAGTGGTTGCC CCGTCTTGAGACAGCCGAAAACCTGT GTCCCCAGGATTGTTGGTTTCATAA AAGCAAGTAGCTAGGGAGGCCACAT TTACAGGGGATCACAGAACACTTGG GTAGGGGCTTGCTGTAGGTGTCATC AGGGAAGTGGGGGACGGCAGGAGGG ATGTGGCCCAGTACGCAGATGAAGA CAGGTGATCATCCGCTGGGCCACAC GTGGCAGGGATATGGGCAGAGTGAG CTTGCTGGCCCCAGGCTCCAAAGC TGCCCAGCCCCCGCTGAAGGTGAGG CCTCAGCTGGTGGGAATGTCACCTT CCAGGTGACTGGCTGGCTCCAAAGG CCTTTGCATGATCTCCAGGAGTTTG GAGGGGAGAGGCCACATTCCAAATC CAGCTTGAAAAGTGCTCTGTATCAC CCTCAGCACTGAGGGGGCCAGAGTC	CTGCCTTCCTGGCGTTTAGTGCGATT TGTTTAGCCATGTGCTCCCTGGTGTG TGTTTTTGAATGTGTGTGAGATGGGT TGTCTCTCGGGACCTGGCAGGTGCGG CCACCAGGTCAGGGCTGCCCCCAAC CCTGTGCCTCCTTCCTCCTAGACTCT GGCCCCCTCAGTGCTGAGGGTGATAC AGAGCACTTTTCAAGCTGGATTTGGA ATGTGGCCTCTCCCCTCCAAACTCCT GGAGATCATGCAAAGGCCTTTGGAGC CAGCCAGTCACCTGGAAGGTGACATT CCCACCAGCTGAGGCCTCACCTTCAG CGGGGGCTGGGCAGCTTTGGAGCCTG GGGCCAGCCAAGCTCACTCTGCCCAT ATCCCTGCCACGTGTGGCCCAGCGGA TGATCACCTGTCTTCATCTGCGTACT GGGCCACATCCCTCCTGCCGTCCCCC ACTTCCCTGATGACACCTACAGCAAG CCCCTACCAAGTGTTCTGTGATCCC CTGTAAATGTGGCCTCCCTAGCTACT TGCTTTTATGAAACCAACAATCCTGG GGACACAGTTTTTCGGCTGTCTCAAGA

	TAGGAGGAAGGAGGCACAGGGTTGG GGGGCAGCCCTGACCTGGTGGCCGC ACCTGCCAGGTCCCGAGAGACAACC CATCTCACACACATTCAAAAACACA CACCAGGGAGCACATGGCTAAACAA ATCGCACTAAACGCCAGGAAGGCAG (SEQ ID NO: 59)	CGGGGCAACCACTCTTTTCCCCAGGC CTGTGGGTCCCAGGCCTGGAGCTAGG GTTGGCATTCTTGCCTGAATTCTCCA CTCTATCCCAACCCCTGAGGCCGCCT GAGGAGGCTCAGACTGTGTCAGGC (SEQ ID NO: 60)
<i>hGJB2</i> GRE9	CGCCTCGGCCTCCCAAAGTGCTGGG ATTACAGGCGTGAGCCACCACCGTG CCTGGCTTATACAAGTAATTGTAAA CGAAAAGGAAAAAATGGAGATACAG TTTTCTCGTGCACTCTTAACTTTGG TGCTTAAAAGCACCATTAATTTCTG CTTTCACATGAACACACACAAGATT ACCACGTTTGCTCTGGGCTGCTGCG TATTGGAAGGACATACACATTCAAC AAATATTTGTTGAACTTCCATTCTG TACACAAAGCACAAAGAAAGATTCTG TTCACAGTCCGTGTGGGTACTGGAA AGCAGTTCCAGCCCTGCCTGCCAGG GGGCACCCAGGCAAGCACATCTCA GTGGCTGCTAGAAAAGTGAATTGAGG CTGAGTCTCTCCACACCCAAGTGTT AGGCGTTCTAGGCTCAGAAAGAGAC AATGACAATGCGGGCAATTCTCTCT TCACTGTGTCCTCTTCTTTGCTAGA AATGTTATTAGAATATGGAAATGTG ACATTGAGCACTAATCAGTTTGACA TATGAATATATCTATACACATATTT CTCCTGAAATTGGCCTAAATACTC TTTCTTGGAACCAAATGAGAAGCAA ACAACCTTTACAACATAACATTAATA CCATAAGATGAACATCTTAGTTGTC TACCTAGA	TTCTAGGTAGACAACCTAAGATGTTCA TCTTATGGTTTAAATGTTTAGTTGTAA AGGTTGTTTGCTTCTCATTTGGTTCC AAGAAAGAGTATTTAGGCCAATTTCA GGGAGAAATATGTGTATAGATATATT CATATGTCAAACCTGATTAGTGCTGAA TGTCACATTTCCATATTCTAATAACA TTTCTAGCAAAGAAGAGGACACAGTG AAGAGAGAATTGCCCGCATTGTCATT GTCTCTTTCTGAGCCTAGAACGCCTA ACACTTGGGTGTGGAGAGACTCAGCC TCAATTCACCTTTCTAGCAGCCACTGA GATGTGCTTGCCCTGGGGTGCCCCCTG GCAGGCAGGGCTGGAAGTCTTTCCA GTACCCACACGGACTGTGAACGAATC TTTCTTTGTGCTTTGTGTACAGAATG GAAGTTCAACAAATATTTGTTGAATG TGTATGTCCTTCCAATACGCAGCAGC CCAGAGCAAACGTGGTAATCTTGTGT GTGTTGATGTGAAAGCAGAATTTAAT GGTGCTTTTAAGCACCAAAGTTTAAG ATGCACGAGAAAACCTGTATCTCCATT TTTTCCTTTTCGTTTACAATTACTTG TATAAGCCAGGCACGGTGGTGGCTCA CGCCTGTAATCCCAGCACTTTGGGAG GCCGAGGCGGGCGGATCACATGAGGT CGGGAG

	(SEQ ID NO: 45)	(SEQ ID NO: 46)
--	-----------------	-----------------

[0081] In some embodiments, the *GJB2* GRE is a non-human primate (e.g., Cynomolgus macaque) *GJB2* enhancer. In some embodiments, the *GJB2* GRE (e.g., a Cynomolgus macaque *GJB2* enhancer) comprises nucleotide sequence at least 60%, at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% identical to any one of the GRE sequences as listed in Table 4.

Table 4: Cynomolgus macaque *GJB2* (*mfGJB2*) Enhancer Sequences

	Sense strand	Reverse Complement strand
<i>mfGJB2</i> GRE1	ATGGCACCAGCTTTTGAAAAAAGAA AACCTTTTTTGCTGGTAGTCTGGCAA GGAGACAGAAAAAACCCTCACAT CTGCCTCCCCAGGCTGGGGGCTGGG CCGGATTTTATAAGGATAGGGTAAT GAGGGGTGGTCTGTTTGGATCTTGC AATGAGGTGCTGCTGGGAGGTGTGA TCTGATTGGATCCTGCCATGGAGTG ATGCCAAAGCTCCATCTGATTGGAT CCTGGATCCTGCCGTGTGTGCTCTG CTTCTTAATGCAACCCCTGCTCCTC AGTCTGAGCCCTTAGATTCTGCCCA CGGTTGCACGCTTGGTTCACCTTGG CATGCTCAGGTTACATGACCTTCAG CTTGGGGTCCATGGCAACTGAAAAG CAACTCACAACTTCCTTTCATAAAA ATTGAACCTGACTGGTCTGGTGCAG TCACACCAGCTCTATCCCATTGATG ACAGGACCGCATCATGGGGATTAGA GCAGAGAGGTCATAGTAAGTAGCAT TTTCAAGAGGGCACCTGATGTCTG GATGAACCTCAGGGCAACAAAATAG	CGATCACCCCTCTATGTGCCATGGACT TATCAGTGAGCAAGACAAAGCCCCTG CCCTCATTAATTCCCATCCTGTGTCC TCCTGTGCCATCCCCACCACCCCACC TTGGTCAGGCCCAGTGTCTGGGTGTC TTCAACTGCTCACCTGCCCCGCTATTT TGTTGCCCTGAAGTTCATCCAGACAT CAGGGTGCCCTCTTGAAAATGCTAGT TACTATGACCTCTCTGCTCTAATCCC CATGATGCGGTCCTGTCTCATCAATGGG ATAGAGCTGGTGTGACTGCACCAGAC CAGTCAGGTTCAATTTTTATGAAAGG AAGTTGTGAGTTGCTTTTTCAGTTGCC ATGGACCCCAAGCTGAAGGTCATGTA ACCTGAGCATGCCAAAGTGAACCAAG CGTGCAACCGTGGGCAGAATCTAAGG GCTCAGACTGAGGAGCAGGGGTTGCA TTAAGAAGCAGAGCACACACGGCAGG ATCCAGGATCCAATCAGATGGAGCTT TGGCATCACTCCATGGCAGGATCCAA TCAGATCACACCTCCCAGCAGCACCT CATTGCAAGATCCAAACAGACCACCC

	CGGGCAGGTGAGCAGTTGAAGACAC CCAGACACTGGGCCTGACCAAGGTG GGGTGGTGGGGATGGCACAGGAGGA CACAGGATGGGAATTAATGAGGGCA GGGGCTTTGTCTTGCTCACTGATAA GTCCATGGCACATAGAGGGTGATCG (SEQ ID NO: 84)	CTCATTACCCTATCCTTATAAAATCC GGCCCAGCCCCCAGCCTGGGGAGGCA GATGTGAGTGGTTTTTTTTCTGTCTCC TTGCCAGACTACCAGCAAAAAGGTTT TCTTTTTTCAAAGCTGGTGCCAT (SEQ ID NO: 85)
<i>mfGJB2</i> GRE2	CCGTTAGGAAAAGAAAAACAGAAGG AATTGTGTTCTCTGGAGGGCAGGGC TCTGAGTACTGAGTCTCATGTTTTC AAAGTCGGAAGGTGCCACAGTTAA TATTTGGATGGGCCCACAGTGCCCG TCTTGCTCGCCGGAGCCCAGGCCTG TCCCATCACAGACAAAGGGCTCTTG CTGTGCACCTGTGGAGAGGGGAGCT TGGCTGGGGAAGGCAGGGTCAGCCT CTTTGTGCTCTTTTTGTTTGAAGCA GAGTTTTGCAAAGGGAGTGGCTCTG GAAGAAAAGCAGAGCGTGGAGTGTC AGAGGCCGGCGTGTGTGAAATGCA TAAGCCCTGGAGACCTCTGTAACT GGCCTTCACACACGCCCGCCGCCAA GGACAACACTGAACCACGGAAGCGG GGTGTTTGCCAGCTCACGAGACGGG GAGACATGAAGCTTCTACCAGCAGA GGAGCTGGAGGGGAAACAGAAAGAA AGAACTGAGTCTAGCAGCCTCCTTG GACATTTCTTCCAACGCCTCCAGCC CAGCACAACAAACAACCTCAGGGCA TCCGGCCCGTGTGCGGCCCTGGCAC ACCCAACTCTGCCCTGCTCCAAGAG CCCACAGAGGGCCTCGGGGTCACAC TCAAGGAGCATGCTTGGAATCCAAA	TTGCTGGGTGCTATTTCTGTCCTTGT CCATCTCCCCACCACAGCATGCACTT TGGATTCCAAGCATGCTCCTTGAGTG TGACCCCGAGGCCCTCTGTGGGCTCT TGGAGCAGGGCAGAGTTGGGTGTGCC AGGGCGCGACACGGGCGCGATGCCCT GAGGTGTTTGTGTGTGCTGGGCTGGA GCGGTTGGAAGAAATGTCCAAGGAGG CTGCTAGACTCAGTTCTTTCTTTCTG TTTCCCCTCCAGCTCCTCTGCTGGTA GAAGCTTCATGTCTCCCCGTCTCGTG AGCTGGCAAACACCCCGCTTCCGTGG TTCAGTGTGTCTTGGCGGCGGGCG TGTGTGAAGGCCAGTTACAGAGGGTC TCCAGGGCTTATGCATTTCAACAACAC GCCGGCCTCTGACACTCCACGCTCTG CTTTTCTTCCAGAGCCACTCCCTTTG CAAAACTCTGCTTCAAACAAAAAGAG CACAAAGAGGCTGACCCTGCCTTCCC CAGCCAAGCTCCCCTCTCCACAGGTG CACAGCAAGAGCCCTTTGTCTGTGAT GGGACAGGCCTGGGCTCCGGCGAGCA AGACGGGCACTGTGGGCCCCATCCAAA TATTAAGTGTGGACACTTTCCGACTT TGAAAACATGAGACTCAGTACTCAGA GCCCTGCCCTCCAGAGAACACAATTC CTTCTGTTTTTCTTTTCCTAACGG

	GTGCATGCTGTGGTGGGGAGATGGA CAAGGACAGAAATAGCACCCAGCAA (SEQ ID NO: 86)	(SEQ ID NO: 87)
<i>mfGJB2</i> GRE3	AAAAAAGAATCACAATTGCCACCAA GGCTCTATGTTTTCGCAAAAGTCCA GCATTTAAAGAACTTCCTGCATG GCCTACATCTGCTGATTGGTAATTT GTCGTTTCAGGTTAAAAACAAAACAA GCGGGCATTGTTGTGATATCATCCT TGATAACATCCCAAGAAAACCTCTAG AGCTGGCAAGAGAGGAAAGCAGATA ATGGTCAAAGCTGTCTATCTGAGTTT TAAAAACACTGTGATTTTTCTTTTA AAGGAACATCTTCAGTTTCCAAGGC CATACACACGGCTCCTAACTGCAGC TTAAAATTTTCCACTGGGCTCCCTT CTGAGAACAACGCTATTTCAGTGGC GAGTGCCGGACACCACTGCGCTTTC AAAGGTGGCTGCCAGAGGACACTCA GGACTTCACAGCAGCCGTAAGCCA GACTGGGGTCAGTCACTCCCCATC AGAATTATTTGTTTCTCCTTTGCT TAGGAAAGGAAGGATTCCTCAGATT GGCATCCAG (SEQ ID NO: 88)	CTGGGATGCCAATCTGAGGAATCCTT CCTTTCCTAAGCAAAGGAGAAACAAA ATAATTCTGATGGGGGAGTGACTGAC CCCAGTCTGGCTTACCGGCTGCTGTG AAGTCCTGAGTGTCTCTGGCAGCCA CCTTTGAAAGCGCAGTGGTGTCCGGC ACTCGCCACTGAATAGCGTTTGTCT CAGAAGGGAGCCCAGTGGAAAATTTT AAGCTGCAGTTAGGAGCCGTGTGTAT GGCCTTGAAACTGAAGATGTTCCCTT TAAAAGAAAAATCACAGTGTTTTTAA AACTCAGATGACAGCTTTGACCATTA TCTGCTTTCCTCTCTTGCCAGCTCTA GAGTTTTCTTGGGATGTTATCAAGGA TGATATCACAACAATGCCCCGCTTGT TTGTTTTTAACCTGAACGACAAATTA CCAATCAGCAGATGTAGGCCATGCAG GAAGTTTCTTTTAAATGCTGGACTTT TGCGAAAACATAGAGCCTTGGTGGCA ATTGTGATTCTTTTTT (SEQ ID NO: 89)
<i>mfGJB2</i> GRE4	ATAATGAGCAACATAAGGTTAAAAT AACATTGCAACCCCATGGAAGCAAG AGAAATGGAATTATTAATAAATGG ACCACATGTAAGGGAATGCTGTGGT TCTATTGTAGAGATTACAGAGAGCA ATTTAGGAGAGCCAGGCGCTGGGGG CAAGAGGGAAATGAAACGAAAACCG AAGGGATTTGTTTCAGGAAGAAAAAT GAAAACAGATAAAAGGTGTTTCAATTT	GCCATTCTGCATTAGGTTTGGTTAAA AAAATGAAACTATCGGCTGAGCTGGG TAAACACTGGTTTTGGTCAAAATATGG AATGAGACGGTGCCACGTATTTCCAA TGGGGCTGCTCAGTGAAGTCTGAGCG TGTGTGGAATGTGAGTCTGGTCTCCC AGGATACTTCAAAGGTGTACAGGTCC CTTTGTGCGGTGCCACACGTCCCCGCT CATGGGTATAACATGCCTGGAGATTT

	CAAAGCTTCCCTCTTTCCCAGCATT TTTCTGAAGTAGAGTTTGAAAGGAA AGCAAAATAACTGCAAACCAATACA GTGGCACGAGTTCAGTGACGCAGAG CTAGGAACGACGTCCAGAGATCTCC AGCCCCGCCTCCCGTTCTGGGTCAC CTGGCTCCTTGACAGCCCTGAAAAC TGCCTGTGCAAATCTCCAGGCATGT TATACCCATGAGCGGGGACGTGTGG CACCGACAAAGGGACCTGTACACCT TTGAAGTATCCTGGGAGACCAGACT CACATTCCACACACGCTCACGAGTC ACTGAGCAGCCCCATTGGAAATACG TGGCACCGTCTCATTCCATATTTGA CCAAACCAGTGTTTACCCAGCTCA GCCGATAGTTTCATTTTTTTAAACCA AACCTAATGCAGAAATGGC (SEQ ID NO: 90)	GCACAGGCAGTTTTTCAGGGCTGTCAA GGAGCCAGGTGACCCAGAACGGGAGG CGGGGCTGGAGATCTCTGGACGTCGT TCCTAGCTCTGCGTCAGTGAACTCGT GCCACTGTATTGGTTTGCAGTTATTT TGCTTTTCCTTTCAAACCTCTACTTCAG AAAAAATGCTGGGAAAGAGGGAAAGCTT TGAAATGAACACCTTTTATCTGTTTT CATTTTTCTTCCTGAACAAATCCCTT CGGTTTTCGTTTCATTTCCCTCTTGC CCCCAGCGCCTGGCTCTCCTAAATTG CTCTCTGTAATCTCTACAATAGAACC ACAGCATTCCCTTACATGTGGTCCAT TTATTAATAATTTCCATTTCTCTTGC TTCCATGGGGTTGCAATGTTATTTTA ACCTTATGTTGCTCATTAT (SEQ ID NO: 91)
<i>mfGJB2</i> GRE5	CACGTCTTGTAATTTTTTTACTGAA TGTTAGACATTGCATATAAAAGACT ATCCAGGAGTGTTTTGTTTTGTTT TTTCTAGTGAGTGCAAGTCCCTTGC TCTCTGCCAGTTGGCTGGAATGAGA ATCTGATCAGATTTTCATCAAGAGTC AGGTTGAGCTGAGACTGAGCGGTAG TGTTCACTAAATTGAGTGCACCACT GATATCTAATGGAAACAAGGACATT TTACTTTGCTCCTCAGCCTAACCTG AATTTCCCTATGCCACCACTGTATAA TGGCTGGTTTCTTTGGTTCTCCTAA TGTGTGAGCTGGAAGCAGGTTGAGA CATAGATTTTCATATCATTTTGGCTT CCCTTGCACTAACATGGCTCCACA ATTCAAGCACTATGAAATTGTTTAA	ACCTTTAAGAAAAATCTGCCAAAAGA TTTGGAGCTGGATTGGAATTTAGAAG TCCACCAAATGCAAAAATAGTTTGGC TCAACGTCACCCCCATCCGTGATTTT ACTGCAAAAGTGGCTGTGGAGGCAAG ACTGGAAAACAGTTAAACAATTTTCAT AGTGCTTGAATTGTGGAGCCATGTTA GATGCAAGGGAAGCCAAAATGATATG AAATCTATGTCTCAACCTGCTTCCAG CTCACACATTAGGAGAACCAAAGAAA CCAGCCATTATACAGTGGTGGCATAG GAAATTCAGGTTAGGCTGAGGAGCAA AGTAAAATGTCCTTGTTTCCATTAGA TATCAGTGGTGCACTCAATTTAGTGA ACACTACCGCTCAGTCTCAGCTCAAC CTGACTCTTGATGAAATCTGATCAGA

	CTGTTTTCCAGTCTTGCCTCCACAG CCACTTTTGCAGTAAAATCACGGAT GGGGGTGACGTTGAGCCAACTATT TTTGCAATTTGGTGGACTTCTAAATT CCAATCCAGCTCCAAATCTTTTGGC AGATTTTTCTTAAAGGT (SEQ ID NO: 92)	TTCTCATTCCAGCCAACTGGCAGAGA GCAAGGGACTTGCACTCACTAGAAAA AACAAAAACAAAACACTCCTGGATAG TCTTTTATATGCAATGTCTAACATTC AGTAAAAAAATTACAAGACGTG (SEQ ID NO: 93)
<i>mfGJB2</i> GRE6	CGGCAGAGACCTACAGACCAAAGTA CATTTACACTGGATCCAGGACACA CATCAGTCTGAAAGCACACACATGA ACCAAACGTTTCCTAAAGCATTACT TACCCTTGCTAATAGCAACACATTC TCATATTCTTTTATACTTCATTTAA TTTCATTTAAAAAAGAAAAAGATAG GAAAGAAATCTATTTCTCCGCCCAT TAATAAGGTCAGACGCAGCAACGCT AGACTAGAAGAAAAGTTTACCTACT GATTTTTCTCCCACCTCCTGAGTGC GCACAGCTTTCCGACAAGTGTCAGT GCCATCTACTGTGCGCTCTGGGTAC TGCAATAGCCTTTTTTTTTTTTTTTT TTTTTTTTTAGAATGAGACTAAATG AGAGAACACAAAGAACTTCTTTCCC CACAGTGGAGATGGCTCTGAAAGCG TTTAAGGAATGGCTTAGATGAGTGG CTAACACATTATCCCAGTTCTGAAT TCTAAGACCACAGACTCCATGTCCG ATCCCCAAAGAGAGGCTTTGCAA (SEQ ID NO: 94)	TTGCAAAGCCTCTCTTTGGGGATCGG ACATGGAGTCTGTGGTCTTAGAATTC AGAAGTGGGATAATGTGTTAGCCACT CATCTAAGCCATTCTTAAACGCTTT CAGAGCCATCTCCACTGTGGGGAAAG AAGTTCTTTGTGTTCTCTCATTTAGT CTCATTCTAAAAAAGAAAAAAGATAG AAAAAAGGCTATTGCAGTACCCAGAG CGCACAGTAGATGGCACTGACACTTG TCGGAAAGCTGTGCGCACTCAGGAGG TGGGAGAAAAATCAGTAGGTAACTT TTCTTCTAGTCTAGCGTTGCTGCGTC TGACCTTATTAATGGGCGGAGAAATA GATTTCTTTCTATCTTTTTTCTTTTT TAAATGAAATTAAATGAAGTATAAAA GAATATGAGAATGTGTTGCTATTAGC AAGGGTAAGTAATGCTTTAGGAAACG TTTGGTTCATGTGTGTGCTTTTCAGAC TGATGTGTGTCTGGATCCAGTGTGA AATGTACTTTGGTCTGTAGGTCTCTG CCG (SEQ ID NO: 95)
<i>mfGJB2</i> GRE7	GGTGTGTATATCAGGTGGTTACTTT ACAAAACAGGATGTGGCAAGCTGGA CCTGATAGACACATCAAAGCCTCTG AACAGAGTTCAGGGCATGAAATGGT TTCTTTTGGGGTCTTCAGGAACAA	TGTATGCTTGTGTGAATTTTTGTTTT TAACTTTTTGTGAGTGCCCTAACAAA GACTACACATTGGGAATACAAACACC AGAGCAATGGAAACAGTGACACTTTT GTGGAAGGTCCACGTGGCCGTTTCAGG

	TTTCATGAAAGCTAAATCATGAAAG ATAGCAGACTTTTGCCAGGAAAAAA AAACAAAACAAAACGAGACTAGTGA TTAGTTTGGCGTTTTTCGGTTTCTTT GAGAAGCGAAATAACTTATCAAGGA CTCTTTGTGCCGCTTGATGTTCTAA TCGGTTGATGGGTCTCTCAGAAGCC CTTTCTGCAAACTAGAACCTGCAGG GATGTGCAAAGCCTCTCTCTGCTGC CATCTGCTGTCTTACAAGAGGTCAC TGCGAGAGGCTGAATCCCCCAATGC CTTGGGGATTCCCCTGCAGGGCAG GGGCGCCAGCCTGTGTTACAACCAC CTGAACGGCCACGTGGACCTTCCAC AAAAGTGTCACTGTTTCCATTGCTC TGGTGTTTGTATTCCCAATGTGTAG TCTTTGTTAGGGCACTCACAAAAG TTAAAAACAAAATTACACAAGCA TACA (SEQ ID NO: 96)	TGGTTGTAACACAGGCTGGCGCCCCCT GCCCTGCAGTGGGAATCCCCAAGGCA TTGGGGGATTTCAGCCTCTCGCAGTGA CCTCTTGTAAGACAGCAGATGGCAGC AGAGAGAGGCTTTGCACATCCCTGCA GGTTCTAGTTTGCAGAAAGGGCTTCT GAGAGACCCATCAACCGATTAGAACA TCAAGCGGCACAAAGAGTCCTTGATA AGTTATTTGCTTCTCAAAGAAACCG AAAACGCCAACTAATCACTAGTCTC GTTTTGTTTTGTTTTTTTTTTCCTGGC AAAAGTCTGCTATCTTTTCATGATTTA GCTTTCATGAAATTGTTCTCTGAAGAC CCCCAAAAGAAACCATTTCATGCCCT GAACTCTGTTTCAGAGGCTTTGATGTG TCTATCAGGTCCAGCTTGCCACATCC TGTTTTGTAAAGTAACCACCTGATAT ACACACC (SEQ ID NO: 97)
<i>mfGJB2</i> GRE8	GGTCAGGATTTGAAAGACCTTAGCT TTGTGTGACCTTCAGTTTTATCATT CAGTTTGAATATGTGCCCCAGAAAA CCTTTATGTAATTTCTTAATATTTT AGTAACATATTTACAACATACAAG CAGCACATTCTCTTTTTTTTAGAATG GTGTCTCGCTGATGACTTTGACGAC AGCTCACGTGAGAGGGAAGTATTTT AGCAATCAGACCGAAGGAGAATCCA AAAACCCCACTATTGCGGGGTCAAG AGTGACGTGTTTGAATTCTGAAAG ATGTAAGCCAAGGCAAACAGAAGGA AATGATCTTCCACTAATCCCTGCAT TACTTCCTCCTCTCTGGAGGGGAC	CACCATCATCTTAGCTCCAACATGTC ATTATTCCTTCCTCACTGAGGACTTT TCTGCCTCCTAATTGGTTGTTGAAGA CGAGGCCCCCATGCTCTTTTAAGAAA ACCTGTTCTGCCCCAGGCTTGGCTGC GACGGGTACTGACTCATAGAGAAGTA GAAAGGCCTGCTGAATCATCAACACT CCCGCGACGCCCTGCATTTTTCATTA ATGACGGCCTCCCTGCTACACGTGAA TCACTCCAGCCTGAGATCTGAAACCC GGGCACACCCCAGGGGCGAGGTGACA CTGAGTGAGCCCAGCTGTGTCCCCTT CAGGAGAAGTCAGAGCACAGGGCTCT GTGTGTGTGGCCGTCCCCTCCAGAGA

	GGCCACACACACAGAGCCCTGTGCT CTGACTTCTCCTGAAGGGGACACAG CTGGGCTCACTCAGTGTACCTCGC CCCTGGGGTGTGCCCCGGGTTTCAGA TCTCAGGCTGGAGTGATTACGTGT AGCAGGGAGGCCGTCATTAATGAAA ATGCAGGGGCGTCGCGGGAGTGTTG ATGATTCAGCAGGCCTTTCTACTTC TCTATGAGTCAGTACCCGTCGCAGC CAAGCCTGGGGCAGAACAGGTTTTC TTAAAAGAGCATGGGGGCCTCGTCT TCAACAACCAATTAGGAGGCAGAAA AGTCCTCAGTGAGGAAGGAATAATG ACATGTTGGAGCTAAGATGATGGTG (SEQ ID NO: 98)	GGAGGAAGTAAATGCAGGGATTAGTG GAAGATCATTTCCTTCTGTTTGCCTT GGCTTACATCTTTCAGAATTCAAACA CGTGCACTCTTGACCCCGCAATAGTG GGGTTTTTGGATTCTCCTTCGGTCTG ATTGCTGAAATACTTCCCTCTCACGT GAGCTGTCGTCAAAGTCATCAGCGAG ACACCATTCTAAAAAAGAGAATGTG CTGCTTGTATGTTGTGAAATATGTTA CTGAAATATTAGGAAATTACATAAAG GTTTTCTGGGGCACATATTCAAACCTG AATGATAAACTGAAGGTCACACAAA GCTAAGGTCTTTCAAATCCTGACC (SEQ ID NO: 99)
<i>mfGJB2</i> GRE9	GTTTTTTCATGCATCTTAACTTTG GTGCTTAAAGAAAAGCACCATTAAA TCCTGCTCTCACACGAACACACACA AGATTACCACGTTTGCTCTGGGCTG CCGCGTATAGGAAGGACATATACAT TCAATAAATATTTGTTGAACTTCCA TTCTGTACACAAAGCACAAAGAAAG ATTGCTTACAGTCCGCGTGGGTAC AGGAAAGCAGTTCCAGCCCTGCCTG CCAGGGGGCACCCCAGGCAAGCACA TCTCAGTGGCTGCAAGAAAGTCAGC GAGTTGAGGCTGAGTCTCTCTCTAT ACCCAAGTGTTAGGTGTTCTAGGCT CAAAGAGAGACAATGACAATGCGGG CAATTCTCTCTTCACTGTGTCCCTT TCTTTGCTAGAAATGTTATTAGAAT GTGGAAATGTGACCCGTCGATTGAG AATTCAGCACTAATCAGTTTGACAT ATGAGTATATCTACATAGACACATA	GTTTCCTTCTCATTTGGTTTCAAGGA AGACAGTGTTTAGGACAATTCAGGG AGAAATATGTGTCTATGTAGATATAC TCATATGTCAAACCTGATTAGTGCTGA ATTCTCAATCGACGGGTCACATTTCC ACATTCTAATAACATTTCTAGCAAAG AAAGGGACACAGTGAAGAGAGAATTG CCCGCATTGTCATTGTCTCTCTTTGA GCCTAGAACACCTAACACTTGGGTAT AGAGAGAGACTCAGCCTCAACTCGCT GACTTTCTTGCAGCCACTGAGATGTG CTTGCCCTGGGGTGCCCCCTGGCAGGC AGGGCTGGAAGTCTTTTCTGTACCC ACGCGGACTGTGAACGAATCTTTCTT TGTGCTTTGTGTACAGAATGGAAGTT CAACAAATATTTATTGAATGTATATG TCCTTCCTATACGCGGCAGCCCAGAG CAAACGTGGTAATCTTGTGTGTGTTT GTGTGAGAGCAGGATTTAATGGTGCT

TTTCTCCCTGAAATTGTCCTAAACA CTGTCTTCCTTGAAACCAAATGAGA AGGAAAC (SEQ ID NO: 100)	TTTCTTTAAGCACCAAAGTTTAAGAT GCATGAAAAAAC (SEQ ID NO: 101)
---	--

[0082] In some embodiments, the human *GJB2* GREs share homology with the *mfGJB2* GREs. In some embodiments, the human *GJB2* GREs correspond to *mfGJB2* GREs as set forth in Table 5:

Table 5: Homology between Human *GJB2* GREs and *mfGJB2* GREs

<i>hGJB2</i> GRE9	<i>mfGJB2</i> GRE9
<i>hGJB2</i> GRE7	<i>mfGJB2</i> GRE8
<i>hGJB2</i> GRE5	<i>mfGJB2</i> GRE7
<i>hGJB2</i> GRE3	<i>mfGJB2</i> GRE6
<i>hGJB2</i> GRE2	<i>mfGJB2</i> GRE5

[0083] In some embodiments, the isolated nucleic acid comprises one or more (*e.g.*, 1, 2, 3, 4, 5, 6, 7, 9, or more) enhancers (*e.g.*, *GJB2* enhancers). In some embodiments, the isolated nucleic acid comprises more than one enhancer, and the more than one enhancer are the same enhancers or different enhancers. . In some embodiments, the *GJB2* GRE is positioned 5' to the promoter. In other embodiments, the *GJB2* GRE is positioned 3' to the promoter. In some embodiments, the presence of the *GJB2* enhancer(s) in the isolated nucleic acid facilitates cell-type specific expression of the *GJB2* protein encoded by the isolated nucleic acid. In some embodiments, cells that normally express the *GJB2* gene (*e.g.*, fibrocytes and supporting cells of the organ of Corti and nearby regions) have the transcriptional network to activate *GJB2* expression regulated by the *GJB2* enhancers, but not in cells that do not normally express *GJB2* (*e.g.*, hair cells and spiral ganglion neurons).

[0084] In some embodiments, the expression cassette of the isolated nucleic acid further comprises a 5' UTR. In some embodiments, the 5' UTR is a native 5' UTR of the genomic *GJB2* gene. The 5' untranslated region (5' UTR) (also known as a leader sequence or leader RNA) is the region of an mRNA that is directly upstream of the initiation codon. The 5' UTR plays important roles in both transcriptional and translational regulation of the downstream gene (*e.g.*, the *GJB2* gene). In some embodiments, the isolated nucleic acid comprising a nucleotide sequence encoding a *GJB2* 5' UTR is also capable of expression *GJB2* in a cell-

specific manner (*e.g.*, expressing *GJB2* in cells that normally express it). In some embodiments, the nucleotide sequence encoding the *GJB2* 5' UTR comprises a portion of a nucleotide sequence encoding a full-length human *GJB2* gene 5' UTR. In some embodiments, the 5' UTR is a human *GJB2* gene exon 1 5' UTR. In some embodiments, the nucleotide sequence encoding a 5' UTR comprises at least 100 consecutive nucleotides, at least 200 consecutive nucleotides, at least 300 consecutive nucleotides, at least 400 consecutive nucleotides, at least 500 consecutive nucleotides, at least 600 consecutive nucleotides, at least 700 consecutive nucleotides, at least 800 consecutive nucleotides, at least 900 consecutive nucleotides, at least 1000 consecutive nucleotides, or more of a native full-length 5' UTR (*e.g.*, the human *GJB2* gene exon 1 5' UTR). In some embodiments, the expression cassette comprises a nucleotide sequence encoding the 5' UTR having at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to a nucleotide sequence encoding a human *GJB2* gene 5' UTR (*e.g.*, human *GJB2* exon 1 5' UTR). In some embodiments, the expression cassette comprises a nucleotide sequence encoding the 5' UTR having at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to a nucleotide sequence encoding a consecutive 300 bp of a human *GJB2* gene 5' UTR (*e.g.*, the human *GJB2* gene exon 1 5' UTR) as set forth in SEQ ID NO: 53. In some embodiments, an exemplary nucleotide sequence encoding the 300 bp of the human *GJB2* gene exon 1 5' UTR has a nucleotide sequence as set forth in SEQ ID NO: 53:

```
GGGGTGCGGTTAAAAGGCGCCACGGCGGGAGACAGGTGTTGCGGCCCCGCAGCGCCCGCGCG
CTCCTCTCCCCGACTCGGAGCCCCCTCGGCGGCGCCCGGCCAGGACCCGCCTAGGAGCGCAG
GAGCCCCAGCGCAGAGACCCCAACGCCGAGACCCCGCCCCGGCCCCGCCGCGCTTCTCTCC
GACGCAGAGCAAACCGCCAGAGTAG
```

[0085] In some embodiments, the cell specific *GJB2* expression is achieved by incorporation of a nucleotide sequence encoding a basal promoter and a *GJB2* 5' UTR or a portion thereof (basal promoter/5' UTR). In some embodiments, an expression cassette (*e.g.*, *GJB2* expression cassette) comprises a nucleotide sequence encoding a 5' UTR. In some embodiments, the isolated nucleic acid can further comprise additional nucleotide sequence encoding one or more *GJB2* GREs (*e.g.*, *GJB2* enhancers). The nucleotide sequence encoding the *GJB2* GREs and the nucleotide sequence encoding the basal promoter/5' UTR can be placed in any order. In some embodiments, the nucleotide sequence encoding the *GJB2*

GREs is placed 5' to the nucleotide sequence encoding the basal promoter/5' UTR. In some embodiments, the isolated nucleic acid comprising a nucleotide sequence encoding a *GJB2* basal promoter/5' UTR is also capable of expressing *GJB2* in a cell-specific manner (*e.g.*, expressing *GJB2* in cells that normally express it). In some embodiments, the nucleotide sequence encoding the basal promoter/5' UTR comprises a portion of a nucleotide sequence encoding a full-length human *GJB2* gene 5' UTR. In some embodiments, the 5' UTR comprises at least 100 consecutive nucleotides, at least 200 consecutive nucleotides, at least 300 consecutive nucleotides, at least 400 consecutive nucleotides, at least 500 consecutive nucleotides, at least 600 consecutive nucleotides, at least 700 consecutive nucleotides, at least 800 consecutive nucleotides, at least 900 consecutive nucleotides, at least 1000 consecutive nucleotides, or more of a native full-length 5' UTR (*e.g.*, the *GJB2* 5' UTR). In some embodiments, the 5' UTR is a human *GJB2* gene exon 1 5' UTR. In some embodiments, the expression cassette comprises a nucleotide sequence encoding a basal promoter/5' UTR having at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to a nucleotide sequence encoding the basal promoter and about 300 bp of a human *GJB2* gene 5' UTR (*e.g.*, the human *GJB2* gene exon 1 5' UTR) (SEQ ID NO: 30). In some embodiments, an exemplary nucleotide sequence encoding the 300 bp of the human *GJB2* gene **basal promoter**/exon 1 5' UTR has a nucleotide sequence as set forth in SEQ ID NO: 30:

**GGGTTCGGGGCTTTCGGGGGCGGTTCGGGGGTTCGCGGACCCGGGAAGCTCTGAGGACCCAGA
GGCCGGGGCGCGCTCCGCCCCGCGCGCCGCCCCCTCCGTAACCTTCCCAGTCTCCGAGGGAAG
AGGCGGGGTGTGGGGTGCGGTTAAAAGGCGCCACGGCGGGAGACAGGTGTTGCGGCCCCGCA
GCGCCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCCTCGGCGGCGCCCGGCCAGGACCCGCC
TAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGACCCCGCCCCGGCCCCGCCG
CGCTTCCTCCCACGACAGAGCAAACCGCCCAGAGTAG**

[0086] In some embodiments, a nucleotide sequence encoding a basal promoter/5' UTR (*e.g.*, a human *GJB2* basal promoter/exon 1 5' UTR) within the expression cassette (*e.g.*, *GJB2* expression cassette) further comprises an intron or a portion thereof. In some embodiments, the expression cassette of the isolated nucleic acid (*e.g.*, *GJB2* expression cassette) further comprises a conserved sequence of intron 1 of the *GJB2* gene. In some embodiments, the nucleotide sequence encoding an intron (*e.g.*, human *GJB2* intron 1) has at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 54.

An exemplary nucleotide sequence encoding the conserved sequence of *GJB2* intron 1 is set forth in SEQ ID NO: 54:

AAGCAGGTGAGTTTGTGGTGTGCGCGATGTCCCTTCGGGGTACTCTAGCGCAGCCGCCTGGC
TACTTGACCCACTGCCACCAAACGTTTTAAATTCACCGAAAGCTTAGCTTCGAAGCAAAGCT
CCGTTTCGCCGGTGAAGCAGGAAGCCTTCGCTGCAGGAAGTACCTTTACCTCTTGAGCGG
CTTCTGCAGAAAAATCCCCGGGCAGAGATTTGGGCGGAGTTTGCCTAGAACTAACGCGGAGC
CAGCCGATCCCCGGCCTACCCGGGGCCAAGATTTTAAGGGGTGAAGAGTCCCTTTTGCCTTT
TCTGGATCCTGGTGATTACCTAGTGTCTTCCCTAAGGAAGTGAACCAACTCCTCCGCTGGC
CTCTGGCAGCCCTCCAGGCGGTGCAGGATGGCGTGGGCCCCGGTAGGAAGCTGCATGTAACCG
CCCAGGGTTCGGGAGGCCAGGAGGGCAGCTCCTCCTCTGACTTGAATATTGAAAACAAGAGGA
TGCTTTTAAAGAAAAAGAAGAAGGAGGATTCACTACCAGCTCTGAAGGGTGGAAAAGAGATGA
TTCATCCGGATTGTGGAGAGGGTGGAAATCTTGTTTAGGAGAGCGTTGGTTGTGGCAGGCAGG
GTGTAAGTATGAATCAGTGAAGACAATTCACATCCTGGGATGAAAAGAAGGCCATGGGCTCA
CAGGAGATTATCCACTGGCCTCTCCACATCCGCTTGCAGTAAGGAGTGTGGGACTCTCCCAA
GCTTCAGCGCTGAACTGCAATGCAGTGACGTCGCTTAAGA

[0087] In some embodiments, the nucleotide sequence encoding a basal promoter/5' UTR/intron has at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 31. An exemplary nucleotide sequence encoding human *GJB2* basal promoter/5'UTR/conserved sequence of intron 1 is set forth in SEQ ID NO: 31:

GGGTTTCGGGGCTTTTCGGGGGCGGTTCGGGGGTTTCGCGGACCCGGGAAGCTCTGAGGACCCAGA
GGCCGGGGCGCGCTCCGCCCCGCGGCGCCGCCCTTCGTAAGTTTCCAGTCTCCGAGGGAAG
AGGCGGGGTGTGGGGTTCGGTTAAAGAGCGCCACGGCGGGAGACAGGTGTTGCGGCCCGCA
GCGCCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCCTCGGCGGCGCCCGGCCAGGACCCGCC
TAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGACCCCGCCCCGGCCCCGCCG
CGCTTCTCTCCCGACGCAGAGCAAACCGCCAGAGTAGAAGCAGGTGAGTTTGTGGTGTGCGC
GATGTCCCTTCGGGGTACTCTAGCGCAGCCGCTGGCTACTTGACCCACTGCCACCAAACGT
TTTAAATTCACCGAAAGCTTAGCTTCGAAGCAAAGCTCCGTTTCGCCGGTGAAGCAGGAAGC
CTTCGCTGCAGGAAGTACCTTTACCTCTTGAGAGCGGCTTCTGCAGAAAAATCCCCGGGCAG
AGATTTGGGCGGAGTTTGCCTAGAACTAACGCGGAGCCAGCCGATCCCGGCCTACCCGGGG
CCAAGATTTTAAGGGGTGAAGAGTCCCTTTTGCCTTTTCTGGATCCTGGTGATTACCTAGT
GTCTTCCCTAAGGAAGTGAACCAACTCCTCCGCTGGCCTCTGGCAGCCCTCCAGGCGGTGCA
GGATGGCGTGGGCCCCGGTAGGAAGCTGCATGTAACCGCCAGGGTTCGGGAGGCCAGGAGGGC
AGCTCCTCCTCTGACTTGAATATTGAAAACAAGAGGATGCTTTTAAGAAAAAGAAGAAGGAG
GATTCACTACCAGCTCTGAAGGGTGGAAAAGAGATGATTCACTCCGGATTGTGGAGAGGGTGG
AATCTTGTTTAGGAGAGCGTTGGTTGTGGCAGGCAGGGTGTAACTATGAATCAGTGAAGACA
ATTCACATCCTGGGATGAAAAGAAGGCCATGGGCTCACAGGAGATTATCCACTGGCCTCTCC
ACATCCGCTTGCAGTAAGGAGTGTGGGACTCTCCAAGCTTCAGCGCTGAACTGCAATGCAG
TGACGTCGCTTAAGA

[0088] In some embodiments, the expression cassette (e.g., *GJB2* expression cassette) comprises a nucleotide sequence encoding a proximal promoter of the human *GJB2* gene. In

some embodiments, the proximal promoter of the human *GJB2* gene has at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to the nucleotide sequence set forth in SEQ ID NO: 102. In some embodiments, an exemplary nucleotide sequence encoding the human *GJB2* gene proximal promoter has a nucleotide sequence as set forth in SEQ ID NO: 102. In some embodiments, the expression cassette (*e.g.*, *GJB2* expression cassette) comprises SEQ ID NO: 102:

GACCTCGAAGGGGACTTGGGGGGTTTCGGGGCTTTTCGGGGGCGGTCGGGGGTTTCGCGGACCCG
GGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGCCGCCCTCCGT

[0089] In some embodiments, the expression cassette (*e.g.*, *GJB2* expression cassette) comprises a nucleotide sequence encoding a 5' UTR of the human *GJB2* gene. In some embodiments, the 5' UTR of the human *GJB2* gene has at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to the nucleotide sequence set forth in SEQ ID NO: 103 or CC. In some embodiments, an exemplary nucleotide sequence encoding the human *GJB2* gene 5' UTR has a nucleotide sequence as set forth in SEQ ID NO: 103 or CC. In some embodiments, an exemplary nucleotide sequence encoding the human *GJB2* gene 5' UTR has a nucleotide sequence comprising SEQ ID NO: 103 and SEQ ID NO: 104. In some embodiments, the expression cassette (*e.g.*, *GJB2* expression cassette) comprises SEQ ID NO: 103:

AACTTTCCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAGGCGCCACGGCG
GGAGACAGGTGTTGCGGCCCCGCAGCGCCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCCTCG
GCGGCGCCCGGCCAGGACCCGCCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCC
GAGACCCCCGCCCCGGCCCCGCGCGCTTCTCCCGACGCAG

[0090] In some embodiments, the expression cassette (*e.g.*, *GJB2* expression cassette) comprises SEQ ID NO: 104:

AGCAAACCGCCCAGAGTAGAAG

[0091] In some embodiments, the expression cassette (*e.g.*, *GJB2* expression cassette) comprises a nucleotide sequence encoding a proximal promoter and a 5' UTR of the human *GJB2* gene. In some embodiments, the proximal promoter and the 5' UTR of the human *GJB2* gene has at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to the nucleotide sequence set forth in SEQ ID NO: 105. In some embodiments, an exemplary nucleotide sequence encoding the human

GJB2 gene proximal promoter and 5' UTR has a nucleotide sequence as set forth in SEQ ID NO: 105. In some embodiments, the expression cassette (*e.g.*, *GJB2* expression cassette) comprises SEQ ID NO: 105:

```
GACCTCGAAGGGGACTTGGGGGGTTTCGGGGGCTTTCGGGGGCGGTTCGGGGGTTTCGCGGACCCG
GGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCCGCGCGCCGCCCCCTCCGTAAC
TTCACAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAAGGCGCCACGGCGGGAG
ACAGGTGTTGCGGCCCCGAGCGCCCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCCTCGGCGG
CGCCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGA
CCCCCGCCCCGGCCCCGCGCGCTTCTCCCGACGCAGAGCAAACCGCCCAGAGTAGAAG
```

[0092] An isolated nucleic acid described herein may also contain an artificial intron, desirably located between the promoter/enhancer sequence and the protein coding sequence (*e.g.*, nucleotide sequence encoding *GJB2* protein). In some embodiments, an intron is a synthetic or artificial (*e.g.*, heterologous) intron. Examples of synthetic introns include an intron sequence derived from SV-40 (referred to as the SV-40 T intron sequence) and intron sequences derived from chicken beta-actin gene. In some embodiments, a transgene described by the disclosure comprises one or more (1, 2, 3, 4, 5, or more) artificial introns. In some embodiments, the one or more artificial introns are positioned between a promoter and a nucleotide sequence encoding the *GJB2* protein.

[0093] In some embodiments, the expression cassette (*e.g.*, the *GJB2*) further comprises a nucleotide sequence encoding a 3' UTR located 3' of the nucleotide sequence encoding the *GJB2* protein. In some embodiments, the 3' UTR is a *GJB2* gene 3' UTR. In some embodiments, the 3' UTR is a *GJB2* gene exon 2 3' UTR. In some embodiments, the nucleotide sequence encoding the 3' UTR has at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 32. An exemplary nucleotide sequence encoding *GJB2* gene exon 2 3' UTR is set forth in SEQ ID NO: 32:

```
CGCATTGCCAGTTGTTAGATTAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCT
CAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACCTTAAATGCAACC
ATTTGAAACCCCTGTAGGCCTCAGGTGAACTCCAGATGCCACAATGGAGCTCTGCTCCCCCT
AAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTCTTTCACTTAAGTTAGTT
CCACTGAGACCCCAGGCTGTTAGGGGTATTGGTGTAAGGTACTTTCATATTTTAAACAGAG
GATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAGCCAGGTTCCACAGAGGACA
CAGAGAAGGTTTGGGTGTCCTCCTGGGGTTCTTTTTGCCAACTTTCCCCACGTTAAAGGTGA
ACATTGGTTCTTTCAATTGCTTTGGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTG
CCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATAGGTTATTTTGATG
TAAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGT
AAATGGTATGTCATTGCTACTATGATTTAATTTGAAATATGGTCTTTTGTTATGAATACT
```

TTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCATAGCACCTAACAAACATTG
 TAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAATGGCC
 TCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCAACTA
 CTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCAT
 CGGAAAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATG
 GGGAGGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAACAGATTTGGAAAGA
 CTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAGTTTGTGTTGCTTA
 CCCCTTCAGCCTCCAATTTTTTAAAGTGAATATAGCTAATAACATGTGAAAAGAATAGAAG
 CTAAGGTTTGTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTAT
 GCTTGACATGGTTTCCAAAAATGGTACTCCACATATTTTCACTGAGGGTAAGTATTTTCCTG
 TTGTCAAGAATAGCATTGTAAAAGCATTTTGTAAATAATAAGAATAGCTTTAATGATATGCT
 TGTAATAAAATAATTTTGTAAATGTATCAAATACATTTAAACATTAAATATAATCTCTAT
 AATAA

[0094] In some embodiments, the expression cassette of the isolated nucleic acid comprises a de-targeting agent that restricts or reduces the transgene expression (*e.g.*, *GJB2* expression) in a cell type (*e.g.*, hair cell or spiral ganglion neurons). In some embodiments, incorporation of one or more miRNA binding sites into an expression allows for de-targeting of transgene expression in a cell-type specific manner (*e.g.*, in hair cell or spiral ganglion neurons). In some embodiments, one or more miRNA binding sites are positioned in the 3' UTR (*e.g.*, *GJB2* exon 2 3' UTR of the expression cassette of the isolated nucleic acid).

[0095] In some embodiments, an expression cassette comprises one or more (*e.g.*, 1, 2, 3, 4, 5, or more) miRNA binding sites that de-target expression of *GJB2* from cells that do not normally express *GJB2* (*e.g.*, hair cell or spiral ganglion neurons). In some embodiments, the expression cassette of the isolated nucleic acid comprises one or more miR binding sites for detargeting neuron cells (*e.g.*, spiral ganglion neurons), *e.g.*, binding sites for neuron enriched miRs as described in Jovičić et al., Comprehensive Expression Analyses of Neural Cell-Type-Specific miRNAs Identify New Determinants of the Specification and Maintenance of Neuronal Phenotypes, *J Neurosci.* 2013 Mar 20; 33(12): 5127–5137, which is incorporated herein by reference. Non-limiting examples of neuron enriched miRs include miR-124, miR-127, miR-129, miR-129*, miR-136, miR-136*, miR-137, miR-154, miR-300-3p, miR-323, miR-329, miR-341, miR-369-5p, miR-376a, miR-376b-3p, miR-376c, miR-379, miR-382, miR-382*, miR-410, miR-411, miR-433, miR-434, miR-495, miR-541, miR-543*, miR-551b, miR-143, miR-449a, miR-219-2-3p, miR-126, miR-126*, miR-141, miR-142-3p, miR-142-5p, miR-146a, miR-150, miR-200c, or miR-223. In some embodiments, the expression cassette of the isolated nucleic acid comprises one or more miR binding sites for detargeting hair cells (*e.g.*, inner or outer hair cell), *e.g.*, binding sites for hair cell enriched miRs as described in Li et al., MicroRNAs in hair cell development and deafness, *Curr Opin*

Otolaryngol Head Neck Surg. 2010 Oct; 18(5): 459–465, which is incorporated herein by reference. Non-limiting examples of neuron enriched miRs include miR-96, miR-182, miR-183, miR-18a, or miR-99a. In some embodiments, the *GJB2* exon 2 3' UTR of the expression cassette comprises one or more miR binding sites for detargeting neuron cells and hair cells. In some embodiments, the *GJB2* exon 2 3' UTR of the expression cassette comprises one or more miR binding sites for miR-124.

[0096] Aspects of the disclosure relate to gene therapy vectors comprising an isolated nucleic acid as described herein. A gene therapy vector may be a viral vector (*e.g.*, a lentiviral vector, an adeno-associated virus vector, an adenoviral (Ad) vector, *etc.*), a plasmid, a closed-ended DNA (*e.g.*, ceDNA), a lipid/DNA nanoparticle, *etc.* In some embodiments, a gene therapy vector is a viral vector. In some embodiments, an expression cassette encoding a protein (*e.g.*, GJB2 protein) is flanked by one or more viral replication sequences, for example, lentiviral long terminal repeats (LTRs) or adeno-associated virus (AAV) inverted terminal repeats (ITRs).

[0097] The isolated nucleic acids of the disclosure may be recombinant adeno-associated virus (AAV) vectors (rAAV vectors). In some embodiments, an isolated nucleic acid as described by the disclosure comprises two adeno-associated virus (AAV) inverted terminal repeat (ITR) sequences, or variants thereof. The isolated nucleic acid (*e.g.*, the recombinant AAV vector) may be packaged into a capsid protein and administered to a subject and/or delivered to a selected target cell. "Recombinant AAV (rAAV) vectors" are typically composed of, at a minimum, an expression cassette (*e.g.*, expression cassette for *GJB2*), and 5' and 3' AAV inverted terminal repeats (ITRs). The isolated nucleic acids may also comprise a region encoding, for example, 5' and 3' untranslated regions (UTRs), and/or an expression control sequence (*e.g.*, a poly-A tail).

[0098] Generally, ITR sequences are about 145 bp in length. Preferably, substantially the entire sequence encoding the ITR is used in the isolated nucleic acid, although some degree of minor modification of these sequences is permissible. The ability to modify these ITR sequences is within the skill of one in the art. (See, *e.g.*, texts such as Sambrook et al., *Molecular Cloning. A Laboratory Manual*, 2d ed., Cold Spring Harbor Laboratory, New York (1989); and K. Fisher et al., *J Virol.*, 70:520 532 (1996)). An example of such a molecule employed in the present invention is an isolated nucleic acid comprising an expression cassette encoding a GJB2 protein, in which the expression cassette comprising the nucleotide sequences GJB2 protein and *GJB2* gene regulatory elements (GREs) are flanked by the 5' and 3' AAV ITR sequences. The AAV ITR sequences may be obtained from any

known AAV, including presently identified mammalian AAV types. In some embodiments, the isolated nucleic acid (*e.g.*, the rAAV vector) comprises at least one ITR having a serotype selected from AAV1, AAV2, AAV5, AAV6, AAV6.2, AAV7, AAV8, AAV9, AAV10, AAV11, and variants thereof. In some embodiments, the isolated nucleic acid comprises a region (*e.g.*, a first region) encoding an AAV2 ITR.

[0099] In some embodiments, the isolated nucleic acid further comprises a region (*e.g.*, a second region, a third region, a fourth region, *etc.*) comprising a second AAV ITR. In some embodiments, the second AAV ITR has a serotype selected from AAV1, AAV2, AAV5, AAV6, AAV6.2, AAV7, AAV8, AAV9, AAV10, AAV11, and variants thereof. In some embodiments, the second AAV ITR is an AAV2 ITR. In some embodiments, the second ITR is a mutant ITR that lacks a functional terminal resolution site (TRS). The term “lacking a terminal resolution site” can refer to an AAV ITR that comprises a mutation (*e.g.*, a sense mutation such as a non-synonymous mutation, or missense mutation) that abrogates the function of the terminal resolution site (TRS) of the ITR, or to a truncated AAV ITR that lacks a nucleic acid sequence encoding a functional TRS (*e.g.*, a Δ TRS ITR, or Δ ITR). Without wishing to be bound by any particular theory, an rAAV vector comprising an ITR lacking a functional TRS produces a self-complementary rAAV vector, for example, as described by McCarthy (2008) *Molecular Therapy* 16(10):1648-1656. In some embodiments, the isolated nucleic acid comprises a 5' AAV2 ITR and a 3' AAV2 ITR.

[00100] An exemplary 5' AAV2 ITR nucleotide sequence is set forth in SEQ ID NO: 34:

```
TTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTCGCCCCG
ACGCCCCGGGCTTTGCCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGAGAGGGAGTGGCCA
ACTCCATCACTAGGGGTTCTAGAT
```

[00101] An exemplary 5' ITR nucleotide sequence is set forth in SEQ ID NO: 106:

```
CTGCGCGCTCGCTCGCTCACTGAGGCCGCCGGGCAAAGCCCCGGGCGTCGGGCGACCTTTGG
TCGCCCCGGCCTCAGTGAGCGAGCGAGCGCGCAGAGAGGGAGTGGCCAACTCCATCACTAGGG
GTTCTT
```

[00102] exemplary 3' AAV2 ITR nucleotide sequence is set forth in SEQ ID NO: 35:

```
CCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGCCCG
GGCAAAGCCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGAGCGAGCGCGCA
GAGAGGGAGTGGCCA
```

[00103] An exemplary 3' ITR nucleotide sequence is set forth in SEQ ID NO: 107:

```
AGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCC
GGGCGACCAAAGGTCGCCCCAGCCCCGGGCTTTGCCCGGGCGGCCTCAGTGAGCGAGCGAGC
GCGCAG
```

[00104] In some embodiments, the isolated nucleic acid (*e.g.*, rAAV vector) described herein comprises a 5' ITR sequence having at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 34 or 106.

[00105] In some embodiments, the isolated nucleic acid (*e.g.*, rAAV vector) described herein comprises a 3' ITR sequence having at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 35 or 107.

[00106] In some embodiments, the isolated nucleic acid (*e.g.*, rAAV vector) described herein comprises a posttranscriptional response element. As used herein, the term “posttranscriptional response element” refers to a nucleic acid sequence that, when transcribed, adopts a tertiary structure that enhances expression of a gene. Examples of posttranscriptional regulatory elements include, but are not limited to, woodchuck hepatitis virus posttranscriptional regulatory element (WPRE), mouse RNA transport element (RTE), constitutive transport element (CTE) of the simian retrovirus type 1 (SRV-1), the CTE from the Mason-Pfizer monkey virus (MPMV), and the 5' untranslated region of the human heat shock protein 70 (Hsp70 5' UTR). In some embodiments, the isolated nucleic acid (*e.g.*, rAAV vector) comprises a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE).

[00107] In some embodiments, the isolated nucleic acid (*e.g.*, rAAV vector) described herein comprises a posttranscriptional response element having at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 108. An exemplary posttranscriptional response element is set forth in SEQ ID NO: 108:

```
GATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGC
TCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTA
TGGCTTTTCATTTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGG
CCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGCTGACGCAACCCCCACTGGTTG
GGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCA
CGGCGGAACCTCATCGCCGCTGCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACT
GACAATTCCGTGGTGTGTCGGGGAAATCATCGTCCTTTCTTGGCTGCTCGCCTGTGTTGC
CACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACC
TTCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAG
ACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGCATCGGACTAG
```

[00108] In some embodiments, the vector further comprises conventional control elements which are operably linked with elements of the GJB2 coding sequence in a manner that permits its transcription, translation, and/or expression in a cell transfected with the vector or infected with the virus produced by the disclosure. Expression control sequences include appropriate transcription initiation, termination; efficient RNA processing signals, such as splicing and polyadenylation (polyA) signals; sequences that stabilize cytoplasmic mRNA; sequences that enhance translation efficiency (*e.g.*, Kozak consensus sequence); sequences that enhance protein stability. A polyadenylation sequence generally is inserted following the coding sequences and optionally before a 3' AAV ITR sequence. A rAAV construct useful in the disclosure may also contain an intron, desirably located between the promoter/enhancer sequence and the transgene.

[00109] In some embodiments, the isolated nucleic acid (*e.g.*, rAAV vector) described herein comprises a polyadenylation signal sequence having at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 109. An exemplary polyadenylation signal sequence is set forth in SEQ ID NO: 109:

```
GTCGACTAGAGCTCGCTGATCAGCCTCGACTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTT
GCCCCCTCCCCCGTGCCTTCCTTGACCCTGGAAGGTGCCACTCCCACTGTCCTTTCCCTAATAA
AATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGGGGGTGGGGTGGG
GCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGA
```

[00110] In some embodiments, an AAV vector described herein comprises a GJB2 proximal promoter (*e.g.*, SEQ ID NO: 102), a GJB2 5' UTR (*e.g.*, SEQ ID NO: 103 and CC), a nucleotide sequence encoding a GJB2 gene product (*e.g.*, SEQ ID NO: 2), a GJB2 3' UTR (*e.g.*, SEQ ID NO: 32), a WPRE (*e.g.*, SEQ ID NO: 108), and a bovine growth hormone poly A signal (*e.g.*, SEQ ID NO: 109). In some embodiments, an AAV vector described herein comprises a nucleotide sequence having at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 110. An exemplary AAV vector sequence is set forth in SEQ ID NO: 110:

```
GACCTCGAAGGGGACTTGGGGGGTTTCGGGGCTTTTCGGGGCGGTCGGGGGTTTCGCGGACCCG
GGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCCGCGCGCCCGCCCCCTCCGTAACCT
TTCCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGCAGTTAAAAGGCGCCACGGCGGGAG
ACAGGTGTTGCGGCCCCCGCAGCGCCCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCCTCGGCGG
CGCCCCGCCCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGA
CCCCCGCCCCCGCCCCCGCGCGCTTCCTCCCGACGCAGAGCAAACCGCCCAGAGTAGAAGCG
GATCCGCCACCATGGATTGGGGCACGCTGCAGACGATCCTGGGGGGTGTGAACAAACACTCC
ACCAGCATTGGAAAGATCTGGCTCACCGTCCTCTTCATTTTTTCGCATTATGATCCTCGTTGT
```

GGCTGCAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACACCCTGCAGCCAG
GCTGCAAGAACGTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGCTATGGGCCCTG
CAGCTGATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCACGTGGCCTACCGGAGACA
TGAGAAGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAGTGAATTTAAGGACATCGAGGAGA
TCAAAACCCAGAAGGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAAGCAGCATCTTC
TTCCGGGTTCATCTTCGAAGCCGCTTCATGTACGTCTTCTATGTCTATGTACGACGGCTTCTC
CATGCAGCGGCTGGTGAAGTGCAACGCCCTGGCCTTGTCCCAACACTGTGGACTGCTTTGTGT
CCCGGCCACAGGAGAAGACTGTCTTCACAGTGTTTCATGATTGCAGTGTCTGGAATTTGCATC
CTGCTGAATGTCACTGAATTGTGTTATTTGCTAATTAGATATTGTTCTGGGAAGTCAAAAAA
GCCAGTTTACCACATACGATGTTCCAGATTACGCTTAAGGCGCGCCACCCCTGCAGGGAATTC
CGCATTGCCAGTTGTTAGATTAAGAAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCT
CAGCTGTCAAGGCTCAGTCGCTAGCATTTCACACACAAAGATTCTGACCTTAAATGCAACC
ATTTGAAACCCCTGTAGGCCTCAGGTGAACTCCAGATGCCACAATGGAGCTCTGCTCCCT
AAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTTCACTTAAAGTTAGTT
CCACTGAGACCCCAGGCTGTTAGGGGTATTGGTGTAAAGTACTTTTCATATTTTAAACAGAG
GATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCCACAGAGGACA
CAGAGAAGGTTTGGGTGTCTCCTGGGGTCTTTTTGCCAACTTTCCCCACGTTAAAGGTGA
ACATTGGTTCTTTCAATTTGCTTTGGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTG
CCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATAGGTTATTTTGATG
TAAAGATGTTCTGGATACCATTATATGTTCCCTGTTTCAGAGGCTCAGATTGTAATATGT
AAATGGTATGTCATTGCTACTATGATTTAATTTGAAATATGGTCTTTTGGTTATGAATACT
TTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTCTATTGTGGTCATAGCACCTAACACATTG
TAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAAATGGCC
TCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCACTA
CTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCAT
CGGAAAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATG
GGGAGGACAAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAACAGATTTGGAAAGA
CTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAGTTTGTGTTGCTTA
CCCCTTCAGCCTCCAATTTTTTAAAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAG
CTAAGGTTTATAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTAT
GCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTCACTGAGGGTAAGTATTTTCTG
TTGTCAAGAATAGCATTGTAAAAGCATTTTGTAATAATAAAGAATAGCTTTAATGATATGCT
TGTAATAAAAAAATTTTGTAAATGTATCAAATACATTTAAAAACATTAAAAATATAATCTCTAT
AATAATTTAAAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGATGATAATC
AACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTT
ACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTT
CATTTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTG
TCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATT
GCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGA
ACTCATCGCCGCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATT
CCGTGGTGTGTCGGGGAAATCATCGTCCTTTTCTTGGCTGCTCGCCTGTGTTGCCACCTGG
ATTCTGCGCGGGACGTCCTTCTGCTACGTCCTTTCGGCCCTCAATCCAGCGGACCTTCCTTC
CCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTC
GGATCTCCCTTTGGGCGCCTCCCCGCATCGGACTAGGAATTCATCGATACCGAGCGCTGCT
CGAGAGATCTGTGATAGCGGCCATCAAGCTGGGTGCACTAGAGCTCGCTGATCAGCCTCGAC
TGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCCTTGACCCTGG
AAGGTGCCACTCCCACTGTCCTTTCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGT
AGGTGTCAATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGA
CAATAGCAGGCATGCTGGGGA

[00111] In some embodiments, an AAV vector described herein comprises a 5' ITR (*e.g.*, SEQ ID NO: 106), a GJB2 proximal promoter (*e.g.*, SEQ ID NO: 102), a GJB2 5' UTR (*e.g.*, SEQ ID NO: 103 and CC), a nucleotide sequence encoding a GJB2 gene product (*e.g.*, SEQ ID NO: 2), a GJB2 3' UTR (*e.g.*, SEQ ID NO: 32), a WPRE (*e.g.*, SEQ ID NO: 108), a bovine growth hormone poly A signal (*e.g.*, SEQ ID NO: 109), and a 3' ITR (*e.g.*, SEQ ID NO: 107). In some embodiments, an AAV vector described herein comprises a nucleotide sequence having at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 111. An exemplary AAV vector sequence is set forth in SEQ ID NO: 111:

```
CTGCGCGCTCGCTCGCTCACTGAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGG
TCGCCCCGGCCTCAGTGAGCGAGCGAGCGCGCAGAGAGGGAGTGCCAACTCCATCACTAGGG
GTTCTTTGTAGTTAATGATTAACCCGCCATGCTACTTATCTACCAGGGTAATGGGGATCCTC
TAGAACGCGTTTAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTTCGGGGGCGGT
CGGGGGTTCGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCCGCGGC
GCCGCCCCCTCCGTAACTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGCAGTTAA
AAGGCGCCACGCGGGGAGACAGGTGTTGCGGCCCCGCGAGCGCCGCGCGCTCCTCTCCCCGA
CTCGGAGCCCCCTCGGCGGCGCCCCGGCCAGGACCCGCCTAGGAGCGCAGGAGCCCCAGCGCA
GAGACCCCAACGCCGAGACCCCCGCCCCGGCCCCGCGCGCTTCTCTCCGACGCAGAGCAAA
CCGCCCAGAGTAGAAGCGGATCCGCCACCATGGATTGGGGCACGCTGCAGACGATCCTGGGG
GGTGTGAACAAACACTCCACCAGCATTGGAAAGATCTGGCTCACCCTCTCTCATTTTTTCG
CATTATGATCCTCGTTGTGGCTGCAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCT
GCAACACCCTGCAGCCAGGCTGCAAGAACGTGTGCTACGATCACTACTTCCCCATCTCCAC
ATCCGGCTATGGGCCCTGCAGCTGATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCA
CGTGGCCTACCGGAGACATGAGAAGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAGTGAAT
TTAAGACATCGAGGAGATCAAAACCCAGAAGTCCGCATCGAAGGCTCCCTGTGGTGGACC
TACACAAGCAGCATCTTCTTCCGGGTCATCTTCAAGCCGCCTTCATGTACGTCTTCTATGT
CATGTACGACGGCTTCTCCATGCGAGCGGCTGGTGAAGTGCAACGCCTGGCCTTGTCCCAACA
CTGTGGAGTGCTTTGTGTCCCGGCCACGGAAGACTGTCTTCACAGTGTTTCATGATTGCA
GTGTCTGGAATTTGCATCCTGCTGAATGTCACTGAATTGTGTTATTTGCTAATTAGATATTG
TTCTGGGAAGTCAAAAAGCCAGTTTACCCATACGATGTTCCAGATTACGCTTAAGGCGCGC
CACCCTGCAGGGAATTCGCAATTGCCAGTTGTTAGATTAAGAAATAGACAGCATGAGAGG
GATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCTAACACAAAGATT
CTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAACTCCAGATGCCACA
ATGGAGCTCTGCTCCCCCTAAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTT
CTTTCACCTTAAGTTAGTTCCACTGAGACCCAGGCTGTTAGGGTTATTGGTGTAAAGTACT
TTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTCTCTGAGGACAAGAGAAAAAAGC
CAGGTTCCACAGAGGACACAGAGAAGTTTGGGTGTCTCCTGCGGGTCTTTTTTGCCAACCTT
TCCCCACGTTAAAGGTGAACATTGGTTCTTTCAATTTGCTTTGGAAGTTTTAATCTCTAACAG
TGGACAAAGTTACCAGTGCTTAAACTCTGTTACACTTTTTGGAAGTGAAACTTTGTAGTA
TGATAGGTTATTTTGTATGTAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAG
GCTCAGATTGTAATATGTAATGGTATGTCAATTCGCTACTATGATTTAATTTGAAATATGGT
CTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTCAATTGTGGTCA
TAGCACCTAACACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGC
TTATGATAGCAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGAC
TGGATGTACCACCACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCAT
```

GACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTG
 ACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCGTTA
 AAAACAGATTTGGAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTT
 CAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAGTGAAAATATAGCTAATAAC
 ATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAA
 CCTGAATATTGCCATTATGCTTGACATGGTTTTCCAAAAAATGGTACTCCACATATTTTCAGTG
 AGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTGTAATAATAAGAA
 TAGCTTTAATGATATGCTTGTAATAAATAATTTTGTAAATGTATCAAATACATTTAAAACA
 TTAATAATAATCTCTATAATAATTTAAAATCTAATATGGTTTTAATAGAACAGCGATATCA
 AGCTTATCGATGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTT
 AACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTAT
 TGCTTCCCGTATGGCTTTTCAATTTCTCCTCTGTATAAATCCTGGTTGCTGTCTCTTTATG
 AGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGCTGACGCAACC
 CCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCT
 CCCTATTGCCACGGCGGAACCTCATCGCCGCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGC
 GTTGGGGCACTGACAATTCGTTGGTGTGTCGGGGAAATCATCGTCCTTTCTTGGCTGCTC
 GCCTGTGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCTTTCGGCCCTCAA
 TCCAGCGGACCTTCCTTCCCGCGGCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCC
 TTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGCATCGGACTAGGAATTCA
 TCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGGTGCGACTAGAGC
 TCGCTGATCAGCCTCGACTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGCCCCCTCCCCCG
 TGCCTTCCCTTGACCCTGGAAGGTGCCACTCCCACTGTCTTTTCCCTAATAAAATGAGGAAATT
 GCATCGCATTGTCTGAGTAGGTGTCAATCTATTCTGGGGGTGGGGTGGGGCAGGACAGCAA
 GGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCGCG
 GTACCAAACCTAGGTAATACCCATTACCCTGGTAGATAAGTAGCATGGCGGGTTAATCATTAA
 ACTACAAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACT
 GAGGCCGGGCGACCAAAGGTCGCCCCGACGCCCGGGCTTTGCCCGGGCGGCCTCAGTGAGCGA
 GCGAGCGCGCAG

[00112] In some embodiments, an AAV vector described herein comprises 5' ITR, a *GJB2* basal promoter, a 5' UTR (e.g., *GJB2* exon 1 5' UTR), Kozak sequence, nucleotide sequence encoding a gene product (e.g., *GJB2* or GFP), an optional HA tag, a 3' UTR (e.g., *GJB2* exon 2 3' UTR), a WPRE, a bovine growth hormone poly A signal, and a 3' ITR (e.g., vector c70). In some embodiments, an AAV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 36. An exemplary nucleotide sequence for vector c70 encoding a mouse *GJB2* protein with an HA tag is set forth in SEQ ID NO: 36 (mouse *GJB2* coding sequence in boldface; HA tag underlined):

TTGCTGGCCTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACTGAGGCCG
 CCCGGGCAAAGCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGTGAGCGAGCGAGCG
 CGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTGCGGCCGCACGCGTTTAATTAA
 GACCTCGAAGGGGACTTGGGGGGTTTCGGGGCTTTTCGGGGCGGTGCGGGGTTTCGCGGACCCG
 GGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGCCGCCCTCCGTAACCT
 TTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAAGGCGCCACGGCGGGAG

ACAGGTGTTGCGGCCCCGCAGCGCCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCCTCGGCGG
CGCCCCGCCCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGA
CCCCCGCCCCGGCCCCGCGCGCTTCTCCCGACGCAGAGCAAACCGCCCAGAGTAGAAGCG
GATCCGCCACC**ATGGATTGGGGCACACTCCAGAGCATCCTCGGGGGTGTCAACAAACACTCC**
ACCAGCATTGGAAAGATCTGGCTCACGGTCCTCTTCATCTTCCGCATCATGATCCTCGTGGT
GGCTGCAAAGGAGGTGTGGGGAGATGAGCAAGCCGATTTTGTCTGCAACACGCTCCAGCCTG
GCTGCAAGAATGTATGCTACGACCACCCTTCCCCATCTCTCACATCCGGCTCTGGGCTCTG
CAGCTGATCATGGTGTCCACGCCAGCCCTCCTGGTAGCTATGCATGTGGCCTACCGGAGACA
TGAAAAGAAACGGAAGTTCATGAAGGGAGAGATAAAGAACGAGTTTAAGGACATCGAAGAGA
TCAAAACCCAGAAGGTCCGTATCGAAGGGTCCCTGTGGTGGACCTACACCACCAGCATCTTC
TTCCGGGTCTCTTTGAAGCCGTCTTCATGTACGTCTTTTACATCATGTACAATGGCTTCTT
CATGCAACGTCTGGTGAATGCAACGCTTGGCCCTGCCCCAATACAGTGGACTGCTTCATTT
CCAGGCCCCACAGAAAAGACTGTCTTCACCGTGTTTATGATTTCTGTGTCTGGAATTTGCATT
CTGCTAAATATCACAGAGCTGTGCTATTTGTTTCGTTAGGTATTGCTCAGGAAAGTCCAAAAG
ACCAGTCTACCCATACGATGTTCCAGATTACGCTTAAGGCGCGCCACCCCTGCAGGGAATTC
CGCATTGCCCAGTTGTTAGATTAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCT
CAGCTGTCAAGGCTCAGTCGCTAGCATTCCCAACACAAAGATTCTGACCTTAAATGCAACC
ATTTGAAACCCCTGTAGGCCTCAGGTGAACTCCAGATGCCACAATGGAGCTCTGCTCCCCCT
AAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTTCACTTAAAGTTAGTT
CCACTGAGACCCCAGGCTGTTAGGGGTATTGGTGTAAAGTACTTTTCATATTTTAAACAGAG
GATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCCACAGAGGACA
CAGAGAAGGTTTGGGTGTCTCCTGCGGTCTTTTGGCCAACTTTCCCCACGTTAAAGGTGA
ACATTGGTTCTTTCACTTTGCTTTGGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTG
CCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATAGGTTATTTTGATG
TAAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGT
AAATGGTATGTCATTGCTACTATGATTTAATTTGAAATATGGTCTTTTGTTATGAATACT
TTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTCTATTGTGGTCATAGCACCTAACAACTTG
TAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAAATGGCC
TCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCACTA
CTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCAT
CGGAAAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATG
GGGAGGACAAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAACAGATTTGGAAAGA
CTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAGTTTGTGTTGCTTA
CCCCTTCAGCCTCCAATTTTTTAAAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAG
CTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTAT
GCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTTCAGTGAGGGTAAGTATTTTCTG
TTGTCAAGAATAGCATTGTAAAAGCATTTTGTAAATAATAAAGAATAGCTTTAATGATATGCT
TGTAATAAAAAATAATTTTGTAAATGTATCAAATACATTTAAAAACATTAAATATAATCTCTAT
AATAATTTAAAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAAC
CTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACG
CTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCAT
TTTCTCCTCCTTGATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCA
GGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTGCC
ACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACT
CATCGCCGCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCGG
TGGTGTGTGTCGGGGAATCATCGTCCTTTCCCTTGGCTGCTCGCCTATGTTGCCACCTGGATT
CTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCTTCCCG
CGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCTTCGCCCTCAGACGAGTCGGA
TCTCCCTTTGGGCCGCTCCCCGCGAATTCATCGATACCGAGCGCTGCTCGAGAGATCTGTG
ATAGCGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCC
CGTGCCTTCCCTTGACCCTGGAAGGTGCCACTCCCACTGTCTTTCCTAATAAAATGAGGAAA

TTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAGC
AAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCG
CAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGC
CGGGCGACCAAAGGTCGCCCCGACGCCCGGGCTTTGCCCGGGCGGCCTCAGTGAGCGAGCGAG
CGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATT
TCACACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAGCGCGGCG
GGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTT
CGCTTTCTTCCCTTCCCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGG
GGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAACTTGATTTG
GGTGATGGTTTACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGA
GTCCACGTTCTTTAATAGTGGACTCTTGTTCCAACTGGAACAACACTCAACCCTATCTCGG
GCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCTG
ATTTAACAAAAATTTAACGCGAATTTTAACAAAATATTAACGTTTACAATTTTATGGTGCAC
TCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCG
CTGACGCGCCCTGACGGGCTTGCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTC
TCCGGGAGCTGCATGTGTGAGAGGTTTTACCGCTCATCACCGAAACGCGCGAGACGAAAGGG
CCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTTTCTTAGACGTCAG
GTGGCACTTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTTCTAAATACATTCA
AATATGTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAA
GAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTTTCGGGCATTTTGCCTTC
CTGTTTTTGTCTACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCA
CGAGTGGGTTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCGGA
AGAAGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTA
TTGACGCCGGGCAAGAGCAACTCGGTGCGCGCATACACTATTCTCAGAATGACTTGGTTGAG
TACTCACCGAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGC
TGCCATAACCATGAGTGATAACACTGCGGCCAATTACTTCTGACAACGATCGGAGGACCGA
AGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACTCGCCTTGATCGTTGGGAA
CCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCACGATGCCTGTAGCAATGGC
AACAACGTTGCGCAAACATTTAACTGGCGAACTACTTACTCTAGCTTCCCGGCAACAATTA
TAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCGCTCGGCCCTTCCGGCTGGC
TGGTTTTATTGTGATAAATCTGGAGCCGGTGAGCGTGGGTCTCGCGGTATCATTGCAGCACT
GGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACGACGGGGAGTCAGGCAACTA
TGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACTGATTAAGCATTGGTAACTG
TCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAACTTCATTTTTTAATTTAAAAG
GATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAAATCCCTTAACGTGAGTTTTCTG
TCCACTGAGCGTCAGACCCCGTAGAAAAAGATCAAAGGATCTTCTTGAGATCCTTTTTTTCTG
CGCGTAATCTGCTGCTTGCAACAAAAAAACCACCGCTACCAGCGGTGGTTTTGTTTGGCGGA
TCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGCAGAGCGCAGATACCAAATA
CTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAACTCTGTAGCACCGCCTACA
TACCTCGCTCTGCTAATCCTGTTACCAAGTGGCTGCTGCCAGTGGCGATAAGTCGTGTCTTAC
CGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGGTGCGGCTGAACGGGGGGTT
CGTGACACAGCCCAGCTTGAGAGCGAACGACCTACACCGAACTGAGATACCTACAGCGTGAG
CTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACAGGTATCCGGTAAGCGGCAG
GGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGAAACGCCTGGTATCTTTATAGTC
CTGTGCGGTTTTCGCCACCTCTGACTTGAGCGTCGATTTTTTGATGCTCGTCAGGGGGGCGG
AGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCTTGGCCTT

[00113] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at

least 99%, or 100% sequence identity to SEQ ID NO: 61. An exemplary nucleotide sequence for vector c70 encoding a human GJB2 protein with an HA tag is set forth in SEQ ID NO: 61 (human GJB2 coding sequence in boldface; HA tag underlined):

TTGCTGGCCTTTTGTCTACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACTGAGGCCG
CCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGTGAGCGAGCGAGCG
CGCAGAGAGGGAGTGGCCAACTCCATCACTAGGGGTTCTGCGGCCGCACGCGTTTAATTAA
GACCTCGAAGGGGACTTGGGGGGTTTCGGGGCTTTTCGGGGGCGTTCGGGGGTTTCGCGGACCCG
GGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCCGCGCGCCGCCCCCTCCGTAACCT
TTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGCGTTAAAAGGCGCCACGGCGGGAG
ACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCTCTCCCCGACTCGGAGCCCCCTCGGCGG
CGCCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGA
CCCCCGCCCCGGCCCCGCGCTTCTCCCGACGCAGAGCAAACCGCCAGAGTAGAAGCG
GATCCGCCACC**ATGGATTGGGGCACGCTGCAGACGATCCTGGGGGGTGTGAACAAACACTCC**
ACCAGCATTGGAAAGATCTGGCTCACCGTCCTCTTCATTTTTTCGCATTATGATCCTCGTTGT
GGCTGCAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACACCCTGCAGCCAG
GCTGCAAGAACGTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGCTATGGGCCCTG
CAGCTGATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCACGTGGCCTACCGGAGACA
TGAGAAGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAGTGAATTTAAGGACATCGAGGAGA
TCAAAACCCAGAAGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAAGCAGCATCTTC
TTCCGGGTCACTTTCGAAGCCGCTTCATGTACGTCTTCTATGTATGTACGACGGCTTCTC
CATGCAGCGGCTGGTGAAGTGAACGCTGGCCTTGTCCCAACACTGTGGACTGCTTTGTGT
CCCGGCCACGGAGAAGACTGTCTTCACAGTGTTTCATGATTGCAGTGTCTGGAATTTGCATC
CTGCTGAATGTCACTGAATTGTGTTATTTGCTAATTAGATATTGTTCTGGGAAGTCAAAAAA
GCCAGTTTACCCATACGATGTTCCAGATTACGCTTAAGGCGCGCCACCCCTGCAGGGAATTC
CGCATTGCCAGTTGTTAGATTAAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCT
CAGCTGTCAAGGCTCAGTCGCTAGCATTCCCAACACAAAGATTCTGACCTTAAATGCAACC
ATTTGAAACCCCTGTAGGCCTCAGGTGAACTCCAGATGCCACAATGGAGCTCTGCTCCCT
AAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTCTTTCACTTAAGTTAGTT
CCACTGAGACCCCAGGCTGTTAGGGGTATTGGTGTAAAGGTACTTTCATATTTTAAACAGAG
GATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCCACAGAGGACA
CAGAGAAGGTTTGGGTGTCTCCTGGGGTCTTTTTGCCAACTTTCCCCACGTTAAAGGTGA
ACATTGGTTCTTTCACTTTGCTTTGGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTG
CCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATAGGTTATTTTGATG
TAAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGT
AAATGGTATGTCATTGCTACTATGATTTAATTTGAAATATGGTCTTTTGTTATGAATACT
TTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTCACTGTGGTCATAGCACCTAACCAACATTG
TAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAAATGGCC
TCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCAACTA
CTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCAT
CGGAAAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATG
GGGAGGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCGTTAAAAACAGATTTGGAAAGA
CTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAGTTTGTGTTGCTTA
CCCCTTCAGCCTCCAATTTTTTAAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAG
CTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTAT
GCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTCACTGAGGGTAAGTATTTTCTG
TTGTCAAGAATAGCATTGTAAAAGCATTTTGTAAATAATAAAGAATAGCTTTAATGATATGCT
TGTAATAAAATAATTTTGTAAATGTATCAAATACATTTAAACATTAAATATAATCTCTAT
AATAATTTAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAAC
CTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACATATGTTGCTCCTTTTACG

CTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCAT
TTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCA
GGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTGCC
ACCACCTGTGAGTCTCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACT
CATCGCCGCTGCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCG
TGGTGTGTGCGGGGAAATCATCGTCTTTCCCTTGGCTGCTCGCCTATGTTGCCACCTGGATT
CTGCGCGGGACGTCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCTTTCCCG
CGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTTCGCTTCGCCCTCAGACGAGTCGGA
TCTCCCTTTGGGCCGCTCCCCGGAATTCATCGATACCGAGCGCTGCTCGAGAGATCTGTG
ATAGCGGCCATCAAGCTGGCTGTGCCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCC
CGTGCCTTCTTGACCCTGGAAGGTGCCACTCCCACTGTCTTTCCCTAATAAAATGAGGAAA
TTGCATCGCATTGTCTGAGTAGGTGTCACTTCTATTCTGGGGGTGGGGTGGGGCAGGACAGC
AAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCG
CAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGC
CGGGCGACCAAAGGTGCCCCGACGCCCGGGCTTTGCCCGGGCGGCCTCAGTGAGCGAGCGAG
CGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATT
TCACACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAGCGCGGCG
GGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTT
CGCTTTCTTCCCTTCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGG
GGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAACTTGATTG
GGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGA
GTCCACGTTCTTTAATAGTGGACTCTTGTTCCAACTGGAACAACACTCAACCTATCTCGG
GCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCTG
ATTTAACAAAAATTTAACGCGAATTTTAACAAAATATTAACGTTTACAATTTTATGGTGCAC
TCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCG
CTGACGCGCCCTGACGGGCTTGCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTC
TCCGGGAGCTGCATGTGTGAGAGGTTTTACCGTTCATCACCGAAACGCGCGAGACGAAAGGG
CCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTTTCTTAGACGTCAG
GTGGCACTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTTCTAAATACATTCA
AATATGTATCCGCTCATGAGACAATAACCTGATAAATGCTTCAATAATATTGAAAAAGGAA
GAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTTTCGGGCATTTTGCCTTC
CTGTTTTTGCTCACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCA
CGAGTGGGTTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCGGA
AGAAGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTA
TTGACGCCGGGCAAGAGCAACTCGGTGCGCGCATACACTATTCTCAGAATGACTTGGTTGAG
TACTCACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGC
TGCCATAACCATGAGTGATAAACAATGCGGCCAACTTACTTCTGACAACGATCGGAGGACCGA
AGGAGCTAACCGCTTTTTTGACAACATGGGGGATCATGTAACTCGCCTTGATCGTTGGGAA
CCGGAGCTGAATGAAGCCATAACAAACGACGAGCGTGACACCACGATGCCTGTAGCAATGGC
AACAACGTTGCGCAAATATTAACCTGGCGAACTACTTACTCTAGCTTCCCGGCAACAATTA
TAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCGCTCGGCCCTTCCGGCTGGC
TGGTTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTCGCGGTATCATTGCAGCACT
GGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACGACGGGGAGTCAGGCAACTA
TGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACTGATTAAGCATTGGTAACTG
TCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAACTTCATTTTTAATTTAAAAG
GATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATCCCTTAACGTGAGTTTTCTG
TCCACTGAGCGTCAGACCCCGTAGAAAAAGATCAAAGGATCTTCTTGAGATCCTTTTTTTCTG
CGCGTAATCTGCTGCTTGCAAACAAAAAAACCACCGCTACCAGCGGTGGTTTTGTTTGGCGGA
TCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGCTTCAGCAGAGCGCAGATACCAATA
CTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAACTCTGTAGCACCGCCTACA
TACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTGGCGATAAGTCGTGTCTTAC

CGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGGTTCGGGCTGAACGGGGGGTT
CGTGACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACTGAGATACCTACAGCGTGAG
CTATGAGAAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACAGGTATCCGGTAAGCGGCAG
GGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGAAACGCCTGGTATCTTTATAGTC
CTGTGCGGTTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTGATGCTCGTCAGGGGGGCGG
AGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCCTGGCCTT

[00114] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 62. An exemplary nucleotide sequence for vector c70 encoding a mouse GJB2 protein with an HA tag is set forth in SEQ ID NO: 62 (mouse GJB2 coding sequence in boldface; no HA tag):

CAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACGACGGGGAGTCAG
GCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACTGATTAAGCATTG
GTAAGTGTGACACCAAGTTTACTCATATATACTTTAGATTGATTTAAACTTCATTTTTAAT
TTAAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAATCCCTTAACGTGAG
TTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTCTTGAGATCCTTT
TTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAGCGGTGGTTTGT
TGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGCAGAGCGCAGATA
CCAAATACTGTCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAACTCTGTAGCACC
GCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTGGCGATAAGTCGT
GTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGGTTCGGGCTGAACG
GGGGGTTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACTGAGATACCTACA
GCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACAGGTATCCGGTAA
GCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGAAACGCCTGGTATCTT
TATAGTCCTGTGCGGTTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTGATGCTCGTCAGG
GGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCCTGGCCTTTTGT
GGCCTTTTTGCTCACATGTCTGTCAGGCAGCTGCGCGCTCGCTCGCTCACTGAGGCCGCCCGG
GCAAAGCCCGGGCGTTCGGGCGACCTTTGGTTCGCCCGGCCTCAGTGAGCGAGCGAGCGCGCAG
AGAGGGAGTGGCCAACTCCATCACTAGGGGTTTCTGCGGCCGCACGCGTTTAATTAAGACCT
CGAAGGGGACTTGGGGGGTTTCGGGGGCGGTTCGGGGGTTTCGCGGACCCGGGAAG
CTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGCCGCCCTCCGTAACCTTTCCC
AGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAAGGCGCCACGGCGGGAGACAGG
TGTTGCGGCCCCGACGCGCCCGCGCTCCTCTCCCGACTCGGAGCCCTCGGCGGGCGCCC
GGCCCAGGACCCGCCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGACCCCC
GCCCCGGCCCCGCGCGCTTCTCTCCCGACGACAGCAAACCGCCAGAGTAGAAGCGGATCC
GCCACC**ATGGATTGGGGCACACTCCAGAGCATCCTCGGGGGTGTCACAAACACTCCACCAG**
CATTGGAAAGATCTGGCTCACGGTCTCTTCATCTTCCGCATCATGATCCTCGTGGTGGCTG
CAAAGGAGGTGTGGGGAGATGAGCAAGCCGATTTTGTCTGCAACACGCTCCAGCCTGGCTGC
AAGAATGTATGCTACGACCACCACTTCCCCATCTCTCACATCCGGCTCTGGGCTCTGCAGCT
GATCATGGTGTCCACGCCAGCCCTCCTGGTAGCTATGCATGTGGCCTACCGGAGACATGAAA
AGAAACGGAAGTTCATGAAGGGAGAGATAAAGAACGAGTTTAAGGACATCGAAGAGATCAAA
ACCCAGAAGGTCCGTATCGAAGGGTCCCTGTGGTGGACCTACACCACCAGCATCTTCTTCCG
GGTCATCTTTGAAGCCGTCTTCATGTACGTCTTTTACATCATGTACAATGGCTTCTTCATGC
AACGTCTGGTGAAATGCAACGCTTGGCCCTGCCCAATACAGTGGACTGCTTCATTTCCAGG
CCCACAGAAAAGACTGTCTTACCGTGTATGATTTCTGTGTCTGGAATTTGCATTCTGCT

AAATATCACAGAGCTGTGCTATTTGTTTCGTTAGGTATTGCTCAGGAAAGTCCAAAAGACCAG
TCTAAGGCGCGCCACCCCTGCAGGGAATTCGCGATTGCCAGTTGTTAGATTAAGAAATAGA
CAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTC
AACACAAAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAACT
CCAGATGCCACAATGGAGCTCTGCTCCCCTAAAGCCTCAAAACAAAGGCCTAATTCTATGCC
TGTCTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCCAGGCTGTTAGGGGTTATTG
GTGTAAGGTACTTTTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACA
AGAGAAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCCTGGGGTTCT
TTTTGCCAACTTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCATTTGCTTTGGAAGTTTT
AATCTCTAACAGTGAGCAAAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGAA
AACTTTGTAGTATGATAGGTTATTTTGATGTAAAGATGTTCTGGATACCATTATATGTTCCC
CCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTGCTACTATGATTTAAT
TTGAAATATGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTAT
TCATTGTGGTCATAGCACCTAACAAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTT
CCTAGTGATGGCTTATGATAGCAAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTA
AGAAATACAGACTGGATGTACCACCACTACTACCTGTAATGACAGGCCTGTCCAACACATC
TCCCTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTGCGTTG
GGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAAATGGGGCAGGGGAGGGAGAAG
TTTCTGTGCTTAAAAACAGATTTGAAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAG
CTTTGTCTACTTCAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAGTGAAAAT
ATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTAT
AGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCCA
CATATTTTCAGTGAGGGTAAGTATTTTCCCTGTTGTCAAGAATAGCATTGTAAAAGCATTGTG
AATAATAAAGAATAGCTTTAATGATATGCTTGTAATAAATAAATTTTGTAAATGTATCAAAT
ACATTTAAACATTAAATATAATCTCTATAATAATTTAAATCTAATATGGTTTAAATAGA
ACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACT
GGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTA
TCATGCTATTGCTTCCCGTATGGCTTTCATTTTCTCCTCCTGTATAAATCCTGGTTGCTGT
CTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTGCT
GACGCAACCCCCACTGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGC
TTTCCCCCTCCCTATTGCCACGGCGGAACATCGCCGCTGCCTTGCCCGCTGCTGGACAG
GGGCTCGGCTGTTGGGCACTGACAATCCGTTGGTGTGTCGGGGAAATCATCGTCCCTTCCT
TGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCTTC
GGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCTGCTGCCGGCTCTGCGGCTCTTCGCG
GTCTTCGCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCGCGGAATTCAT
CGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTGTGCCTTCTAG
TTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCCTTGACCCTGGAAGGTGCCACTC
CCACTGTCTTTTCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCT
ATTCTGGGGGTGGGGTGGGGCAGGACAGCAAGGGGAGGATTGGGAAGACAATAGCAGGCA
TGCTGGGGACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCC
CTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTGCCCCGACGCCCGGGCT
TTGCCCGGGCGGCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGG
TATTTTCTCCTTACGCATCTGTGCGGTATTTACACCGCATACGTCAAAGCAACCATAGTAC
GCGCCCTGTAGCGGCGCATTAAAGCGCGGGGTGTGGTGGTTACGCGCAGCGTGACCGCTAC
ACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCCTTTCTCGCCACGTTTCG
CCGGCTTTTCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTA
CGGCACCTCGACCCCAAAAACTTGATTTGGGTGATGGTTACGTTAGTGGGCCATCGCCCTG
ATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCC
AACTGGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAGGGATTTTGCCG
ATTTGCGCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACAA
AATATTAACGTTTACAATTTTATGGTGCCTCTCAGTACAATCTGCTCTGATGCCGCATAGT

TAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCG
GCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTGAGAGGTTTTACCC
GTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATG
TCATGATAATAATGGTTTTCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAACC
CCTATTTGTTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCCTG
ATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTCGCCC
TTATTTCCCTTTTTTGCGGCATTTTGCCTTCCTGTTTTTGTCTACCCAGAAACGCTGGTGAAA
GTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTTACATCGAACTGGATCTCAACAG
CGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAACGTTTTCCAATGATGAGCACTTTTAAAG
TTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCGC
ATACACTATTCTCAGAATGACTTGGTTGAGTACTCACCAGTCACAGAAAAGCATCTTACGGA
TGGCATGACAGTAAGAGAATTATGCAGTGTGCCATAACCATGAGTGATAACACTGCGGCCA
ACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCCTTTTTTGACAACATGGGG
GATCATGTAACTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATAACAAACGACGA
GCGTGACACCACGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAAGTGGCGAAC
TACTTACTCTAGCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGA
CCACTTCTGCGCTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGA
CGGTGGGTCTCGCGGTATCATTG

[00115] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 63. An exemplary nucleotide sequence for vector c70 encoding a mouse GJB2 protein with a HA tag is set forth in SEQ ID NO: 63 (human GJB2 coding sequence in boldface; no HA tag):

CAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACGACGGGGAGTCAG
GCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACTGATTAAGCATTG
GTAAGTGTGACACCAAGTTTACTCATATATACTTTAGATTGATTTAAACTTCATTTTTAAT
TTAAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAATCCCTTAACGTGAG
TTTTCTGTCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAGCGGTGGTTTGT
TGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGCAGAGCGCAGATA
CCAAATACTGTCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAACTCTGTAGCACC
GCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTGGCGATAAGTCGT
GTCTTACCGGGTTGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGGTGCGGCTGAACG
GGGGGTTTCGTGCACACAGCCAGCTTGGAGCGAACGACCTACACCGAACTGAGATACCTACA
GCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACAGGTATCCGGTAA
GCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGAAACGCCTGGTATCTT
TATAGTCCTGTGCGGTTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTGATGCTCGTCAGG
GGGGCGGAGCCTATGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCCTGGCCTTTTGTCT
GGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACTGAGGCCGCCCGG
GCAAAGCCCGGGCGTCGGGCGACCTTTGGTTCGCCCGGCCTCAGTGAGCGAGCGAGCGCGCAG
AGAGGGAGTGGCCAACTCCATCACTAGGGGTTTCTGCGGCCGCACGCGTTTAATTAAGACCT
CGAAGGGGACTTGGGGGTTTCGGGGCTTTCGGGGGCGGTGCGGGGTTTCGCGGACCCGGGAAG
CTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGCCGCCCTCCGTAACTTTCCC
AGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAGGCGCCACGGCGGGGAGACAGG
TGTTGCGGCCCCGCAGCGCCCGCGCTCCTCTCCCGACTCGGAGCCCTCGGCGGCGCCC

GGCCCAGGACCCGCCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGACCCCC
GCCCCGCGCCCGCCGCGCTTCCCTCCCGACGCGAGAGCAAACCGCCAGAGTAGAAGCGGATCC
GCCACC**ATGGATTGGGGCAGCTGCAGACGATCCTGGGGGGTGTGAACAAACACTCCACCAG**
CATTGGAAAAGATCTGGCTCACCGTCCCTCTTCATTTTTTCGCATTATGATCCTCGTTGTGGCTG
CAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACACCCTGCAGCCAGGCTGC
AAGAACGTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGCTATGGGCCCTGCAGCT
GATCTTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCACGTGGCCTACCGGAGACATGAGA
AGAAGAGGAAAGTTCATCAAGGGGGAGATAAAGAGTGAATTTAAGGACATCGAGGAGATCAAA
ACCCAGAAGGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAAGCAGCATCTTCTTCCG
GGTCATCTTCGAAGCCGCCTTCATGTACGTCTTCTATGTCATGTACGACGGCTTCTCCATGC
AGCGGCTGGTGAAGTGCAACGCCTGGCCTTGTCCCAACACTGTGGACTGCTTTGTGTCCCGG
CCCACGGAGAAGACTGTCTTACAGTGTTTCATGATTGCAGTGTCTGGAATTTGCATCCTGCT
GAATGTCACTGAATTGTGTTATTTGCTAATTAGATATTGTTCTGGGAAGTCAAAAAAGCCAG
TTTAAGGCGCGCCACCCCTGCAGGGAATTCGCGATTGCCAGTTGTTAGATTAAGAAAATAGA
CAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCC
AACACAAAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAACT
CCAGATGCCACAATGGAGCTCTGCTCCCCCTAAAGCCTCAAAACAAAGGCCTAATTCTATGCC
TGTCTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCCAGGCTGTTAGGGGTTATTG
GTGTAAGGTACTTTCATATTTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACA
AGAGAAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCCTGGGGTTCT
TTTTGCCAACTTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCATTTGCTTTGGAAGTTTT
AATCTCTAACAGTGGACAAAGTTACCAGTGCCTTAACTCTGTTACACTTTTTTGGAAGTGAA
AACTTTGTAGTATGATAGGTTATTTTGATGTAAAGATGTTCTGGATACCATTATATGTTCCC
CCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTGCTACTATGATTTAAT
TTGAAATATGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTAT
TCATTGTGGTCATAGCACCTAACAAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTT
CCTAGTGATGGCTTATGATAGCAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTA
AGAAATACAGACTGGATGTACCACCAACTACTACCTGTAATGACAGGCCTGTCCAACACATC
TCCCTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTCGCTTG
GGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAAATGGGGCAGGGGAGGGAGAAG
TTTCTGTGCTTAAAAACAGATTTGGAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAG
CTTTGTCTACTTCAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAGTGAAAAT
ATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTAT
AGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCCA
CATATTTTCAGTGAGGGTAAGTATTTTCCGTGTTGTCAAGAATAGCATTGTAAAAGCATTTTGT
AATAATAAAGAATAGCTTTAATGATATGCTTGTAACTAAAAATAATTTTGTAAATGTATCAAAT
ACATTTAAAACATTAAATATAATCTCTATAATAATTTAAAAATCTAATATGGTTTTAATAGA
ACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACT
GGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTA
TCATGCTATTGCTTCCCGTATGGCTTTTCATTTTCTCCTCCTGTATAAATCCTGGTTGCTGT
CTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGT
GACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGC
TTTCCCCCTCCCTATTGCCACGGCGGAACATCATCGCCGCTGCCTTGCCCGCTGCTGGACAG
GGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTGTCGGGGAAATCATCGTCCCTTCCCT
TGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTC
GGCCCTCAATCCAGCGGACCTTCCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGC
GTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCCTCCCCGCGAATTCAT
CGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTGTGCCTTCTAG
TTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCCCTGACCCTGGAAGGTGCCACTC
CCACTGTCCTTTCCCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCT
ATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCA

TGCTGGGGACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCC
 CTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTCGCCCCGACGCCCGGGCT
 TTGCCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGG
 TATTTTCTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCAACCATAGTAC
 GCGCCCTGTAGCGGCGCATTAAGCGCGGGGCTGTGGTGGTTACGCGCAGCGTGACCGCTAC
 ACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCCTTTCTCGCCACGTTTCG
 CCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTA
 CGGCACCTCGACCCCCAAAAAAGTTGATTGGGTGATGGTTACGTTAGTGGGCCATCGCCCTG
 ATAGACGGTTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCC
 AAAGTGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGGATTATAAGGGATTTTGCCG
 ATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACAA
 AATATTAACGTTTACAATTTTATGGTGCACCTCTCAGTACAATCTGCTCTGATGCCGCATAGT
 TAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCG
 GCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTGAGAGGTTTTTACC
 GTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATG
 TCATGATAATAATGGTTTTCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAACC
 CCTATTTGTTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCTG
 ATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTCGCC
 TTATTCCTTTTTTTCGGGCATTTTGCCTTCCTGTTTTTGTCTACCCAGAAACGCTGGTGAAA
 GTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTTACATCGAACTGGATCTCAACAG
 CGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAAGCTTTTCCAATGATGAGCACTTTTAAAG
 TTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCGC
 ATACACTATTCTCAGAATGACTTGGTTGAGTACTCACCAGTCACAGAAAAGCATCTTACGGA
 TGGCATGACAGTAAGAGAATTATGCAGTGTGCCATAACCATGAGTGATAACACTGCGGCCA
 ACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGG
 GATCATGTAACTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGA
 GCGTGACACCACGATGCCTGTAGCAATGGCAACAACGTTGCGCAAATTTAACTGGCGAAC
 TACTTACTCTAGCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGA
 CCACCTTCTGCGCTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGA
 CGGTGGGTCTCGCGGTATCATTG

[00116] In some embodiments, an AAV vector described herein comprises an AAV 5' ITR, a *GJB2* GRE enhancer (*hGJB2 GRE1*), a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, Kozak sequence, nucleotide sequence encoding a gene product (e.g., *GJB2* or GFP), a *GJB2* exon 2 3' UTR, a WPRE, a bovine growth hormone poly A signal, and an AAV 3' ITR (e.g., vector c81.1).

[00117] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 64. An exemplary nucleotide sequence for vector c81.1 encoding eGFP is set forth in SEQ ID NO: 64 (*hGJB2 GRE1* underlined; eGFP coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAATTTAACTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC

GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
TTCATTTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAACAAAAAACACCGCTACCAG
CGGTGGTTTTGTTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGC
AGAGCGCAGATACCAATACTGTCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACC GCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCCAGCTTGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCTGTGCGGTTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCATCACTAGGGGTTCTGCGGCCGCACGCGTA
AGAGAGCACTTGGAAGAGCCCCCGAGGGCAGCCGGGGCTTGCCGCCTCACCTTTTTGGTTT
CACATCCCAGAAATCAGTAAGGCAGGAATTGGAGGCTGCTTCTTGCCTTAGCAACTCGGTGA
CCTTAGGCAGAACAGTTTACGCTTCTGAGTGTCTTCTCTTCTGTAAGGGGAGCGTAAACC
GTCCTCCATGCAGAACGTGTACTGTGCTGGCACAGCACTGGGGCATTAGGATCTCCAAATT
AAAGGCTCACTCTGCGGGATGGAGGCAGCCACAGCTGGAAGAAGGAACATTTGGGGCCAGAA
GTCCCCCTACCTCCGTCTTAAGAGAGAAGATGGGAATAACGACCCTCGCTGAAATGATTGCT
CTCTGGCCAGCTCGCCTCGCATCCACATCCAAATCTGGGAGGCACAGAGCGCATCAGGACAT
CGGGTTCTGTCACTGTAATGGGCGTGGCTCCTGACCTTCTGTCTGTATCAGAGAAGATAAGG
GAGAACATTTGAAAGAAAGGAGAAAAGATAGCCACTGGAGAACAGAGCAAAGGAGCCAGC
AGAAAAAGACGAGACGGCTGTAGCCCCACAGGAAGCAGAAAACCGATAGGCTAAGTAGGATAC
ACACAAAGAAAAAGTAGATCCCGAGAGGCATTTCCCCGAGGGCTTTCATGTGGTTTTCTCGTGA
GGAGAAGCTGACTGCAGGGTGTTTTGAAAAGAACGACTTATGCAGCCATAAAAAATGATGAGTT
CATGTCTTTTGTAGGGACATGGATGATTAATTAAGACCTCGAAGGGGACTTGGGGGGTTTCGG
GGCTTTTCGGGGGCGGTTCGGGGGTTTCGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGC
GCGCTCCGCCCCGCGCGCCGCCCCCTCCGTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGG
TGTGGGGTGCGGTTAAAGGCGCCACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGC
GCGCTCTCTCCCCGACTCGGAGCCCCCTCGGCGGCGCCCGGCCAGGACCCGCTAGGAGCG
CAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGACCCCGCCCCGGCCCCGCGCGCTTCT
CCCGACGCAGAGCAAACCGCCCAGAGTAGAAGCC**ATGGTGAGCAAGGGCGAGGAGCTGTTCA**
CCGGGGTGGTGCCCATCTGGTTCGAGCTGGACGGCGACGTAAACGGCCACAAGTTCAGCGTG
TCCGGCGAGGGCGAGGGCGATGCCACCTACGGCAAGCTGACCCTGAAGTTCATCTGCACCAC
CGGCAAGCTGCCCCGTGCCCTGGCCACCCCTCGTGACCACCCTGACCTACGGCGTGCACTGCT
TCAGCCGCTACCCCGACCACATGAAGCAGCAGCACTTCTTCAAGTCCGCCATGCCCGAAGGC
TACGTCCAGGAGCGCACCATCTTCTTCAAGGACGACGGCAACTACAAGACCCGCGCCGAGGT
GAAGTTCGAGGGCGACACCCTGGTGAACCGCATCGAGCTGAAGGGCATCGACTTCAAGGAGG
ACGGCAACATCCTGGGGCACAAGCTGGAGTACAACATAACAGCCACAACGTCTATATCATG
GCCGACAAGCAGAAGAACGGCATCAAGGTGAACCTCAAGATCCGCCACAACATCGAGGACGG
CAGCGTGAGCTCGCCGACCACTACCAGCAGAACACCCCCATCGGCGACGGCCCCGTGCTGC
TGCCCCGACAACCACTACCTGAGCACCCAGTCCGCCCTGAGCAAAGACCCCAACGAGAAGCGC
GATCACATGGTCTGCTGGAGTTTCGTGACCGCCGCGGGGATCACTCTCGGCATGGACGAGCT
GTACAAGTAATAAAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTA
AGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTA
GCATTTCCCAACACAAAGATTCTGACCTTAAATGCAACCATTGAAACCCCTGTAGGCCTCA

GGTGAAACTCCAGATGCCACAATGGAGCTCTGCTCCCCTAAAGCCTCAAAACAAAGGCCTAA
TTCTATGCCTGTCTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCCAGGCTGTTAG
GGGTTATTGGTGTAAGGTACTTTTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTCT
CTGAGGACAAGAGAAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCC
TGGGGTTCTTTTTGCCAAGTTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCAATTTGCTTT
GGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTT
GGAAGTGAAAACTTTGTAGTATGATAGGTTATTTTGATGTAAAGATGTTCTGGATACCATTA
TATGTTCCCCCTGTTTTAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTGCTACTA
TGATTTAATTTGAAATATGGTCTTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGT
CTGTTGTATTCAATTGTGGTCATAGCACCTAACAAACATTGTAGCCTCAATCGAGTGAGACAGA
CTAGAAGTTCCTAGTGATGGCTTATGATAGCAAATGGCCTCATGTCAAATATTTAGATGTAA
TTTTGTGTAAAGAAATACAGACTGGATGTACCACCACTACTACCTGTAATGACAGGCCTGTC
CAACACATCTCCCTTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGA
GGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGGGG
AGGGAGAAGTTTCTGTCGTTAAAAACAGATTTGAAAGACTGGACTCTAAAGTCTGTTGATT
AAAGATGAGCTTTGTCTACTTTCAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTA
AGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAAATATTGAG
CAGATCTATAGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAAAT
GGTACTCCACATATTTTCAGTGAGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAA
GCATTTTGTAAATAATAAGAATAGCTTTAATGATATGCTTGTAATAAAATAATTTTGTAAAT
GTATCAAATACATTTAAACATTTAAATATAATCTCTATAATAATTTAAATCTAATATGGT
TTTAATAGAACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAA
AGATTGACTGGTATTCTTAATATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAAT
GCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCATTTTCTCCTCCTTGATAAAATCCT
GGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTGAGGCAACGTGGCGTGGTGTGCACT
GTGTTTGTGCTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTGAGCTCCTTTCCGG
GACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACCTCATCGCCGCCTGCCTTGCCCGCT
GCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTGTCGGGGAAATCATCG
TCCTTTTCTTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCTTCTGCTA
CGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGC
CTCTTCCGCGTCTTCGCTTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCG
CGAATTCATCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTGT
GCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCCTTGACCCTGGAAG
GTGCCACTCCCCTGCTCTTTCCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGG
TGTCATTCTATTCTGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAA
TAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGCGCGCAGGAACCCCTAGTGATGGAGTT
GGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTCGCCCGAC
GCCCCGGGCTTTGCCCCGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGC
CTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCAA
CCATAGTACGCGCCCTGTAGCGGCGCATTAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGT
GACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCTTTCTCG
CCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTT
AGTGCTTTACGGCACCTCGACCCCCAAAAAAGTTGATTTGGGTGATGGTTACAGTAGTGGGCC
ATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGAC
TCTTGTTCCAACTGGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAGGG
ATTTTGCCGATTTTCGGCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAA
TTTTAACAAAAATATTAACGTTTACAATTTTATGGTGCCTCTCAGTACAATCTGCTCTGATG
CCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGT
CTGCTCCCGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTGAGAG
GTTTTACCGTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTAT
AGGTTAATGTCATGATAATAATGGTTTCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTG

CGCGGAACCCCTATTTGTTTATTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACA
 ATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCC
 GTGTGCGCCCTTATTCCTTTTTTTCGGGCATTTTGCCTTCCTGTTTTTGCTCACCCAGAAACG
 CTGGTGAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTTACATCGAACTGGA
 TCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAACGTTTTCCAATGATGAGCA
 CTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTC
 GGTCGCCGCATACACTATTCTCAGAATGACTTGGTTGAGTACTACCAGTCACAGAAAAGCA
 TCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAACA
 CTGCGGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCAC
 AACATGGGGGATCATGTAACTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACC
 AAACGACGAGCGTGACACCA

[00118] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 65. An exemplary nucleotide sequence for vector c81.1 encoding human GJB2 is set forth in SEQ ID NO: 65 (*hGJB2* GRE1 underlined; human GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACCTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCCTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
 TTCATTTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATC
 CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
 CGGTGGTTTTGTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGCTTCAGC
 AGAGCGCAGATACCAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
 CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
 GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
 TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
 GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCAGAGGAGAAAGGCGGACA
 GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
 GCCTGGTATCTTTATAGTCCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
 ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
 TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
 GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
 GCGAGCGCGCAGAGAGGGAGTGGCCAACTCCATCACTAGGGGTTCTGCGGCCGCACGCGTA
 AGAGAGCACTTGGGAAGAGCCCCCGAGGGCAGCCGGGGCTTGCCGCCTCACCTTTTTGGTTT
 CACATCCCAGAAATCAGTAAGGCAGGAATTGGAGGCTGCTTCTTGCCTTAGCAACTCGGTGA
 CCTTAGGCAGAACAGTTTACGCTTCTGAGTGTCTTCTCTTCTGTAAGGGGAGCGTAAACC
 GTCCTCCATGCAGAACGTGTACTGTGCCTGGCACAGCACTGGGGCATTAGGATCTCCAAATT
 AAAGGCTCACTCTGCGGGATGGAGGCAGCCACAGCTGGAAGAAGGAACATTTGGGGCCAGAA
 GTCCCCCTACCTCCGTCTTAAGAGAGAAGATGGGAATAACGACCCTCGCTGAAATGATTGCT
 CTCTGGCCAGCTCGCCTCGCATCCACATCCAAATCTGGGAGGCACAGAGCGCATCAGGACAT
 CGGGTTCTGTGAGTGAATGGGCGTGGCTCCTGACCTTCTGTCTGTATCAGAGAAGATAAGG
 GAGAACATTTGAAAGAAAGGAGAAAAGATAGCCACTGGAGAACAGAGCAAAGGAGCCAGC

AGAAAAAGACGAGACGGCTGTAGCCCCACAGGAAGCAGAAACCGATAGGCTAAGTAGGATAC
ACACAAAGAAAAAGTAGATCCCGAGAGGCATTTCCCCGAGGGCTTTCATGTGGTTTCTCGTGA
GGAGAAGCTGACTGCAGGGTGTTTTGAAAGAACGACTTATGCAGCCATAAAAAATGATGAGTT
CATGTCCTTTGTAGGGACATGGATGATTAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGG
GGCTTTTCGGGGGCGGTTCGGGGGTTTCGGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGC
GCGCTCCGCCCCGCGGCGCCGCCCCCTCCGTAACCTTTCCCAGTCTCCGAGGGAAGAGGCGGGG
TGTGGGGTGCGGTTAAAGGCGCCACGGCGGGAGACAGGTGTTGCGGCCCCGAGCGCCCCG
GCGCTCCTCTCCCCGACTCGGAGCCCCCTCGGCGGCGCCCCGGCCAGGACCCGCTAGGAGCG
CAGGAGCCCCAGCGCAGAGACCCCCAACGCCGAGACCCCCGCCCCGGCCCCGCGGCTTCCT
CCCCAGCGCAGAGCAAACCGCCCAGAGTAGAAGCC**ATGGATTGGGGCAGCTGCAGACGATCC**
TGGGGGGTGTGAACAAACACTCCACCAGCATTGGAAAGATCTGGCTCACCGTCTCTTCATT
TTTCGCATTATGATCCTCGTTGTGGCTGCAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTT
TGTCTGCAACACCCTGCAGCCAGGCTGCAAGAACGTGTGCTACGATCACTACTTCCCCATCT
CCCACATCCGGCTATGGGGCCCTGCAGCTGATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCC
ATGCACGTGGCCTACCGGAGACATGAGAAGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAG
TGAATTTAAGGACATCGAGGAGATCAAAACCCAGAAGGTCCGCATCGAAGGCTCCCTGTGGT
GGACCTACACAAGCAGCATCTTCTTCCGGGTCTCTTCGAAGCCGCCTTCATGTACGTCTTC
TATGTCTGTACGACGGCTTCTCCATGCAGCGGCTGGTGAAGTGAACGCCTGGCCTTGTCC
CAACACTGTGGACTGCTTTGTGTCCCGGCCACGGAGAAGACTGTCTTCACAGTGTTCATGA
TTGCAGTGTCTGGAATTTGCATCCTGCTGAATGTCACTGAATTGTGTTATTTGCTAATTAGA
TATTGTTCTGGGAAGTCAAAAAAGCCAGTTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGC
ATTGCCAGTTGTTAGATTAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAG
CTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACCTTAAATGCAACCATT
TGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGCCACAATGGAGCTCTGCTCCCTTAA
GCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTCACTTAAGTTAGTTCCA
CTGAGACCCAGGCTGTTAGGGGTTATTGGTGTAAAGTACTTTCATATTTTAAACAGAGGAT
ATCGGCATTTGTTTCTTCTCTGAGGACAAGAGAAAAAGCCAGGTTCACAGAGGACACAG
AGAAGGTTTGGGTGTCCTCCTGGGGTTCTTTTTGCCAACTTTCCCCACGTTAAAGGTGAACA
TTGGTTCTTTCATTTGCTTTGGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTGCCT
TAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATAGGTTATTTTGATGTAA
AGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGTAAA
TGGTATGTCAATTCGCTACTATGATTTAATTTGAAATATGGTCTTTTGGTTATGAATACTTTG
CAGCACAGCTGAGAGGCTGTCTGTTGATTTCATTGTGGTTCATAGCACCTAACACATTGTAG
CCTCAATCGAGTGAGACAGACTAGAAGTTCCCTAGTGATGGCTTATGATAGCAAATGGCCTCA
TGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCAACTACTA
CCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCATCGG
AAAGAACGCTGATTTAAAGAGGTGCTTGGGAATTTTATTGACACAGTACCATTTAATGGGG
AGGACAAAATGGGGCAGGGGAGGGAGAGTTTCTGTGCTTAAAAACAGATTTGGAAAGACTG
GACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAGTTTGTGTTGCTTACCC
CTTCAGCCTCCAATTTTTTAAAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAGCTA
AGGTTTAGATAAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTATGCT
TGACATGGTTTCCAAAAAATGGTACTCCACATATTTCACTGAGGGTAAGTATTTTCTGTTG
TCAAGAATAGCATTTGTAAGCATTTTGTAAATAATAAAGAATAGCTTTAATGATATGCTTGT
AACTAAAATAATTTTGTAAATGATCAAAATACATTTAAACATTAAAATATAATCTCTATAAT
AATTTAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAACCTC
TGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTA
TGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCAATTT
CTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGC
AACGTGGCGTGGTGTGCACTGTGTTTGTGCTGACGCAACCCCCACTGGTTGGGGCATTGCCACC
ACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACCTCAT
CGCCGCTGCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGG

TGTTGTCGGGGAAATCATCGTCCTTTTCCTTGGCTGCTCGCCTATGTTGCCACCTGGATTCTG
 CGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCCTCCCGCGG
 CCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTTCGCCTTCGCCCTCAGACGAGTCGGATCT
 CCCTTTGGGCGCCTCCCCGCGAATTCATCGATAACGAGCGCTGCTCGAGAGATCTGTGATA
 GCGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGCCCTCCCCCGT
 GCCTTCCCTTGACCCTGGAAGGTGCCACTCCCCTGTCTTTCCCTAATAAAAATGAGGAAATTG
 CATCGCATTGTCTGAGTAGGTGTCTATTCTATTTGGGGGGTGGGGTGGGGCAGGACAGCAAG
 GGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCGCGAG
 GAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGG
 GCGACCAAAGGTCGCCCCAGCCCCGGGCTTTGCCCGGGCGGCCCTCAGTGAGCGAGCGAGCGC
 GCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTCA
 CACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAAGCGCGCGGGT
 GTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGC
 TTTCTTCCCTTCCCTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGC
 TCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAACTTGATTTGGGT
 GATGGTTACGTAAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTC
 CACGTTCTTTAATAGTGGACTCTTGTTCCAAACCTGGAACAACACTCAACCCTATCTCGGGCT
 ATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCTGATT
 TAACAAAAATTTAACGCGAATTTTAACAAAATATTAACGTTTACAATTTTATGGTGCCTCT
 CAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTG
 ACGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCC
 GGGAGCTGCATGTGTGAGAGTTTTTACCCTCATCACCGAAACGCGCGAGACGAAAGGGCCT
 CGTGATACGCCCTATTTTTATAGGTTAATGTATGATAATAATGGTTTTCTTAGACGTCAGGTG
 GCACTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTTCTAAATACATTCAAAT
 ATGTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAG
 TATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTTTCGGCATTTTGCCTTCCTG
 TTTTGTCTACCCAGAAACGCTGGTGAAAGTAAAGATGCTGAAGATCAGTTGGGTGCACGA
 GTGGGTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTCGCCCCGAAGA
 ACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTG
 ACGCCGGGCAAGAGCAACTCGGTGCGCCGCATACACTATTCTCAGAATGACTTGGTTGAGTAC
 TCACAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGC
 CATAACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGG
 AGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACCTCGCCTTGATCGTTGGGAACCG
 GAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00119] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 66. An exemplary nucleotide sequence for vector c81.1 encoding mouse GJB2 is set forth in SEQ ID NO: 66 (*hGJB2* GRE1 underlined; mouse GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACAG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACCTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC

TTCATTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTTGTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACC GCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAAGCGCCACGCTTCCC GAAGGGAGAAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCTGTGCGGTTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACTCCATCACTAGGGGTTCTGCGGCCGCACGCGTA
AGAGAGCACTTGGGAAGAGCCCCCGAGGGCAGCCGGGGCTTGGCGCCTCACCTTTTTGGTTT
CACATCCCAGAAAATCAGTAAGGCAGGAATTGGAGGCTGCTTCTTGCCTTAGCAACTCGGTGA
CCTTAGGCAGAACAGTTT CAGCCTTCTGAGTGTCTTCTCTTCTGTAAGGGGAGCGTAAACC
GTCCTCCATGCAGAACGTGTACTGTGCTGGCACAGCACTGGGGCATTAGGATCTCCAAATT
AAAGGCTCACTCTGCGGGATGGAGGCAGCCACAGCTGGAAGAAGGAACATTTGGGGCCAGAA
GTCCCCCTACCTCCGTCTTAAGAGAGAAGATGGGAATAACGACCCTCGCTGAAATGATTGCT
CTCTGGCCAGCTCGCCTCGCATCCACATCCAAATCTGGGAGGCACAGAGCGCATCAGGACAT
CGGGTTCTGT CAGTGTAATGGGCGTGGCTCCTGACCTTCTGTCTGTATCAGAGAAGATAAGG
GAGAACATTTGAAAGAAAGGAGAAAAGATAGCCACTGGAGAACAGAGCAAAGGAGCCAGC
AGAAAAAGACGAGACGGCTGTAGCCCCACAGGAAGCAGAAAACCGATAGGCTAAGTAGGATAC
ACACAAAGAAAAAGTAGATCCCGAGAGGCATTTCCCCGAGGGCTTTCATGTGGTTTTCTCGTGA
GGAGAAGCTGACTGCAGGGTGTTTTGAAAAGAACGACTTATGCAGCCATAAAAAATGATGAGTT
CATGTCTTTGTAGGGACATGGATGATTAATTAAGACCTCGAAGGGGACTTGGGGGGTTTCGG
GGCTTTTCGGGGGCGGTTCGGGGGTTTCGGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGC
GCGCTCCGCCCCGCGCGCCGCCCTCCGTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGG
TGTGGGGTGCGTTAAAGGCGCCACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGC
GCGCTCTCTCCCCGACTCGGAGCCCCCTCGGCGGCGCCCGGCCAGGACCCGCTAGGAGCG
CAGGAGCCCCAGCGCAGAGACCCCCAACGCCGAGACCCCCGCCCCGGCCCCGCGCTTCT
CCCGACGCAGAGCAAACCGCCAGAGTAGAAGCC**ATGGATTGGGGCACACTCCAGAGCATCC**
TCGGGGGTGTCAACAACACTCCACCAGCATTGGAAAGATCTGGCTCACGGTCTCTTCATC
TTCCGCATCATGATCTCTGTTGGTGGCTGCAAAGGAGGTGTGGGGAGATGAGCAAGCCGATTT
TGTCTGCAACACGCTCCAGCCTGGCTGCAAGAATGTATGCTACGACCACCACTTCCCCATCT
CTCACATCCGGCTCTGGGCTCTGCAGCTGATCATGGTGTCCACGCCAGCCCTCTGGTAGCT
ATGCATGTGGCCTACCGGAGACATGAAAAGAAACGGAAGTTCATGAAGGGAGAGATAAAGAA
CGAGTTTAAGGACATCGAAGAGATCAAACCCAGAAGGTCCGTATCGAAGGGTCCCTGTGGT
GGACCTACACCACCAGCATCTTCTTCCGGGTCTATCTTTGAAGCCGTCTTCATGTACGCTTTT
TACATCATGTACAATGGCTTCTTCATGCAACGTCTGGTGAAATGCAACGCTTGGCCCTGCCC
CAATACAGTGGACTGCTTCATTTCCAGGCCACAGAAAAGACTGTCTTCACCGTGTATGA
TTTCTGTGTCTGGAATTTGCATTCTGCTAAATATCACAGAGCTGTGCTATTTGTTTCGTTAGG
TATTGCTCAGGAAAGTCCAAAAGACCAGTCTACCCATACGATGTTCCAGATTACGCTTAAAG
GCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAAGAAATAGACAGCAT
GAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACA
AAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGAT
GCCACAATGGAGCTCTGCTCCCCTAAAGCCTCAAACAAAGGCCTAATTCTATGCCTGTCTT
AATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCCGAGCTGTTAGGGGTTATTGGTGTAA
GGTACTTTTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAA

AAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCCTGGGGTTCTTTTTGC
CAACTTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCATTTGCTTTGGAAGTTTTAATCTC
TAACAGTGGACAAAGTTACCAGTGCCTTAACTCTGTTACACTTTTTGGAAGTGAAAACTTT
GTAGTATGATAGGTTATTTTTGATGTAAAGATGTTCTGGATACCATTATATGTTCCCCCTGTT
TCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTTCGCTACTATGATTTAATTTGAAA
TATGGTCTTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTG
TGGTCATAGCACCTAACAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGT
GATGGCTTATGATAGCAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAAT
ACAGACTGGATGTACCACCAACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTT
TTCCATGACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTCGCTTGGGAATT
TTATTGACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTG
TCGTTAAAAACAGATTTGAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGT
CTACTTCAAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAAGTAAAAATATAGCT
AATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAAATATTGAGCAGATCTATAGGAAG
ATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCCACATATT
TCAGTGAGGGTAAGTATTTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTGTAAATAAT
AAAGAATAGCTTTAATGATATGCTTGTAATAAATAATTTTGTAAATGTATCAAATACATTT
AAAACATTAAAAATATAATCTCTATAATAATTTAAAATCTAATATGGTTTTAATAGAACAGCG
ATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATT
CTTAATCTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGC
TATTGCTTCCCGTATGGCTTTTCATTTTCTCCTCCTTGATAAAATCCTGGTTGCTGTCTCTTT
ATGAGGAGTTGTGGCCCGTTGTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGCTGACGCA
ACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCC
CCTCCCTATTGCCACGGCGGAACCTCATCGCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTC
GGCTGTTGGGCACTGACAATTCCGTGGTGTGTGTCGGGGAATCATCGTCCTTTTCTTGGCTG
CTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCTTCTGCTACGTCCCTTCGGCCCT
CAATCCAGCGGACCTTCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTC
GCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGCGAATTCATCGATAC
CGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCA
GCCATCTGTTGTTTGCCCCTCCCCCGTGCCTTCTTGACCCTGGAAGGTGCCACTCCCCTG
TCCTTTTCTAATAAAATGAGGAAATGCATCGCATTGTCTGAGTAGGTGTCTATTCTATCTG
GGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGG
GGACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCT
GCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTGCGCCGACGCCCCGGGCTTTGCCC
GGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTT
CTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCAACCATAGTACGCGCCC
TGTAGCGGCGCATTAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGC
CAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCTTCTCGCCACGTTCCGCGGCT
TTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCAC
CTCGACCCCCAAAAAATTGATTTGGGTGATGGTTACGTAGTGGGCCATCGCCCTGATAGAC
GGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACTG
GAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCG
GCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACAAAAATATT
AACGTTTACAATTTTATGGTGCCTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCC
AGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCC
GCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTGTCAGAGGTTTTTACCCTCATC
ACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGA
TAATAATGGTTTCTTAGACGTCAGGTGGCACTTTTTCGGGGAATGTGCGCGGAACCCCTATT
TGTTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCTGATAAAT
GCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTGCGCCCTTATTC
CCTTTTTTTCGGGCATTTTGCCTTCTGTTTTTGTCTACCCAGAAACGCTGGTGAAAGTAAAA

GATGCTGAAGATCAGTTGGGTGCACGAGTGGGTTACATCGAACTGGATCTCAACAGCGGTAA
 GATCCTTGAGAGTTTTTCGCCCCGAAGAAGCTTTTCCAATGATGAGCACTTTTAAAGTTCTGC
 TATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTCGCCGCATACAC
 TATTCTCAGAAATGACTTGGTTGAGTACTACCAGTACAGAAAAGCATCTTACGGATGGCAT
 GACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACTTAC
 TTCTGACAACGATCGGAGGACCGAAGGAGCTAACCCTTTTTTGCACAACATGGGGGATCAT
 GTAACCTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGA
 CACCA

[00120] In some embodiments, an AAV vector described herein comprises an AAV 5' ITR, a *GJB2* GRE enhancer (*hGJB2* GRE2), a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, Kozak sequence, nucleotide sequence encoding a gene product (e.g., *GJB2* or GFP), a *GJB2* exon 2 3' UTR, a WPRE, a bovine growth hormone poly A signal, and an AAV 3' ITR (e.g., vector c81.2).

[00121] In some embodiments, an AAV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 48. An exemplary nucleotide sequence for vector c81.2 encoding eGFP is set forth in SEQ ID NO: 48 (*hGJB2* GRE2 underlined; eGFP coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAAGTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
 TTCATTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
 CCTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACACCGCTACCAG
 CGGTGGTTTGTGTGCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGC
 AGAGCGCAGATACCAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
 CTCTGTAGCACCGCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
 GCGATAAGTCGTGCTTACCAGGGTTGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
 TCGGGCTGAACGGGGGGTTCTGTGCACACAGCCAGCTTGGAGCGAACGACCTACACCGAAT
 GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
 GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGAAAC
 GCCTGGTATCTTTATAGTCCTGTGCGGTTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
 ATGCTCGTCAGGGGGCGGAGCCTATGAAAAACGCCAGCAACGCGCCTTTTTACGGTTCC
 TGGCCTTTTGCTGGCCTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCACT
 GAGGCCGCCCGGCAAGCCCGGGCGTGGGCGACCTTTGGTCCCGGCTCAGTGAGCGA
 GCGAGCGCGAGAGGGAGTGCCCACTCCATCACTAGGGGTTCTTGCAGGCGCACGCGTC
 AGTGATGCCTGAAACCTCAGATGGTACTGAACCTCTATATAATCTGTTTTTTTCTATACAT
ACAAACCTACCATAAGGCTTAATGGTAAGAGATTAACAATAAAGAATAATAAAACAACACTT
ATAACAATGTATAACAATATATTGTAATATAAGTTTTTGGATGCAGTCTCTCTCTCAAAATG
CTATCATATTTTCCAACGTGTGGTTGACTACAGGTAAGTGAACCAAAAAATGAAACAGTGG

ATAAGAGGGCGACTCCTGTACCAAAGAAAAAATAGAGTGTTGCAGCTGTAACATAGTTGAA
TGACTGAGTTAGACTGCATAACTGACACACAAAACCACATAAATATAAATGAAGGAATCTCT
GGGTGTAATCTGGTGCAAAGGTGACTGTGTTAATCATTAAATCCACAAGTTGCTATCCTGAAG
TGTGCCAAATGCTTTATGTTTATTTTCATCACATAGCTCTATAAAGAAAGGATTTGTAATTCC
TTTCTACAGAAGTGGAAGTAAGTCTTAAGACTCAAAAAACTTTAAAAACTACAATGAAGTA
ACAACTTTTATTAAATTTATTTTGTGTCTTTCCAGAATTTCTATATATATAGGAATGTGATAT
GAATCTATATGTGAATTGAATCTACATGAATATTGATGACTTTTATTTCCCTTTTGCACAT
AAGATAGAATATTTTACCTACTATTCCACACTTTGCTTTTCTTAACATATCATGGGATCTTT
TTATATAAGTGAACAAAGAGTTTCTTCATTCTTTACACAGTTTAATTAAGACCTCGAAGGG
GACTTGGGGGGTTCGGGGCTTTTCGGGGGCGGTTCGGGGGTTTCGCGGACCCGGAAGCTCTGAG
GACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGCCGCCCTCCGTAACCTTTCCAGTCTCC
GAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAAGGCGCCACGGCGGGAGACAGGTGTTGCG
GCCCCGCGAGCGCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCTCGGCGGCGCCCGGCCAG
GACCCGCCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGACCCCCGCCCGG
CCCCGCGCGCTTCTCTCCGACGCAGAGCAAACCGCCAGAGTAGAAGCC**ATGGTGAGCAAG**
GGCGAGGAGCTGTTACCGGGGTGGTGGCCATCCTGGTTCGAGCTGGACGGCGACGTAAACGG
CCACAAGTTCAGCGTGTCCGGCGAGGGCGAGGGCGATGCCACCTACGGCAAGCTGACCCTGA
AGTTCATCTGCACCACCGCAAGCTGCCCGTGCCCTGGCCCCACCCTCGTGACCACCCTGACC
TACGGCGTGCACTGCTTACGCCGTACCCCGACCACATGAAGCAGCACGACTTCTTCAAGTC
CGCCATGCCCCAAGGCTACGTCCAGGAGCGCACCATCTTCTTCAAGGACGACGGCAACTACA
AGACCCGCGCCGAGGTGAAGTTCGAGGGCGACACCCTGGTGAACCGCATCGAGCTGAAGGGC
ATCGACTTCAAGGAGGACGGCAACATCCTGGGGCACAAGCTGGAGTACAACACTACAACAGCCA
CAACGTCTATATCATGGCCGACAAGCAGAAGAACGGCATCAAGGTGAACCTTCAAGATCCGCC
ACAACATCGAGGACGGCAGCGTGCAGCTCGCCGACCACTACCAGCAGAACACCCCCATCGGC
GACGGCCCCGTGCTGCTGCCCCGACAACCACTACCTGAGCACCCAGTCCGCCCTGAGCAAAGA
CCCCAACGAGAAGCGCGATCACATGGTCTGCTGGAGTTCGTGACCGCCGCGGGGATCACTC
TCGGCATGGACGAGCTGTACAAGTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCC
AGTTGTTAGATTAAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAA
GGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACCTTAAATGCAACCATTTGAAACC
CCTGTAGGCCTCAGGTGAAACTCCAGATGCCACAATGGAGCTCTGCTCCCCTAAAGCCTCAA
AACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGAC
CCCAGGCTGTTAGGGGTATTGGTGTAAGGTACTTTTCATATTTTAAACAGAGGATATCGGCA
TTTGTCTTTCTCTGAGGACAAGAGAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGT
TTGGGTGTCTCTCGGGTCTTTTTTGCCAACCTTTCCCCACGTTAAAGGTGAACATTGGTTC
TTTCATTTGCTTTGGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTGCCTTAAACTC
TGTTACACTTTTTGGAAGTGAAACTTTGTAGTATGATAGGTATTTTTGATGTAAAGATGTT
CTGGATAACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATG
TCATTCGCTACTATGATTTAATTTGAAATATGGTCTTTTGGTTATGAATACTTTGCAGCACA
GCTGAGAGGCTGTCTGTTGTATTCAATTGTGGTTCATAGCACCTAACACATTGTAGCCTCAAT
CGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAATGGCCTCATGTCAA
TATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCACTACTACCTGTAA
TGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAAC
GCTGATTTAAAGAGGTTCGCTTGGGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAA
AATGGGGCAGGGGAGGGAGAAGTTTCTGTCGTTAAAAACAGATTTGGAAAGACTGGACTCTA
AAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAGTTTGTGTTGCTTACCCCTTCAGC
CTCCAATTTTTTAAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTA
GATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATG
GTTTCCAAAAAATGGTACTCCACATATTTTCAGTGAGGGTAAGTATTTTCTGTTGTCAAGAA
TAGCATTGTAAAGCATTTTGTAAATAATAAGAATAGCTTTAATGATATGCTTGTAACATAA
ATAATTTTGTAAATGTATCAAATACATTTAAACATTAAATATAATCTCTATAATAATTTAA
AATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTA

CAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGAT
 ACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCATTTTCTCCTCC
 TTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTGAGGCAACGTGG
 CGTGGTGTGCACTGTGTTTGCTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTC
 AGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACCTCATCGCCGCC
 TGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTGTC
 GGGGAAATCATCGTCTTTTCTTGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGA
 CGTCTTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCCTGCTG
 CCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTG
 GGCCGCTCCCCGCGAATTCATCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCA
 TCAAGCTGGCTGTGCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCC
 TTGACCCTGGAAGGTGCCACTCCCCTGCTCTTTTCTTAATAAAATGAGGAAATTGCATCGCA
 TTGTCTGAGTAGGTGTCAATTCTATTCTGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGG
 ATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCGAGGAACCCC
 TAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCA
 AAGGTCGCCCCGACGCCCCGGGCTTTGCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTG
 CCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTTACACCGCA
 TACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAGCGCGGCGGGTGTGGTGG
 TTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTC
 CTTTCTTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTT
 AGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCCAAAAAACTTGATTTGGGTGATGGTT
 CACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTT
 TTTAATAGTGGACTCTTGTTCCAAACTGGAACAACACTCAACCCTATCTCGGGCTATTCTTT
 TGATTTATAAGGGATTTTTCGCGATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTTAACAAA
 AATTTAACGCGAATTTTAAACAAAATATTAACGTTTACAATTTTATGGTGCCTCTCAGTACA
 ATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCC
 CTGACGGGCTTGCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCT
 GCATGTGTCAGAGGTTTTACCGTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATA
 CGCCTATTTTTATAGGTTAATGTGATGATAATAATGGTTTCTTAGACGTCAGGTGGCACTTT
 TCGGGGAAATGTGCGCGGAACCCCTATTGTTTTATTTTTCTAAATACATTCAAATATGTATC
 CGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGT
 ATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTTTCGGCATTTTGCCTTCTGTTTTTGC
 TCACCCAGAAACGCTGGTGAAAGTAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTT
 ACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAACGTTTT
 CCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGG
 GCAAGAGCAACTCGGTCGCCGCATACACTATTCTCAGAATGACTTGGTTGAGTACTCACCAG
 TCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAAATTATGCAGTGCTGCCATAACC
 ATGAGTGATAAACTGCGGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAAC
 CGCTTTTTTGCACAACATGGGGGATCATGTAACCTCGCCTTGATCGTTGGGAACCGGAGCTGA
 ATGAAGCCATACCAAACGACGAGCGTGACACCA

[00122] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 67. An exemplary nucleotide sequence for vector c81.2 encoding human GJB2 is set forth in SEQ ID NO: 67 (*hGJB2* GRE2 underlined; human GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACCTGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAAGTTGCAGGACCACCTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
TTCATTTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAAACCACCGCTACCAG
CGGTGGTTTTGTTTGCCGGATCAAGAGCTACCAACTCTTTTTTCCGAAGGTAACCTGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCCAGCTTGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTGCGGCCGCACGCGTC
AGTGATGCCTGAAACCTCAGATGGTACTGAACCCTCTATATAATCTGTTTTTCTTATACAT
ACAAACCTACCATAAGGCTTAATGGTAAGAGATTAACAATAAAGAATAATAAAACAACACTT
ATAACAATGTATAACAATATATTGTAATATAAGTTTTTGGATGCAGTCTCTCTCTCAAAATG
CTATCATATTTTCCAACCTGTGGTTGACTACAGGTAACCTGGAACCACAAAATGAAACAGTGG
ATAAGAGGGCGACTCCTGTACCAAAAGAAAAAATAGAGTGTGCAGCTGTAACATAGTTGAA
TGACTGAGTTAGACTGCATAACTGACACACAAAACCACATAAAATATAAATGAAGGAATCTCT
GGGTGTAATCTGGTGCAAAGGTGACTGTGTTAATCATTAATCCACAAGTTGCTATCCTGAAG
TGTGCCAAATGCTTTATGTTTATTTTCATCACATAGCTCTATAAAGAAAGGATTTGTAATTCC
TTTCTACAGAAAGTGAAAGTAAGTCTTAAGACTCAAAAAACTTTAAAAACTACAATGAAGTA
ACAACCTTTTATTAATTTATTTTGTGTCTTTCCAGAATTTCTATATATATAGGAATGTGATAT
GAATCTATATGTGAATTGAATCTACATGAATATTGATGACTTTTATTTCCCTTTTGCACAT
AAGATAGAATATTTTACCTACTATTCCACACTTTGCTTTTCTTAACATATCATGGGATCTTT
TTATATAAGTGAACAAAGAGTTTCTTCATTCTTTCACACAGTTTAATTAAGACCTCGAAGGG
GACTTGGGGGGTTCGGGGCTTTTCGGGGGCGGTTCGGGGGTTTCGCGGACCCGGGAAGCTCTGAG
GACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGCCGCCCTCCGTAACCTTTCCAGTCTCC
GAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAAGGCGCCACGGCGGGAGACAGGTGTTGCG
GCCCCGCAGCGCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCTCGGCGGCGCCCGGCCAG
GACCCGCCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGACCCCCGCCCGG
CCCCGCCGCGCTTCTCTCCGACGCAGAGCAAACGCCAGAGTAGAAGCC**ATGGATTGGGGC**
ACGCTGCAGACGATCCTGGGGGGTGTGAACAAACACTCCACCAGCATTGGAAAGATCTGGCT
CACCGTCCTCTTCATTTTTTCGCATTATGATCCTCGTTGTGGCTGCAAAGGAGGTGTGGGGAG
ATGAGCAGGCCGACTTTGTCTGCAACACCCCTGCAGCCAGGCTGCAAGAACGTGTGCTACGAT
CACTACTTCCCCATCTCCACATCCGGCTATGGGCCCTGCAGCTGATCTTCGTGTCCACGCC
AGCGCTCCTAGTGGCCATGCACGTGGCCTACCGGAGACATGAGAAGAAGAGGAAGTTCATCA
AGGGGGAGATAAAGAGTGAATTTAAGGACATCGAGGAGATCAAAACCCAGAAGGTCCGCATC
GAAGGCTCCCTGTGGTGGACCTACACAAGCAGCATCTTCTTCCGGGTCATCTTCAAGCCGC
CTTCATGTACGTCTTCTATGTACGTACGACGGCTTCTCCATGCAGCGGCTGGTGAAGTGCA
ACGCTGGCCTTGTCCCAACACTGTGGACTGCTTTGTGTCCCGGCCACGGAGAAGACTGTC
TTACAGTGTTTCATGATTGCAGTGTCTGGAATTTGCATCCTGCTGAATGTCACTGAATTGTG
TTATTTGCTAATTAGATATTGTTCTGGGAAGTCAAAAAAGCCAGTTTAAAGGCGCGCCACCC

CTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAAGAAATAGACAGCATGAGAGGGATGA
GGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGAC
CTTAAATGCAACCATTGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGCCACAATGGA
GCTCTGCTCCCCCTAAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTTC
ACTTAAGTTAGTTCCACTGAGACCCCAGGCTGTTAGGGGTATTGGTGTAAGGTACTTTTCAT
ATTTTAAACAGAGGATATCGGCATTTGTTTCTTCTCTGAGGACAAGAGAAAAAGCCAGGT
TCCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCCTGGGGTTCTTTTTGCCAACTTTCCCC
ACGTTAAAGGTGAACATTGGTTCTTTTCATTTGCTTTGGAAGTTTTAATCTCTAACAGTGAC
AAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATA
GGTTATTTTTGATGTAAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCA
GATTGTAATATGTAAATGGTATGTCATTGCTACTATGATTTAATTTGAAATATGGTCTTTT
GGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCATAGCA
CCTAACAAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATG
ATAGCAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGAT
GTACCACCAACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTG
TGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTGACACA
GTACCATTTAATGGGGAGGACAAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAAC
AGATTTGAAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAA
GTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAGTGAAAATATAGCTAATAACATGTG
AAAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGA
ATATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTTCAGTGAGGGT
AAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTGTAATAATAAAGAATAGCT
TTAATGATATGCTTGTAATAAAAAATAATTTTGTAAATGTATCAAATACATTTAAAAACATTAA
ATATAATCTCTATAATAATTTAAAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTT
ATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGT
TGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCC
GTATGGCTTTTCATTTTCTCCTCCTTGATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTG
TGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGG
TTGGGGCATTGCCACCACCTGTGAGCTCCTTTCCGGGACTTTCGCTTTCCCCCTCCCTATTG
CCACGGCGGAACTCATCGCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGC
ACTGACAATTCCGTGGTGTGTCGGGGAAATCATCGTCCTTTTCCCTGGCTGCTCGCCTATGT
TGCCACCTGGATTCTGCGCGGGACGTCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGG
ACCTTCCTTTCCCGCGGCTGCTGCCGGCTCTGCGGCCTCTTCCGCGCTCTTCGCTTCGCCCT
CAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGCGAATTCATCGATACCGAGCGCTGCT
CGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTG
TTTGCCCCCTCCCCCGTGCCTTCCCTTGACCCTGGAAGGTGCCACTCCCACTGTCTTTTCTTAA
TAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCAATCTATTCTGGGGGTGGGGT
GGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCG
GACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCT
CGCTCACTGAGGCCGGGCGACCAAAGGTCGCCCGACGCCGGGCTTTGCCCGGGCGGCCTCA
GTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCA
TCTGTGCGGTATTTACACCGCATACTGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGC
ATTAAGCGCGGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAG
CGCCCGCTCCTTTTCGCTTTTCTTCCCTTCTTCTCGCCACGTTGCGCGGCTTTCCCCGTCAA
GCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCCAA
AAAACCTTGATTTGGGTGATGGTTACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCC
CTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACCTGGAACAACACTC
AACCTATCTCGGGCTATTCTTTTGAATTTATAAGGGATTTTGGCGATTTTCGGCCTATTGGTT
AAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACAAAATATTAACGTTTACAA
TTTTATGGTGCCTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACAC
CCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCCGCTTACAGACA

AGCTGTGACCGTCTCCGGGAGCTGCATGTGTGTCAGAGGTTTTACCGTTCATCACCGAAACGCG
 CGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTT
 TCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTT
 CTAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCCTGATAAATGCTTCAATAAT
 ATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTGCGCCCTTATTCCTTTTTTTCGCG
 GCATTTTTCCTTCTGTTTTTGTCTCACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGA
 TCAGTTGGGTGCACGAGTGGGTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGA
 GTTTTTCGCCCCGAAGAAGCTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCG
 GTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCCGCATACACTATTCTCAGAA
 TGACTTGGTTGAGTACTACCAAGTACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAG
 AATTATGCAGTGTGCCATAACCATGAGTGATAAACTGCGGCCAACTTACTTCTGACAACG
 ATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACCTGCCT
 TGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00123] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 68. An exemplary nucleotide sequence for vector c81.2 encoding mouse GJB2 is set forth in SEQ ID NO: 68 (hGJB2 GRE2 underlined; mouse GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAAGTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCCTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
 TTCATTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
 CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
 CGGTGGTTTTGTTGCCGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGC
 AGAGCGCAGATACCAATACTGTCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
 CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
 GCGATAAGTCGTGTCTTACCAGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
 TCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
 GAGATACCTACAGCGTGAGCTATGAGAAAAGCGCCACGCTTCCCAGAGGAGAAAGGCGGACA
 GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
 GCCTGGTATCTTTATAGTCCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
 ATGCTCGTCAGGGGGGCGAGCCTATGGAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
 TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
 GAGGCCCGCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
 GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTGCGGCCGCACGCGTC
 AGTGATGCCTGAAACCTCAGATGGTACTGAACCTCTATATAATCTGTTTTTTCCTATACAT
ACAAACCTACCATAAGGCTTAATGGTAAGAGATTAACAATAAAGAATAATAAAACAACACTT
ATAACAATGTATAACAATATATTGTAATATAAGTTTTTGGATGCAGTCTCTCTCTCAAAATG
CTATCATATTTTCCAACCTGTGGTTGACTACAGGTAAGTGAACCAACAAAAATGAAACAGTGG
ATAAGAGGGCGACTCCTGTACCAAAAGAAAAAATAGAGTGTGTCAGCTGTAACATAGTTGAA
TGACTGAGTTAGACTGCATAACTGACACACAAAACCATATAAATATAAATGAAGGAATCTCT
GGGTGTAATCTGGTGCAAAGGTGACTGTGTTAATCATTAATCCACAAGTTGCTATCCTGAAG

TGTGCCAAATGCTTTATGTTTATTTTCATCACATAGCTCTATAAAGAAAGGATTTGTAATTCC
TTTCTACAGAAGTGGAAGTAAGTCTTAAGACTCAAAAACTTTAAAACTACAATGAAGTA
ACAACTTTTATTAATTTATTTTGTGTCTTTCCAGAATTTCTATATATATAGGAATGTGATAT
GAATCTATATGTGAATTGAATCTACATGAATATTGATGACTTTTATTTCCCTTTTGCACAT
AAGATAGAATATTTTACCTACTATTCCACACTTTGCTTTTCTTAACATATCATGGGATCTTT
TTATATAAGTGAACAAAGAGTTTCTTCATTCTTTACACAGTTTAATTAAGACCTCGAAGGG
GACTTGGGGGGTTCGGGGCTTTTCGGGGGCGGTTCGGGGTTTCGCGGACCCGGAAGCTCTGAG
GACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGCCGCCCTCCGTAACCTTTCCAGTCTCC
GAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAAGGCGCCACGGCGGGAGACAGGTGTTGCG
GCCCCGAGCGCCCGCGCGCTCCTCTCCCCGACTCGGAGCCCTCGGCGGCGCCCGGCCAG
GACCCGCCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACGCCGAGACCCCCGCCCGG
CCCCGCCGCGCTTCTCCCCGACGAGCAGAAACGCCAGAGTAGAAGCC**ATGGATTGGGGC**
ACACTCCAGAGCATCCTCGGGGGTGTCAACAAACACTCCACCAGCATTGGAAAGATCTGGCT
CACGGTCCTCTTCATCTTCCGCATCATGATCCTCGTGGTGGCTGCAAAGGAGGTGTGGGGAG
ATGAGCAAGCCGATTTTGTCTGCAACACGCTCCAGCCTGGCTGCAAGAATGTATGCTACGAC
CACCACTTCCCCATCTCTCACATCCGGCTCTGGGCTCTGCAGCTGATCATGGTGTCCACGCC
AGCCCTCCTGGTAGCTATGCATGTGGCTACCGGAGACATGAAAAGAAACGGAAGTTTCATGA
AGGGAGAGATAAAGAACGAGTTTAAGGACATCGAAGAGATCAAAACCCAGAAGGTCCGTATC
GAAGGGTCCCTGTGGTGGACCTACACCACCAGCATCTTCTTCCGGGTCATCTTTGAAGCCGT
CTTCATGTACGTCTTTTACATCATGTACAATGGCTTCTTCATGCAACGTCTGGTGAAATGCA
ACGCTTGGCCCTGCCCAATACAGTGGACTGCTTCATTTCCAGGCCACAGAAAAGACTGTC
TTCACCGTGTTTATGATTTCTGTGTCTGGAATTTGCATTCTGCTAAATATCACAGAGCTGTG
CTATTTGTTCTGTTAGGTATTGCTCAGGAAAGTCCAAAAGACCAGTCTACCCATACGATGTTT
CAGATTACGCTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATT
AAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCT
AGCATTTCCCAACACAAAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCTC
AGGTGAAACTCCAGATGCCACAATGGAGCTCTGCTCCCTAAAGCCTCAAAACAAAGGCCTA
ATTCTATGCCTGTCTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCAGGCTGTTA
GGGGTTATTGGTGTAAGGTACTTTTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTC
TCTGAGGACAAGAGAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCTCT
CTGGGGTTCTTTTTGCCAATTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCATTTGCTT
TGGAAGTTTTTAATCTCTAACAGTGGACAAAGTTACCAGTGCCTTAAACTCTGTACACTTTT
TGGAAGTGAAAACTTTGTAGTATGATAGGTTATTTTGATGTAAAGATGTTCTGGATACCATT
ATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTTCGCTACT
ATGATTTAATTTGAAATATGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTG
TCTGTTGTATTTCATTGTGGTCATAGCACCTAACACATTGTAGCCTCAATCGAGTGAGACAG
ACTAGAAGTTCCTAGTGATGGCTTATGATAGCAATGGCCTCATGTCAAATATTTAGATGTA
ATTTTGTGTAAGAAATACAGACTGGATGTACCACCACTACTACCTGTAATGACAGGCCTGT
CCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAAGCTGATTTAAAG
AGGTGCTTGGGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGGG
GAGGGAGAAGTTTCTGTCTGTTAAAAACAGATTTGGAAAGACTGGACTCTAAAGTCTGTTGAT
TAAAGATGAGCTTTGTCTACTTCAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTT
AAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAAATATTGA
GCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTTCAAAAAA
TGGTACTCCACATATTTTCAGTGAGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAA
AGCATTTTGTAAATAATAAAGAAATAGCTTTAATGATATGCTTGTAATAAATAATTTGTAA
TGTATCAAATACATTTAAACATTTAAATATAATCTCTATAATAATTTAAATCTAATATGG
TTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGA
AAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAA
TGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCATTTTCTCCTCCTTGATAAATCC
TGGTTGCTGTCTTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCAC

TGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCG
GGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACTCATCGCCGCCTGCCTTGCCCGC
TGCTGGACAGGGGCTCGGCTGTTGGGGCACTGACAATTCCGTGGTGTGTCGGGGAAATCATC
GTCCTTTTCTTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCTTCTGCT
ACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCCTGCTGCCGGCTCTGCGG
CCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGGCCGCTCCCC
GCGAATTTCATCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTG
TGCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCCTTGACCCTGGAA
GGTGCCACTCCCACTGTCCTTTCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAG
GTGTCAATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACA
ATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCGCAGGAACCCCTAGTGATGGAGT
TGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTCGCCCCGA
CGCCCCGGGCTTTGCCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCG
CCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCA
ACCATAGTACGCGCCCTGTAGCGGCGCATTAAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCG
TGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCTTTCTC
GCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATT
TAGTGCTTTACGGCACCTCGACCCCAAAAACTTGATTTGGGTGATGGTTACAGTAGTGGGC
CATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGA
CTCTTGTTCCAACTGGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAGG
GATTTTGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGA
ATTTTAACAAAAATATTAACGTTTACAATTTTATGGTGCACTCTCAGTACAATCTGCTCTGAT
GCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTG
TCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTCAGA
GGTTTTTACCGTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTTA
TAGGTTAATGTCATGATAATAATGGTTTCTTAGACGTCAGGTGGCACTTTTTCGGGGAAATGT
GCGCGGAACCCCTATTTGTTTATTTTCTAAATACATTCAAATATGTATCCGCTCATGAGAC
AATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTT
CGTGTCGCCCTTATTTCCCTTTTTTTCGGCATTTTGCCTTCTGTTTTTGCTCACCCAGAAAC
GCTGGTGAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTACATCGAACTGG
ATCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCGAAGAACGTTTTTCCAATGATGAGC
ACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACT
CGGTGCGCCGCATACACTATTCTCAGAATGACTTGGTTGAGTACTCACCAGTCACAGAAAAGC
ATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAAC
ACTGCGGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCA
CAACATGGGGGATCATGTAACCTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATAC
CAAACGACGAGCGTGACACCA

[00124] In some embodiments, an AAV vector described herein comprises an AAV 5' ITR, a *GJB2* GRE enhancer (*hGJB2* GRE3), a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, Kozak sequence, nucleotide sequence encoding a gene product (e.g., *GJB2* or GFP), a *GJB2* exon 2 3' UTR, a WPRE, a bovine growth hormone poly A signal, and an AAV 3' ITR (e.g., vector c.81.3).

[00125] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 49. An exemplary nucleotide sequence

for vector c.81.3 is set forth in SEQ ID NO: 49 (*hGJB2* GRE3 underlined; eGFP coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACCTGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
TTCATTTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTTGTTTGGCGGATCAAGAGCTACCAACTCTTTTTTCCGAAGGTAACCTGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCAGGTTGGACTCAAGACGATAGTTACCAGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAAGCGCCACGCTTCCCGAAGGGAGAAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCCTGTGCGGTTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTGCGGCCGCACGCGTG
CTATCTATCATCTTGAAGGGCTTCTGGAACAAGTTAGAATAGAGTCAACACTCATGAAGTGC
TGTAAGCAAAAAAACTATAGATGTAGGATTGACAAGGGCAATAGAGCGATGACTCCCTGGCT
GTGTTGTATTTGATGGACGGCAGTAGCTTTTACAAAATGCTCATTGATGTTTCAAATTA
AAACGTTTCACTTTCTAGAACCAATTACGTGGTCAGTTTAGCTCCTGAGGTCCCAGTCAGAG
GGGTATTCTGTAGCTTGCAAAGCCTCTCTTTGGGGACTGGACATGGAGTCTGTGGTCTTAGA
ATTCAGAACCGGGAGAATGTGTTAGCCACTCATCTAAGCTATTCCTTAAACGCTTTTCAGAGC
CATCTCCACTGTGGGGAAAGAAGTTCTTTGTGTTCTCTGACTTAGTCTCATTCTAAAAA
AAAAAAAAAAAAAAAAAAGCAATTGCAATACCCAGAGCGCACAGTAGATGGCACTGAGACT
TGTCGGAAAGCTGGACGCACTCAAGAGGTGGCAGAAAAATCTATAGGTAAGCTTTTTCTTCTA
GTCTGGTGTGCTGCTCCTGACCTTATTAATGGGCTGAGAAAATAGATTTCTTTCTTTCTT
TTCTTTTTTATATGAAATTAATGAAGTATAAAAGAATATGAGAATGTGTTGCTATTAGCAA
GGATAAGTAATGCTTTAGGAAACGTTTGGTTCATGTGTGTGTTTTCAGACTGATGTGTGTCC
TGGATCCAGTGTAATGTACTTCTGTCTGTAGGTCTCTGCCACAGAAAAGTTGGAAAAGCCA
TTGTTGTATTCCATTTCCAGGGCAACAAAAGATACCACTGTCACTTCATGTGAAATGGTGT
GTTTAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTCGGGGGCGGTTCGGGGGT
CGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCGCGCGCCGCC
CTCCGTAACTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGCGGTTAAAGGCGCC
ACGGCGGGAGACAGGTGTTGCGGCCCCGCAGCGCCCGCGCGCTCCTCTCCCGACTCGGAGC
CCCTCGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCC
AACGCCGAGACCCCGCCCGGCCCGCCGCGCTTCTCCCGACGCAGAGCAAACCGCCAG
AGTAGAAGCC**ATGGTGAGCAAGGGCGAGGAGCTGTTACCGGGGTGGTGCCCATCTGGTGC**
AGCTGGACGGCGACGTAAACGGCCACAAGTTCAGCGTGTCCGGCGAGGGCGAGGGCGATGCC
ACCTACGGCAAGCTGACCCTGAAGTTCATCTGCACCACCGGCAAGCTGCCCGTGCCCTGGCC
CACCCTCGTGACCACCCTGACCTACGGCGTGCAGTGCTTCAGCCGCTACCCCGACCACATGA
AGCAGCACGACTTCTTCAAGTCCGCCATGCCCGAAGGCTACGTCCAGGAGCGCACCATCTTC
TTCAAGGACGACGGCAACTACAAGACCCGCGCCGAGGTGAAGTTCGAGGGCGACACCTGGT
GAACCGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGGCACAAAGC

TGGAGTACAACTACAACAGCCACAACGTCTATATCATGGCCGACAAGCAGAAGAACGGCATC
AAGGTGAACTTCAAGATCCGCCACAACATCGAGGACGGCAGCGTGCAGCTCGCCGACCCTA
CCAGCAGAACACCCCCATCGGCGACGGCCCCGTGCTGCTGCCCCGACAACCCTACCTGAGCA
CCCAGTCCGCCCTGAGCAAAGACCCCCAACGAGAAGCGCGATCACATGGTCCTGCTGGAGTTC
GTGACCGCCCGGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAAAGGCGCGCCACCCC
TGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAAGAAATAGACAGCATGAGAGGGATGAG
GCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACC
TTAAATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGCCACAATGGAG
CTCTGCTCCCCCTAAAGCCTCAAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTTCA
CTTAAGTTAGTTCCACTGAGACCCAGGCTGTTAGGGGTTATTGGTGTAAAGTACTTTTCATA
TTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAAGCCAGTT
CCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCTCGGGTTCTTTTTGCCAACCTTTCCCCA
CGTTAAAGGTGAACATTGGTTCTTTTCATTTGCTTTGGAAGTTTTAATCTCTAACAGTGGACA
AAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATAG
GTTATTTTGTATGTAAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAG
ATTGTAATATGTAAATGGTATGTCATTTCGCTACTATGATTTAATTTGAAATATGGTCTTTTG
GTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCATAGCAC
CTAACAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGA
TAGCAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATG
TACCACCAACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGT
GGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTGCGTTGGGAATTTTATTGACACAG
TACCATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTGCTTAAAAACA
GATTTGGAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAG
TTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAAGTGAAAAATATAGCTAATAACATGTGA
AAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAA
TATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTTCAGTGAGGGTA
AGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTGTGTAATAATAAAGAATAGCTT
TAATGATATGCTTGTAATAAATAAATTTTGTAAATGTATCAAATACATTTAAACATTAAAA
TATAATCTCTATAATAATTTAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTA
TCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTT
GCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCG
TATGGCTTTTCATTTTCTCCTCCTTGATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGT
GGCCCGTTGTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGT
TGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTGCTTTCCCCCTCCCTATTGC
CACGGCGGAACATCGCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCA
CTGACAATTCCGTGGTGTGTCGGGGAAATCATCGTCCTTTCTTGGCTGCTCGCCTATGTT
GCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGA
CCTTCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTC
AGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGCGAATTCATCGATACCGAGCGCTGCTC
GAGAGATCTGTGATAGCGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGT
TTGCCCTCCCCGTGCCTTCTTACCCTGGAAGGTGCCACTCCCCTGTCCTTTCTTAAT
AAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCAATTCTATTCTGGGGGGTGGGGTG
GGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGG
ACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTC
GCTCACTGAGGCCGGGCGACCAAAGGTCGCCCCGACGCCCCGGCTTTGCCGGGGCGGCCCTCAG
TGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCAT
CTGTGCGGTATTTACACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCA
TTAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGC
GCCCGCTCCTTTGCTTTCTTCCCTTCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAG
CTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAA
AACTTGATTTGGGTGATGGTTACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCC

TTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACTGGAACAACACTCA
 ACCCTATCTCGGGCTATTCTTTTGATTATAAGGGATTTTGCCGATTCGGCCTATTGGTTA
 AAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACAAAATATTAACGTTTACAAT
 TTTATGGTGCACCTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACC
 CGCCAACACCCGCTGACGCGCCCTGACGGGCTTGCTGCTCCCGGCATCCGCTTACAGACAA
 GCTGTGACCGTCTCCGGGAGCTGCATGTGTGAGAGGTTTTACCGTCATCACCGAAACGCGC
 GAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTT
 CTTAGACGTGAGTGGCCTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTTTC
 TAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATA
 TTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTTGCGG
 CATTTTGCTTCTGTTTTTGCTCACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGAT
 CAGTTGGGTGCACGAGTGGGTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAG
 TTTTCGCCCCGAAGAACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGG
 TATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCCGCATACACTATTCTCAGAAT
 GACTTGGTTGAGTACTACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGA
 ATTATGCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGA
 TCGGAGGACCGAAGGAGCTAACCGCTTTTTTGACAACATGGGGGATCATGTAACCTCGCCTT
 GATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00126] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 70. An exemplary nucleotide sequence for vector c.81.3 is set forth in SEQ ID NO: 70 (*hGJB2* GRE3 underlined; human GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAACCTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCCTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACAG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
 TTCATTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATC
 CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAAACAAAAAACCACCGCTACCAG
 CGGTGGTTTGTGTTGCCGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGCTTCAGC
 AGAGCGCAGATACCAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
 CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
 GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
 TCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGAGAGCAACGACCTACACCGAACT
 GAGATACCTACAGCGTGAGCTATGAGAAAAGCGCCACGCTTCCCGAAGGGAGAAAAGGCGGACA
 GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
 GCCTGGTATCTTTATAGTCCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
 ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
 TGGCCTTTTGCTGGCCTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
 GAGGCCGCCGGGCAAAGCCCGGGCTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
 GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCATCACTAGGGGTTCTGCGGCCGCACGCGTG
 CTATCTATCATCTTGAAGGGCTTCTGGAACAAGTTAGAATAGAGTCAACACTCATGAAGTGC
 TGTAGCAAAAAAACTATAGATGTAGGATTGACAAGGGCAATAGAGCGATGACTCCCTGGCT

GTGTTGTATTTGATGGACGGCAGTAGCTTTTACAAAATGCTCATTGGATGTTTCAAATTA
AAACGTTTCACTTTCTAGAACCAATTACGTGGTCAGTTTAGCTCCTGAGGTCCCAGTCAGAG
GGGTATTCTGTAGCTTGCAAAGCCTCTCTTTGGGGACTGGACATGGAGTCTGTGGTCTTAGA
ATTCAGAACCGGGAGAATGTGTTAGCCACTCATCTAAGCTATTCTTAAACGCTTTTCAGAGC
CATCTCCACTGTGGGGAAGAAGTTCTTTGTGTTCTCTGACTTAGTCTCATTCTAAAAA
AAAAAAAAAAAAAAAAAAGCAATTGCAATACCCAGAGCGCACAGTAGATGGCACTGAGACT
TGTCGGAAGCTGGACGCACTCAAGAGGTGGCAGAAAAATCTATAGGTAAGCTTTTCTTCTA
GTCTGGTGTGCTGCTCCTGACCTTATTAATGGGCTGAGAAATAGATTTCTTTCTTTCTT
TTCTTTTTTATATGAAATTAATGAAGTATAAAAGAATATGAGAATGTGTTGCTATTAGCAA
GGATAAGTAATGCTTTAGGAAACGTTTGTTTCATGTGTGTGTTTTAGACTGATGTGTGTCC
TGGATCCAGTGTAATGTACTTCTGTCTGTAGGTCTCTGCCACAGAAAAGTTGGAAAGCCA
TTGTTGTATTCCATTTCCAGGGCAACAAAAGATACCACTGTCACTTCATGTGAAATGGTGT
GTTTAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTCGGGGGCGGTTCGGGGGT
CGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCGCGGCGCCGCC
CTCCGTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGTGCGGTTAAAGGCGCC
ACGGCGGGAGACAGGTGTTGCGGCCCCGCGAGCGCCGCGCGCTCCTCTCCCGACTCGGAGC
CCCTCGGCGGCGCCCGGCCAGGACCCGCCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCC
AACGCCGAGACCCCGCCCGGCCCGCGCGCTTCTCCCGACGCAGAGCAAACCGCCAG
AGTAGAAGCC**ATGGATTGGGGCACGCTGCAGACGATCCTGGGGGGTGTGAACAAACACTCCA**
CCAGCATTGGAAAGATCTGGCTCACCGTCTCTTCAATTTTCGCATTATGATCCTCGTTGTG
GCTGCAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACACCCTGCAGCCAGG
CTGCAAGAACGTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGCTATGGGCCCTGC
AGCTGATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCACGTGGCCTACCGGAGACAT
GAGAAGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAGTGAATTTAAGGACATCGAGGAGAT
CAAAACCCAGAAGGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAAGCAGCATCTTCT
TCCGGGTCACTTTCGAAGCCGCCTTCATGTACGTCTTCTATGTCATGTACGACGGCTTCTCC
ATGCAGCGGCTGGTGAAGTGCAACGCCTGGCCTTGTCCTCAACACTGTGGACTGCTTTGTGTC
CCGGCCCACGGAGAAGACTGTCTTCACAGTGTTCATGATTGCAGTGTCTGGAATTTGCATCC
TGCTGAATGTCACCTGAATTGTGTTATTTGCTAATTAGATATTGTTCTGGGAAGTCAAAAAAG
CCAGTTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAGAA
ATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCAT
TTCCCAACACAAAAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTG
AAACTCCAGATGCCACAATGGAGCTCTGCTCCCTAAAGCCTCAAAACAAAGGCCTAATTCT
ATGCCTGTCTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCAGGCTGTTAGGGGT
TATTGGTGTAAAGTACTTTTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTGA
GGACAAGAGAAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCTCTCTGGG
GTTCTTTTTTGCCAACCTTTCCCCACGTAAAGGTGAACATTGGTTCTTTTCAATTTGCTTTGGAA
GTTTTAATCTCTAACAGTGGACAAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTGGAA
GTGAAAACCTTTGTAGTATGATAGGTTATTTTGATGTAAAGATGTTCTGGATACCATTATATG
TTCCCTCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTGCTACTATGAT
TTAATTTGAAATATGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGT
TGTATTCAATTGTGGTCATAGCACCTAACAACATTGTAGCCTCAATCGAGTGAGACAGACTAG
AAGTTCCTAGTGATGGCTTATGATAGCAAATGGCCTCATGTCAAATATTTAGATGTAATTTT
GTGTAAGAAATACAGACTGGATGTACCACCACTACTACCTGTAATGACAGGCCTGTCCAAC
ACATCTCCCTTTTCCATGACTGTGGTAGCCAGCATCGAAAGAACGCTGATTTAAAGAGGTC
GCTTGGGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGG
AGAAGTTTCTGTCGTTAAAAACAGATTTGGAAAGACTGGACTCTAAAGTCTGTTGATTAAAG
ATGAGCTTTGTCTACTTCAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAGTG
AAAATATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGA
TCTATAGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTA
CTCCACATATTTCAAGTGAGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCAT

TTTGTAATAATAAAGAATAGCTTTAATGATATGCTTGTAACATAAATAATTTTGTAATGTAT
CAAATACATTTAAAACATTAAAATATAATCTCTATAATAATTTAAAATCTAATATGGTTTTA
ATAGAACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGAT
TGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCT
TTGTATCATGCTATTGCTTCCCGTATGGCTTTTCAATTTTCTCCTCCTTGATAAAATCCTGGTT
GCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTGAGGCAACGTGGCGTGGTGTGCACTGTGT
TTGCTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACT
TTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACCTCATCGCCGCCTGCCTTGCCCGCTGCTG
GACAGGGGCTCGGCTGTTGGGCACTGACAAATCCGTGGTGTGTGCGGGGAAATCATCGTCCT
TTCTTTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCTTTCTGCTACGTC
CCTTCCGGCCCTCAATCCAGCGGACCTTCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCT
TCCGCGTCTTTCGCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCGCGCTCCCCGCGAA
TTCATCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTGTGCCT
TCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCCTTGACCCTGGAAGGTGC
CACTCCCACTGTCTTTTCTAATAAAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTC
ATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGC
AGGCATGCTGGGGACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCC
ACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTGCGCCGACGCCC
GGGCTTTGCCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGA
TGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCAACCAT
AGTACGCGCCCTGTAGCGGCGCATTAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACC
GCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCTTTCTCGCCAC
GTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTG
CTTTACGGCACCTCGACCCCCAAAAAACTTGATTTGGGTGATGGTTCACGTAGTGGGCCATCG
CCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTT
GTTCCAAACTGGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAGGGATTT
TGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTTAAACAAAAATTTAACGCGAATTTT
AACAAAATATTAACGTTTACAATTTTATGGTGCCTCTCAGTACAATCTGCTCTGATGCCGC
ATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGC
TCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTGAGAGGTTT
TCACCGTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGT
TAATGTGATGATAATAATGGTTTTCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCG
GAACCCCTATTTGTTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATAA
CCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGT
CGCCCTTATTCCCTTTTTTTCGGCATTTTGCCTTCTGTTTTTGTCTACCCAGAAACGCTGG
TGAAAGTAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTACATCGAACTGGATCTC
AACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAACGTTTTCCAATGATGAGCACTTT
TAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTC
GCCGCATACACTATTCTCAGAATGACTTGTTGAGTACTACCAGTCACAGAAAAGCATCTT
ACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAAAGCATGC
GGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAACA
TGGGGGATCATGTAACCTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAAC
GACGAGCGTGACACCA

[00127] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 71. An exemplary nucleotide sequence

for vector c.81.3 is set forth in SEQ ID NO: 71 (*hGJB2* GRE3 underlined; mouse GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACCTGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
TTCATTTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTTGTTTGGCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCAGGTTGGACTCAAGACGATAGTTACCAGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAAGCGCCACGCTTCCCGAAGGGAGAAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCTGTGCGGTTTTGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTGCGGCCGCACGCGTG
CTATCTATCATCTTGAAGGGCTTCTGGAACAAGTTAGAATAGAGTCAACACTCATGAAGTGC
TGTAAGCAAAAAAACTATAGATGTAGGATTGACAAGGGCAATAGAGCGATGACTCCCTGGCT
GTGTTGTATTTGATGGACGGCAGTAGCTTTTACAAAATGCTCATTGATGTTTCAAATTA
AAACGTTTCACTTTCTAGAACCAATTACGTGGTCAGTTTAGCTCCTGAGGTCCCAGTCAGAG
GGGTATTCTGTAGCTTGCAAAGCCTCTCTTTGGGGACTGGACATGGAGTCTGTGGTCTTAGA
ATTGAGAACCGGGAGAATGTGTTAGCCACTCATCTAAGCTATTCCTTAAACGCTTTTCAGAGC
CATCTCCACTGTGGGGAAAGAAGTTCTTTGTGTTCTCTGACTTAGTCTCATTCTAAAAA
AAAAAAAAAAAAAAAAAAGCAATTGCAATACCCAGAGCGCACAGTAGATGGCACTGAGACT
TGTCGGAAGCTGGACGCACTCAAGAGGTGGCAGAAAAATCTATAGGTAAGCTTTTCTTCTA
GTCTGGTGTGCTGCTCCTGACCTTATTAATGGGCTGAGAAAATAGATTTCTTTCTTTCTT
TTCTTTTTTATATGAAATTAATGAAGTATAAAAGAATATGAGAATGTGTTGCTATTAGCAA
GGATAAGTAATGCTTTAGGAAACGTTTGGTTCATGTGTGTGTTTTCAGACTGATGTGTGTCC
TGGATCCAGTGTAATGTACTTCTGTCTGTAGGTCTCTGCCACAGAAAAGTTGGAAAAGCCA
TTGTTGTATTCCATTTCCAGGGCAACAAAAGATACCACTGTCACTTCATGTGAAATGGTGT
GTTTAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTCGGGGGCGGTGCGGGGT
CGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCGCGCGCCGCC
CTCCGTAACTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGCGGTTAAAGGCGCC
ACGGCGGGAGACAGGTGTTGCGGCCCCGCGAGCGCCCGCGCTCCTCTCCCGACTCGGAGC
CCCTCGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCC
AACGCCGAGACCCCGCCCGGCCCGCCGCGCTTCTCCCGACGCAGAGCAAACCGCCAG
AGTAGAAGCC**ATGGATTGGGGCACACTCCAGAGCATCCTCGGGGGTGTCAACAAACACTCCA**
CCAGCATTGGAAAGATCTGGCTCACGGTCCTCTTCATCTTCCGCATCATGATCCTCGTGGTG
GCTGCAAAGGAGGTGTGGGGAGATGAGCAAGCCGATTTTGTCTGCAACACGCTCCAGCCTGG
CTGCAAGAATGTATGCTACGACCACCACTTCCCCATCTCTCACATCCGGCTCTGGGCTCTGC
AGCTGATCATGGTGTCCACGCCAGCCCTCCTGGTAGCTATGCATGTGGCCTACCGGAGACAT
GAAAGAAACGGAAGTTCATGAAGGGAGAGATAAAGAACGAGTTTAAGGACATCGAAGAGAT
CAAAACCCAGAAGGTCCGTATCGAAGGGTCCCTGTGGTGGACCTACACCACCAGCATCTTCT

TCCGGGTCATCTTTGAAGCCGTCTTCATGTACGTCTTTTACATCATGTACAATGGCTTCTTC
ATGCAACGTCTGGTGAAATGCAACGCTTGGCCCTGCCCAATACAGTGGACTGCTTCATTTT
CAGGCCCACAGAAAAGACTGTCTTCACCGTGTTTATGATTTCTGTGTCTGGAATTTGCATTC
TGCTAAATATCACAGAGCTGTGCTATTTGTTTCGTTAGGTATTGCTCAGGAAAGTCCAAAAGA
CCAGTCTACCCATACGATGTTCCAGATTACGCTTAAAGGCGCGCCACCCCTGCAGGGAATTC
CGCATTGCCAGTTGTTAGATTAAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCT
CAGCTGTCAAGGCTCAGTCGCTAGCATTTCACACACAAAGATTCTGACCTTAAATGCAACC
ATTTGAAACCCCTGTAGGCCTCAGGTGAACTCCAGATGCCACAATGGAGCTCTGCTCCCT
AAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTTCACTTAAGTTAGTT
CCACTGAGACCCAGGCTGTTAGGGGTATTGGTGTAAGGTACTTTTCATATTTTAAACAGAG
GATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCACAGAGGACA
CAGAGAAGGTTTGGGTGTCTCCTGGGGTTCTTTTTGCCAACTTTCCCCACGTTAAAGGTGA
ACATTGGTTCTTTTCATTTGCTTTGGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTG
CCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATAGGTTATTTTGATG
TAAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGT
AAATGGTATGTCATTGCTACTATGATTTAATTTGAAATATGGTCTTTTGTTATGAATACT
TTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCATAGCACCTAACAAACATTG
TAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAAATGGCC
TCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCAACTA
CTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCAT
CGGAAAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATG
GGGAGGACAAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAACAGATTTGGAAAGA
CTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAGTTTGTGTTGCTTA
CCCCTTCAGCCTCCAATTTTTTAAAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAG
CTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTAT
GCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTTCAGTGAGGGTAAGTATTTTCCTG
TTGTCAAGAATAGCATTGTAAAAGCATTTTGTAAATAATAAAGAATAGCTTTAATGATATGCT
TGTAATAAAAAATAATTTTGTAAATGTATCAAATACATTTAAAAACATTAAAAATATAATCTCTAT
AATAATTTAAAAATCTAATATGGTTTAAATAGAACAGCGATATCAAGCTTATCGATAATCAAC
CTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACG
CTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCAT
TTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCA
GGCAACGTGGCGTGGTGTGCACTGTGTTGCTGACGCAACCCCCACTGGTTGGGGCATTGCC
ACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACT
CATCGCCGCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCGG
TGGTGTGTCGGGGAAATCATCGTCTTTCCCTTGGCTGCTCGCCTATGTTGCCACCTGGATT
CTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCTCTCCCG
CGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCTTCGCCCTCAGACGAGTCGGA
TCTCCCTTTGGGCCGCTCCCGCGAATTCATCGATAACGAGCGCTGCTCGAGAGATCTGTG
ATAGCGGCCATCAAGCTGGCTGTGCCCTTCTAGTTGCCAGCCATCTGTTGTTTGCCCCCTCCCC
CGTGCCTTCTTGACCCTGGAAGGTGCCACTCCCACTGTCTTTCTTAATAAAATGAGGAAA
TTGCATCGCATTGCTGAGTAGGTGTCATTCTATTCTGGGGGTGGGGTGGGGCAGGACAGC
AAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCG
CAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGC
CGGGCGACCAAAGTTCGCCGACGCCGGGCTTTGCCCGGGCGGCCTCAGTGAGCGAGCGAG
CGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATT
TCACACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAGCGCGGCG
GGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTT
CGCTTTCTTCCCTTCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGG
GGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAACTTGATTTG
GGTGATGGTTACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGA

GTCCACGTTCTTTAATAGTGGACTCTTGTTCCAACTGGAACAACACTCAACCCCTATCTCGG
 GCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCTG
 ATTTAACAAAAATTTAACGCGAATTTTAACAAAATATTAACGTTTACAATTTTATGGTGCAC
 TCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCG
 CTGACGCGCCCTGACGGGCTTGCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTC
 TCCGGGAGCTGCATGTGTGTCAGAGGTTTTACCGTTCATCACCAGAACGCGCGAGACGAAAGGG
 CCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTTCTTAGACGTCAG
 GTGGCACTTTTCGGGGAATGTGCGCGGAACCCCTATTTGTTTATTTTTCTAAATACATTCA
 AATATGTATCCGCTCATGAGACAATAACCCCTGATAAATGCTTCAATAATATTGAAAAAGGAA
 GAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTTGCGGCATTTTGCCTTC
 CTGTTTTTGCTCACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCA
 CGAGTGGGTTACATCGAAGTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTCGCCCCGA
 AGAACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTA
 TTGACGCCGGGCAAGAGCAACTCGGTGCGCGCATACACTATTCTCAGAATGACTTGGTTGAG
 TACTCACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGC
 TGCCATAACCATGAGTGATAACACTGCGGCCAATTACTTCTGACAACGATCGGAGGACCGA
 AGGAGCTAACCGCTTTTTTGACAACATGGGGGATCATGTAAGTTCGCTTGATCGTTGGGAA
 CCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00128] In some embodiments, an AAV vector described herein comprises an AAV 5' ITR, a *GJB2* GRE enhancer (*hGJB2* GRE4), a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, Kozak sequence, nucleotide sequence encoding a gene product (e.g., *GJB2* or GFP), a *GJB2* exon 2 3' UTR, a WPRE, a bovine growth hormone poly A signal, and an AAV 3' ITR (e.g., vector c.81.4).

[00129] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 72. An exemplary nucleotide sequence for vector c.81.4 is set forth in SEQ ID NO: 72 (*hGJB2* GRE4 underlined; eGFP coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAAGTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
 TTCATTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATC
 CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
 CGGTGGTTTGTGTGCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGC
 AGAGCGCAGATACCAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
 CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
 GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
 TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCCAGCTTGAGAGCAACGACCTACACCGAACT
 GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA

GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCCTGTCTGGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCCGGGCAAAGCCCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACTCCATCACTAGGGGTTCTGCGGCCGCACGCGTA
ACTGGGCAATGCGTTAAACTGGCTTTTTTGAATTCCCAGAACAAATATCTAATTAGCAAATAA
CACAAATTCAGTGACATTCAGCAGGATGCAAATTCAGACACTGCAATCATGAACACTGTGAA
GACAGTCTTCTCCGTGGGCGGGGACACAAAGCAGTCCACAGTGTTGGGACAAGGCCAGGCGT
TGCACTTTCACCAGCCGCTGCATGGAGAAGCCGTCGTACATGACATAGAAGACGTACATGAAG
GCGGCTTCGAAGATGACCCGGAAGAAGATGCTGCTTGTGTAGGTCCACCACAGGGAGCCTTC
GATGCGGACCTTCTGGGTTTTGATCTCCTCGATGTCTTAAATTCACTCTTTATCTCCCCCT
TGATGAACTTCTCTTCTTCTCATGTCTCCGGTAGGCCACGTGCATGGCCACTAGGAGCGCT
GGCGTGGACACGAAGATCAGCTGCAGGGCCCATAGCCGGATGTGGGAGATGGGGAAGTAGTG
ATCGTAGCACACGTTCTTGACGCTGGCTGCAGGGTGTTCAGACAAAGTCGGCCTGCTCAT
CTCCCCACACCTCCTTTGCAGCCACAACGAGGATCATAATGCGAAAAATGAAGAGGACGGTG
AGCCAGATCTTTCCAATGCTGGTGGAGTGTGTTTACACCCCCCAGGATCGTCTGCAGCGT
GCCCCAATCCATCTTCTACTCTGGGCGGTTTGTCTGAAAAAGACGAATGCACACAACACAG
GAATCACTAGCTAGGACAGAACAGGGAGACTTCTCTGAGTCTGGGTAAGCAAGCATGCTTAA
ATCTCTTCTGAGCAAACACCAACTCTTACACAACCTCACCAAAACAGGTGAAGACAGAACC
AACTTAGTTTGTCTTAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTTCGGGGG
CGGTTCGGGGGTTCGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCG
CGGCGCCGCCCCCTCCGTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGG
TAAAAGGCGCCACGGCGGGAGACAGGTGTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCC
CCGACTCGGAGCCCCCTCGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAG
CGCAGAGACCCCAACGCCGAGACCCCCGCCCCGCCCCGCGCTTCTCCCGACGCAGAG
CAAACCGCCAGAGTAGAAGCC**ATGGTGAGCAAGGGCGAGGAGCTGTTACACGGGGTGGTG**
CCATCCTGGTTCGAGCTGGACGGCGACGTAAACGGCCACAAGTTCAGCGTGTCCGGCGAGGGC
GAGGGCGATGCCACCTACGGCAAGCTGACCCTGAAGTTCATCTGCACCACCGGCAAGCTGCC
CGTGCCCTGGCCCCACCCTCGTGACCACCCTGACCTACGGCGTGCAGTGCTTACGCCGTACC
CCGACCACATGAAGCAGCACGACTTCTTCAAGTCCGCCATGCCCGAAGGCTACGTCCAGGAG
CGCACCATCTTCTTCAAGGACGACGGCAACTACAAGACCCGCGCCGAGGTGAAGTTCGAGGG
CGACACCCTGGTGAACCGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCC
TGGGGCACAAGCTGGAGTACAACATAACAGCCACAACGTCTATATCATGGCCGACAAGCAG
AAGAACGGCATCAAGGTGAACCTTCAAGATCCGCCACAACATCGAGGACGGCAGCGTGCAGCT
CGCCGACCACTACCAGCAGAACACCCCCATCGGCGACGGCCCCGTGCTGCTGCCCCGACAACC
ACTACCTGAGCACCCAGTCCGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTC
CTGCTGGAGTTCGTGACCGCCGCGGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAATA
AAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAAGAAATAGACAG
CATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAAC
ACAAAGATTCTGACCTTAAATGCAACCATTGAAACCCCTGTAGGCCTCAGGTGAAACTCCA
GATGCCACAATGGAGCTCTGCTCCCCATAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGT
CTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCAGGCTGTTAGGGGTATTGGTG
TAAGGTACTTTTATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGA
GAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCTCTCTGGGGTTCTTTT
TGCCAACCTTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCAATTGCTTTGGAAGTTTAAAT
CTCTAACAGTGGACAAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGAAAAC
TTTGTAGTATGATAGGTTATTTTGTATGTAAGATGTTCTGGATACCATTATATGTTCCCCCT
GTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTTCGCTACTATGATTTAATTTG
AAATATGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTCA
TTGTGGTCATAGCACCTAACAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCT

AGTGATGGCTTATGATAGCAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTAAGA
AATACAGACTGGATGTACCACCACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCC
CTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTGCGTTGGGA
ATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGGAGAAAGTTT
CTGTCGTTAAAAACAGATTTGGAAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTT
TGTCTACTTCAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAAGTGAAAAATATA
GCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAAATATTGAGCAGATCTATAGG
AAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTTCCAAAAAATGGTACTCCACAT
ATTTTCACTGAGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTTGTAAAT
AATAAAGAATAGCTTTAATGATATGCTTGTAACTAAAATAATTTTGTAAATGTATCAAAATACA
TTTAAACATTAAAAATATAATCTCTATAATAATTTAAATCTAATATGGTTTTAATAGAACA
GCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGT
ATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCA
TGCTATTGCTTCCCGTATGGCTTTTCAATTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTC
TTTATGAGGAGTTGTGGCCCGTTGTGAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGCTGAC
GCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTT
CCCCCTCCCTATTGCCACGGCGGAACCTCATCGCCGCTGCTTGGCCGCTGCTGGACAGGGG
CTCGGCTGTTGGGCACTGACAATTCCGTGGTGTGTCGGGGAAATCATCGTCTTTTCTTGG
CTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGC
CCTCAATCCAGCGGACCTTCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTC
TTCGCCTTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGCGAATTCATCGA
TACCGAGCGCTGCTCGAGAGATCTGTGATAGCGCCATCAAGCTGGCTGTGCCTTCTAGTTG
CCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCTTGAACCTGGAAGGTGCCACTCCCA
CTGTCCTTTCTAATAAAAATGAGGAAATTCATCGCATTGTCTGAGTAGGTGTCAATCTATT
CTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGC
TGGGGACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTC
TCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTCGCCCCAGCCCCGGGCTTTG
CCCCGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTAT
TTTCTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCAACCATAGTACGCG
CCCTGTAGCGGCGCATTAAAGCGCGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACT
TGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCTTTCTCGCCACGTTTCGCCG
GCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGG
CACCTCGACCCCAAAAACTTGATTTGGGTGATGGTTACGTAGTGGGCCATCGCCCTGATA
GACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAA
CTGGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAGGGATTTTGCCGATT
TCGGCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAAACAAAAT
ATTAACGTTTACAATTTTATGGTGCACTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAA
GCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGGCA
TCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTCAGAGGTTTTACCGTCT
ATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCATTTTTTATAGGTTAATGTCA
TGATAATAATGGTTTCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAACCCCT
ATTTGTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCTGATA
AATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTGCCCTTA
TTCCCTTTTTTTCGGCATTTTGCCTTCTGTTTTTGTCTACCCAGAAACGCTGGTGAAAGTA
AAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTACATCGAACTGGATCTCAACAGCGG
TAAGATCCTTGAGAGTTTTCGCCCCGAAGAACGTTTTTCCAATGATGAGCACTTTTAAAGTTC
TGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCCGATA
CACTATTCTCAGAATGACTTGGTTGAGTACTACCAGTCACAGAAAAGCATCTTACGGATGG
CATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACT
TACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCCTTTTTTGCACAACATGGGGGAT

CATGTAACCTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCG
TGACACCA

[00130] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 73. An exemplary nucleotide sequence for vector c.81.4 is set forth in SEQ ID NO: 73 (*hGJB2* GRE4 underlined; human GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAACGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGTAACGTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
TTCATTTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTTGTTTGCCGGATCAAGAGCTACCAACTCTTTTTTCCGAAGGTAACGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCCTGTGCGGTTTTGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAACACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTTGCAGGCCGACGCGTA
ACTGGGCAATGCGTTAACTGGCTTTTTTGAATTTCCAGAACAAATATCTAATTAGCAAATAA
CACAATTCAGTGACATTCAGCAGGATGCAAATTCAGACACTGCAATCATGAACACTGTGAA
GACAGTCTTCTCCGTGGGCCGGGACACAAAGCAGTCCACAGTGTTGGGACAAGGCCAGGCGT
TGCACTTCACCAGCCGCTGCATGGAGAAGCCGTCGTACATGACATAGAAGACGTACATGAAG
GCGGCTTCGAAGATGACCCGGAAGAAGATGCTGCTTGTGTAGGTCCACCACAGGGAGCCTTC
GATGCGGACCTTCTGGGTTTTGATCTCCTCGATGTCCTTAAATTCACCTCTTTATCTCCCCCT
TGATGAACTTCCTCTTCTTCTCATGTCTCCGGTAGGCCACGTGCATGGCCACTAGGAGCGCT
GGCGTGGACACGAAGATCAGCTGCAGGGCCCATAGCCGGATGTGGGAGATGGGGAAGTAGTG
ATCGTAGCACACGTTCTTGCAGCCTGGCTGCAGGGTGTTCAGACAAAGTCGGCCTGCTCAT
CTCCCCACACCTCCTTTGCAGCCACAACGAGGATCATAATGCGAAAAATGAAGAGGACGGTG
AGCCAGATCTTTCCAATGCTGGTGGAGTGTTTGTTCACACCCCCCAGGATCGTCTGCAGCGT
GCCCCAATCCATCTTCTACTCTGGGCGGTTTTGCTCTGGAAAAGACGAATGCACACAACACAG
GAATCACTAGCTAGGACAGAACAGGGAGACTTCTCTGAGTCTGGGTAAGCAAGCATGCTTAA
ATCTCTTCTGAGCAAACACCAACTCTTACACAACCTCACCAAAACAGGTGAAGACAGAACC
AACTTAGTTTGTCAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTTCGGGGG
CGGTGCGGGGTTTCGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCG
CGGCGCCGCCCCCTCCGTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGC

TTAAAAGGCGCCACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCC
CCGACTCGGAGCCCCCTCGGCGGGCGCCCGGCCAGGACCCGCCTAGGAGCGCAGGAGCCCCAG
CGCAGAGACCCCAACGCCGAGACCCCCGCCCCGCCCCGCGCTTCCTCCCGACGCAGAG
CAAACCGCCAGAGTAGAAGCC**ATGGATTGGGGCACGCTGCAGACGATCCTGGGGGGTGTGA**
ACAAACACTCCACCAGCATTGGAAAAGATCTGGCTCACCGTCCTCTTCATTTTTTCGCATTATG
ATCCTCGTTGTGGCTGCAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACAC
CCTGCAGCCAGGCTGCAAGAACGTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGC
TATGGGCCCTGCAGCTGATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCACGTGGCC
TACCGGAGACATGAGAAGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAGTGAATTTAAGGA
CATCGAGGAGATCAAAACCCAGAAGGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAA
GCAGCATCTTCTTCGGGTTCATCTTCGAAGCCGCTTCATGTACGTCTTCTATGTACGTAC
GACGGCTTCTCCATGCAGCGGCTGGTGAAGTGCAACGCCTGGCCTTGTCCCAACACTGTGGA
CTGCTTTGTGTCCCGGCCACGGAGAAGACTGTCTTCACAGTGTTTCATGATTGCAGTGTCTG
GAATTTGCATCCTGCTGAATGTCACTGAATTGTGTTATTTGCTAATTAGATATTGTTCTGGG
AAGTCAAAAAAGCCAGTTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTG
TTAGATTAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTC
AGTCGCTAGCATTTCCCAACACAAAAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGT
AGGCCTCAGGTGAAACTCCAGATGCCACAATGGAGCTCTGCTCCCCCTAAAGCCTCAAAACAA
AGGCCTAATTCTATGCCTGTCTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCAG
GCTGTTAGGGGTATTGTTGTAAGGTACTTTTCATATTTTAAACAGAGGATATCGGCATTTGT
TTCTTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGG
TGTCCTCCTGGGGTTCTTTTTGCCAACTTTCCCCACGTTAAAGGTGAACATTGGTTCTTTCA
TTTGCTTTGGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTGCCTTAAACTCTGTTA
CACTTTTTGGAAGTAAAACCTTTGTAGTATGATAGGTTATTTTGATGTAAAGATGTTCTGGA
TACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATT
CGCTACTATGATTTAATTTGAAATATGGTCTTTTGTTATGAATACTTTGCAGCACAGCTGA
GAGGCTGTCTGTTGTATTCTATTGTGGTCATAGCACCTAACAACATTGTAGCCTCAATCGAGT
GAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAAATGGCCTCATGTCAAATATTT
AGATGTAAATTTTGTTAAGAAATACAGACTGGATGTACCACCACTACTACCTGTAATGACA
GGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAACGCTGA
TTTAAAGAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAATGG
GGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAACAGATTTGGAAAGACTGGACTCTAAAGTC
TGTTGATTAAAGATGAGCTTTGTCTACTTCAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCA
ATTTTTTAAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAA
ATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTC
CAAAAAATGGTACTCCACATATTTCACTGAGGGTAAGTATTTTCCCTGTTGTCAAGAATAGCA
TTGTAAAAGCATTTTGTAAATAATAAAGAATAGCTTTAATGATATGCTTGTAATAATAAATAAT
TTTGTAAATGTATCAAATACATTTAAAAACATTAATAATAATCTCTATAATAATTTAAAAATCT
AATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAA
TTTGTGAAAGATTGACTGGTATTCTTAACATATGTTGCTCCTTTTACGCTATGTGGATACGCT
GCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCATTTTCTCCTCCTTGTA
TAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGG
TGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTC
CTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACTCATCGCCGCTGCCT
TGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTTGGTGTGTCGGGGGA
AATCATCGTCCCTTTCCTTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCC
TTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCCTCCCGCGGCCTGCTGCCGGC
TCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCG
CCTCCCCGGAATTCATCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAG
CTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCTTGAC
CCTGGAAGGTGCCACTCCCACTGTCTTTCCTAATAAAATGAGGAAATTGCATCGCATTTGTC

TGAGTAGGTGTCATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGG
 GAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCGCAGGAACCCCTAGTG
 ATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGT
 CGCCCCGACGCCCGGGCTTTGCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGC
 AGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGT
 CAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAGCGCGGCGGGTGTGGTGGTTACG
 CGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTTCTTCCCTTC
 CTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGT
 TCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAACTTGATTTGGGTGATGGTTCACGT
 AGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAA
 TAGTGGACTCTTGTTCCAAACCTGGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATT
 TATAAGGGATTTTGGCGATTTTCGGCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTT
 AACGCGAATTTTAACAAAATATTAACGTTTACAATTTTATGGTGCACTCTCAGTACAATCTG
 CTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCCGCTGACGCGCCCTGAC
 GGGCTTGTCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATG
 TGTCAGAGGTTTTACCGTTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCT
 ATTTTTATAGGTAAATGTCATGATAATAATGGTTTTCTTAGACGTCAGGTGGCACTTTTCGGG
 GAAATGTGCGCGGAACCCCTATTTGTTTATTTTTCTAAATACATTCAAATATGTATCCGCTC
 ATGAGACAATAACCCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCA
 ACATTTCCGTGTCGCCCTTATTCCCTTTTTTTCGGCATTTTGCCTTCCTGTTTTTGCTCACC
 CAGAAACGCTGGTGAAGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTACATC
 GAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAAGCTTTTCCAAT
 GATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAG
 AGCAACTCGGTGCGGCATACACTATTCTCAGAATGACTTGGTTGAGTACTCACCAGTCACA
 GAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAG
 TGATAACACTGCGGCCAATTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTT
 TTTTGACAACATGGGGGATCATGTAACTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAA
 GCCATACCAAACGACGAGCGTGACACCA

[00131] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 74. An exemplary nucleotide sequence for vector c.81.4 is set forth in SEQ ID NO: 74 (*hGJB2* GRE4 underlined; mouse GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAACCTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCCTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACCTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
 TTCATTTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
 CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAACAAAAAACCACCGCTACCGAG
 CGGTGGTTTTGTTTGGCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGCTTCAGC
 AGAGCGCAGATACCAATACTGTCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
 CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG

GCATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCAGAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCCGGGCAAAGCCCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACTCCATCACTAGGGGTTCCCTGCGGCCGCACGCGTA
ACTGGGCAATGCGTTAAACTGGCTTTTTTGAATTCCCAGAACAAATATCTAATTAGCAAATAA
CACAATTTCAGTGACATTCAGCAGGATGCAAATTCAGACACTGCAATCATGAACACTGTGAA
GACAGTCTTCTCCGTGGGCGGGACACAAAGCAGTCCACAGTGTGGGACAAGGCCAGGCGT
TGCACCTTACCAGCCGCTGCATGGAGAAGCCGTCGTACATGACATAGAAGACGTACATGAAG
GCGGCTTCGAAGATGACCCGGAAGAAGATGCTGCTTGTGTAGGTCCACCACAGGGAGCCTTC
GATGCGGACCTTCTGGGTTTTGATCTCCTCGATGTCCTTAAATTCACCTCTTTATCTCCCCCT
TGATGAACTTCTCTTCTTCTCATGTCTCCGGTAGGCCACGTGCATGGCCACTAGGAGCGCT
GGCGTGGACACGAAGATCAGCTGCAGGGCCCATAGCCGGATGTGGGAGATGGGGAAGTAGTG
ATCGTAGCACACGTTCTTGAGCCTGGCTGCAGGGTGTTCAGACAAAGTCGGCCTGCTCAT
CTCCCCACACCTCCTTTGCAGCCACAACGAGGATCATAATGCGAAAAATGAAGAGGACGGTG
AGCCAGATCTTTCCAATGCTGGTGGAGTGTGTTGTTACACCCCCCAGGATCGTCTGCAGCGT
GCCCCAATCCATCTTCTACTCTGGGCGGTTTGCTCTGGAAAAAGACGAATGCACACAACACAG
GAATCACTAGCTAGGACAGAACAGGGAGACTTCTCTGAGTCTGGGTAAGCAAGCATGCTTAA
ATCTCTTCTGAGCAAACACCAACTCTTACACAACCTCACCAAAACAGGTGAAGACAGAACC
AACTTAGTTTGTCAATTAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTCGGGGG
CGGTGCGGGGTTCGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCG
CGGCGCCGCCCCCTCCGTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGC GG
TAAAAGGCGCCACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCC
CCGACTCGGAGCCCCCTCGGCGGCGCCCCGGCCAGGACCCGCCTAGGAGCGCAGGAGCCCCAG
CGCAGAGACCCCAACGCCGAGACCCCCGCCCCGCCCCGCGCTTCTTCCGACGCAGAG
CAAACCGCCAGAGTAGAAGCC**ATGGATTGGGGCACACTCCAGAGCATCCTCGGGGGTGTCA**
ACAAACACTCCACCAGCATTGGAAGATCTGGCTCACGGTCCTCTTCATCTTCCGCATCATG
ATCCTCGTGGTGGCTGCAAAGGAGGTGTGGGGAGATGAGCAAGCCGATTTTGTCTGCAACAC
GCTCCAGCCTGGCTGCAAGAATGTATGCTACGACCACCACTTCCCCATCTCTCACATCCGGC
TCTGGGCTCTGCAGCTGATCATGGTGTCCACGCCAGCCCTCCTGGTAGCTATGCATGTGGCC
TACCGGAGACATGAAAAGAAACGGAAGTTCATGAAGGGAGAGATAAAGAACGAGTTTAAGGA
CATCGAAGAGATCAAAACCCAGAAGGTCCGTATCGAAGGGTCCCTGTGGTGGACCTACACCA
CCAGCATCTTCTTCCGGGTCTCTTTGAAGCCGTCTTCATGTACGTCTTTTACATCATGTAC
AATGGCTTCTTCATGCAACGTCTGGTGAATGCAACGCTTGGCCCTGCCCCAATACAGTGGA
CTGCTTCATTTCCAGGCCCACAGAAAAGACTGTCTTACCCTGTTTATGATTTCTGTGTCTG
GAATTTGCATTCTGCTAAATATCACAGAGCTGTGCTATTTGTTTCGTTAGGTATTGCTCAGGA
AAGTCCAAAAGACCAGTCTACCCATACGATGTTCCAGATTACGCTTAAAGGCGCGCCACCCC
TGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAAGAAATAGACAGCATGAGAGGGATGAG
GCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACC
TTAAATGCAACCATTGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGCCACAATGGAG
CTCTGCTCCCCATAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTTCA
CTTAAGTTAGTTCCACTGAGACCCAGGCTGTTAGGGGTATTGGTGTAAAGGTACTTTTATA
TTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAGCCAGGTT
CCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCCTGGGGTTCTTTTTGCCAACCTTTCCCCA
CGTTAAAGGTGAACATTGGTTCTTTTCAATTTGCTTTTGAAGTTTTAATCTCTAACAGTGGACA
AAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTTGAAGTGAAAACCTTTGTAGTATGATAG
GTTATTTTGATGTAAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAG

ATTGTAATATGTAAATGGTATGTCATTTCGCTACTATGATTTAATTTGAAATATGGTCTTTTG
GTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCATAGCAC
CTAACAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGA
TAGCAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATG
TACCACCAACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGT
GGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTTCGCTTGGGAATTTTATTGACACAG
TACCATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAACA
GATTTGGAAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAAG
TTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAAGTGAAAATATAGCTAATAACATGTGA
AAAGAATAGAAGCTAAGGTTTAGATAAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAA
TATTGCCATTATGCTTGACATGGTTTTCCAAAAAATGGTACTCCACATATTTTCAAGTGAGGGTA
AGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTGTAATAATAAAGAATAGCTT
TAATGATATGCTTGTAACTAAAATAATTTTGTAAATGTATCAAAATACATTTAAAAACATTAAAA
TATAATCTCTATAATAATTTAAAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTA
TCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTT
GCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCG
TATGGCTTTTCATTTTCTCCTCCTTGTATAAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGT
GGCCCGTTGTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGTCGCAACCCCCACTGGT
TGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGC
CACGGCGGAACATCGCCGCTGCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCA
CTGACAATTCCGTGGTGTGTCGGGGAAATCATCGTCCTTTCCCTGGCTGCTCGCCTATGTT
GCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGA
CCTTCCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTTCGCTTCCGCCCTC
AGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGCGAATTCATCGATACCGAGCGCTGCTC
GAGAGATCTGTGATAGCGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGT
TTGCCCCCTCCCCGTGCCTTCCCTTGACCCTGGAAGGTGCCACTCCCCTGTCTTTCCTAAT
AAAATGAGGAAATTCATCGCATTGTCTGAGTAGGTGTCAATTCTATTCTGGGGGGTGGGGTG
GGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGG
ACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTC
GCTCACTGAGGCCGGGCGACCAAAGGTCGCCCCGACGCCCGGGCTTTGCCCGGGCGGCCCTCAG
TGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCAT
CTGTGCGGTATTTACACCCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCA
TTAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGC
GCCCCGCTCCTTTTCGCTTTCTTCCCTTCCCTTCTCGCCACGTTTCGCGGCTTTCCCCGTCAAG
CTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAA
AACTTGAATTTGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCC
TTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACCTGGAACAACACTCA
ACCCTATCTCGGGCTATTCTTTTGAATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTA
AAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAAACAAAATATTAACGTTTACAAT
TTTATGGTGCACCTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACC
CGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCCGCTTACAGACAA
GCTGTGACCGTCTCCGGGAGCTGCATGTGTCAGAGGTTTTACCGTCATACCGAAACGCGC
GAGACGAAAGGGCCTCGTGATACGCCTATTTTTTATAGGTTAATGTCATGATAATAATGGTTT
CTTAGACGTCAGGTGGCACTTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTC
TAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATA
TTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTGCGCCCTTATTCCCTTTTTTTCGCG
CATTTTGCCTTCTGTTTTTGTCTACCCAGAAACGCTGGTGAAAGTAAAGATGCTGAAGAT
CAGTTGGGTGCACGAGTGGGTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAG
TTTTTCGCCCCGAAGAACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGG
TATTATCCCGTATTGACGCGGGCAAGAGCAACTCGGTGCGCGCATACACTATTCTCAGAAT
GACTTGGTTGAGTACTACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGA

ATTATGCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGA
TCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACCTCGCCTT
GATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00132] In some embodiments, an AAV vector described herein comprises an AAV 5' ITR, a *GJB2* GRE enhancer (*hGJB2* GRE5), a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, Kozak sequence, nucleotide sequence encoding a gene product (e.g., *GJB2* or GFP), a *GJB2* exon 2 3' UTR, a WPRE, a bovine growth hormone poly A signal, and an AAV 3' ITR (e.g., vector c.81.5).

[00133] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 50. An exemplary nucleotide sequence for vector c.81.5 is set forth in SEQ ID NO: 50 (*hGJB2* GRE5 underlined; eGFP coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
TTCATTTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTGTGTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTCGTGCACACAGCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAC
GCCTGGTATCTTTATAGTCCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTGCTGGCCTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACTCCATCACTAGGGGTTCCCTGCGGCCGCACGCGTA
AGCTACTAATACTACAACCACGAGATTATAGATGTTTGCTGATATTGTTCTCAGTTTGTTATT
GTGTTGTTTATGAATGAAAGTAGTGTATGTTTGTTGTAATTTTTGTTTTTAATTTTTTATGA
GTGCCCTAACAAAGATTACAAATTGGGAATACAAACTCCAGAGCAATGGAGACAGTGACACT
TTTGTGGAGGGGTACATGTGGCTGTTTCGGGTGGTTATTAACACAGGCTGCTGCCCTGCCCT
GCAATGGGAATCCCCAGGGCATTGGAGGATTCAACCTCTTGCACTTACCTCTTGTAAGACAG
CAGATGGCAGCAGAGAGAGGCTTTGCACATCCCTGCAGGTTCTAGTTTGACAAAGGGCTTC
TGAGAGACCTATCAACCAATTATAACATCAAGTGGCAAAAAGAGTCCTTGATAAGTTATTTTC
GCTTCTCAAAGAAACCGAAAACGCCAAACTAATCACTAGTCTTGTTTTTTTTTTTCTGGCA
AAAGCCTGCTATCTTTCATGATTTAGCTTTCATGAAATTGTTCTGAAGACCCCCAAAAGAA

ACAATTTTCATGCCCCGAACCTCTGTTTCAGAGACTTTTGCTGTGCCTGTCATGTCCAGCTTGCCA
TATCCTGTTTTGTAAAGTAGCCACCTTATATACACACCTGCTGTCTGCACTGTGACCTCCTT
TCAAAATCATCTTTGGTTCTTCAGAGGCCTGGAATAATGCTCTGCCAGATGAAGATCTCCG
TAAATGTGTTTTTGAATGGCTAATCAAATAATGGATACCCTTAGGTATTTTTGCAGAAACA
CTTGGCAGCCTTCCATAATATCCCTACTATGAAATGGAACTTGTGAATGAGATGTGGCTTT
AATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTTCGGGGGCGGTTCGGGGTTCGCG
GACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCGCGGCGCCGCCCTCC
GTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGTGCGGTTAAAGGCGCCACGG
CGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCT
CGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACG
CCGAGACCCCCGCCCCGGCCCCGCGCGCTTCTCTCCGACGCAGAGCAAACCGCCCAGAGTA
GAAGCC**ATGGTGAGCAAGGGCGAGGAGCTGTTACCGGGGTGGTGCCCATCTGGTCGAGCT**
GGACGGCGACGTAAACGGCCACAAGTTTCAGCGTGTCCGGCGAGGGCGAGGGCGATGCCACCT
ACGGCAAGCTGACCCTGAAGTTTCATCTGCACCACCGGCAAGCTGCCCGTGGCCCTGGCCACC
CTCGTGACCACCTGACCTACGGCGTGCAGTGCTTCAGCCGCTACCCCGACCACATGAAGCA
GCACGACTTCTTCAAGTCCGCCATGCCCCGAAGGCTACGTCCAGGAGCGCACCATCTTCTTCA
AGGACGACGGCAACTACAAGACCCGCGCCGAGGTGAAGTTTCGAGGGCGACACCCTGGTGAAC
CGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGGCACAAGCTGGA
GTACAACCTACAACAGCCACAACGTCTATATCATGGCCGACAAGCAGAAGAAGCGCATCAAGG
TGAACCTTCAAGATCCGCCACAACATCGAGGACGGCAGCGTGCAGCTCGCCGACCCTACCAG
CAGAACACCCCCATCGGCGACGGCCCCGTGCTGCTGCCCCGACAACCCTACCTGAGCACCCA
GTCCGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTCTGCTGGAGTTTCGTGA
CCGCCGCCGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAAAGGCGCGCCACCCCTGCA
GGGAATTCCGCATTGCCAGTTGTTAGATTAAGAAATAGACAGCATGAGAGGGATGAGGCAA
CCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACCTTAA
ATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGCCACAATGGAGCTCT
GCTCCCCCTAAAGCCTCAAAACAAAGGCCCTAATTCTATGCCTGTCTTAATTTTTCTTTACTTA
AGTTAGTTCCACTGAGACCCAGGCTGTTAGGGGTTATTGGTGTAAGGTACTTTTCATATTTT
AAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCAC
AGAGGACACAGAGAAGGTTTGGGTGTCTCCTGGGGTTCTTTTTGCCAACTTTCCCCACGTT
AAAGGTGAACATTGGTTCTTTTCAATTTGCTTTGGAAGTTTTAATCTCTAACAGTGACAAAAGT
TACCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACTTTGTAGTATGATAGGTTA
TTTTGATGTAAAGATGTTCTGGATAACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTG
TAATATGTAAATGGTATGTCATTTCGCTACTATGATTTAATTTGAAATATGGTCTTTTGGTTA
TGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCATAGCACCTAA
CAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGC
AAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACC
ACCAACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTA
GCCAGCATCGGAAAGAAGCTGATTTAAAGAGGTGCTTGGGAATTTTATTGACACAGTACC
ATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGAGAAGTTTCTGTCGTTAAAAACAGATT
TGGAAGAGCTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAGTTTG
TTTGCTTACCCCTTCAGCCTCCAATTTTTTAAAGTGAAATATAGCTAATAACATGTGAAAAG
AATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATT
GCCATTATGCTTGACATGGTTTTCAAAAAATGGTACTCCACATATTTTCAGTGAGGGTAAGTA
TTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTGTAAATAATAAAGAATAGCTTTAAT
GATATGCTTGTAACATAAATAATTTTGTAAATGATCAAATACATTTAAACATTAATAATA
ATCTCTATAATAATTTAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGA
TAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTC
CTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATG
GCTTTTCAATTTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTTTTATGAGGAGTTGTGGCC
CGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGCTGACGCAACCCCCACTGGTTGGG

GCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACG
 GCGGAATCATCGCCGCTGCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGA
 CAATTCCGTGGTGTGTGTCGGGGAAATCATCGTCCTTTCCCTGGCTGCTCGCCTATGTTGCCA
 CCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTT
 CTTCCCCGCGGCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGAC
 GAGTCGGATCTCCCTTTGGGCGCCTCCCCGCGAATTCATCGATAACGAGCGCTGCTCGAGA
 GATCTGTGATAGCGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGC
 CCTCCCCCGTGCCTTCCCTTGACCCTGGAAGGTGCCACTCCCACTGTCCTTTCTAATAAAAA
 TGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCAATTCTATTCTGGGGGGTGGGGTGGGGC
 AGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCG
 AGCGGCCCGCAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTC
 ACTGAGGCCGGGCGACCAAGGTGCCCCGACGCCGGGCTTTGCCGGGCGGCGCTCAGTGAG
 CGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGT
 GCGGTATTTACACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTA
 GCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCC
 GCTCCTTTTCGCTTTCTTCCCTTCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCT
 AAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAAAC
 TTGATTTGGGTGATGGTTACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTG
 ACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACTGGAACAACACTCAACCC
 TATCTCGGGCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAA
 ATGAGCTGATTTAACAATAATTTAACGCGAATTTTAAACAAAATATTAACGTTTACAATTTTA
 TGGTGCACCTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCC
 AACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCCGCTTACAGACAAGCTG
 TGACCGTCTCCGGGAGCTGCATGTGTGAGAGTTTTTACCGTCATCACCGAAACGCGGAGA
 CGAAAGGGCCTCGTGATACGCCTATTTTTATAGTTAATGTCATGATAATAATGGTTTCTTA
 GACGTGAGGTGGCACTTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTCTAAA
 TACATTCAAATATGTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGA
 AAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTGCGCCCTTATTCCTTTTTTTCGGGCATT
 TTGCCTTCTGTTTTTTGTCTACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGATCAGT
 TGGGTGCACGAGTGGGTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTT
 CGCCCCGAAGAACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATT
 ATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCGCATACACTATTCTCAGAATGACT
 TGGTTGAGTACTACCAAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTA
 TGCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGATCGG
 AGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACCTCGCCTTGATC
 GTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00134] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 75. An exemplary nucleotide sequence for vector c.81.5 is set forth in SEQ ID NO: 75 (*hGJB2* GRE5 underlined; human GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAACCTGGCGAACTACTTACTCTA
 GCTTCCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT

GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
TTCATTTTTTAAATTTAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACACCGCTACCAG
CGGTGGTTTTGTTTCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACTGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCCAGCTTGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCAGAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCTGTGCGGTTTTGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTGCGGCCGCGACGCGTA
AGCTACTAACTACAACCACGAGATTATAGATGTTTGCTGATATTGTTCTCAGTTTGTTATT
GTGTTGTTTATGAATGAAAGTAGTGTATGTTTGTGTGAATTTTTGTTTTTAAATTTTTTATGA
GTGCCCTAAACAAAGATTACAAATTGGGAATACAACTCCAGAGCAATGGAGACAGTGACACT
TTTTGTGGAGGGGTACATGTGGCTGTTCCGGTGGTTATTAACACAGGCTGCTGCCCCTGCCCT
GCAATGGGAATCCCCAGGGCATTGGAGGATTCAACCTCTTGCACTTACCTCTTGTAAGACAG
CAGATGGCAGCAGAGAGAGGCTTTGCACATCCCTGCAGGTTCTAGTTTGCACAAAGGGCTTC
TGAGAGACCTATCAACCAATTATAACATCAAGTGGCAAAAAGAGTCCTTGATAAGTTATTTTC
GCTTCTCAAAGAAACCGAAAACGCCAACTAATCACTAGTCTTGTTTTTTTTTTTCTGGCA
AAAGCCTGCTATCTTTTCATGATTTAGCTTTTCATGAAATTGTTCTGAAGACCCCCAAAAGAA
ACAATTTTCATGCCCCGAACTCTGTTTCAGAGACTTTGCTGTGCCGTGTCATGTCCAGCTTGCCA
TATCCTGTTTTGTAAAGTAGCCACCTTATATACACACCTGCTGTCTGCACTGTGACCTCCTT
TCAAAATCATCTTTGGTTCTTCAGAGGCCTGGAATAATGCTCTGCCCAGATGAAGATCTCCG
TAAATGTGTTTTTGAATGGCTAATCAAATAATGGATACCCTTAGGTATTTTTGCAGAAACA
CTTGGCAGCCTTCCATAATATCCCTACTATGAAATGGAACTTGTGAATGAGATGTGGCTTT
AATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTCCGGGGCGGTGCGGGGTTTCGCG
GACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCCGCGCGCCGCCCTCC
GTAATTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGCGGTTAAAGGCGCCACGG
CGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCTCCTCTCCCCGACTCGGAGCCCCT
CGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACG
CCGAGACCCCCGCCCCGCCCCGCGCTTCTCCCGACGCAGAGCAAACCGCCCAGAGTA
GAAGCC**ATGGATTGGGGCACGCTGCAGACGATCCTGGGGGTGTGAACAAACACTCCACCAG**
CATTGGAAAGATCTGGCTCACCGTCTCTTCAATTTTTTCGCATTATGATCCTCGTTGTGGCTG
CAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACACCCTGCAGCCAGGCTGC
AAGAACGTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGCTATGGGCCCTGCAGCT
GATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCACGTGGCCTACCGGAGACATGAGA
AGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAGTGAATTTAAGGACATCGAGGAGATCAAA
ACCCAGAAGGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAAGCAGCATCTTCTTCCG
GGTCATCTTCGAAGCCGCCTTCATGTACGTCTTCTATGTCATGTACGACGGCTTCTCCATGC
AGCGGCTGGTGAAGTGCAACGCCTGGCCTTGTCCCAACACTGTGGACTGCTTTGTGTCCCGG
CCCACGGAGAAGACTGTCTTCACAGTGTTCATGATTGCAGTGTCTGGAATTTGCATCTGCT
GAATGTCACTGAATGTGTTATTTGCTAATTAGATATTGTTCTGGGAAGTCAAAAAGCCAG
TTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAGAAATAG
ACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCC
CAACACAAAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAAAC
TCCAGATGCCACAATGGAGCTCTGCTCCCCTAAAGCCTCAAAACAAAGGCCTAATTCTATGC

CTGTCTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCCAGGCTGTTAGGGGTTATT
GGTGTAAGGTACTTTTCATATTTTAAACAGAGGATATCGGCATTGTCTTTCTCTGAGGAC
AAGAGAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCTGGGGTTC
TTTTTGCCAACTTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCATTTGCTTTGGAAGTTT
TAATCTCTAACAGTGGACAAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGA
AAACTTTGTAGTATGATAGGTTATTTTGATGTAAAGATGTTCTGGATACCATTATATGTTCC
CCCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTTCGCTACTATGATTTAA
TTTGAAATATGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTA
TTCATTGTGGTCATAGCACCTAACAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGT
TCCTAGTGATGGCTTATGATAGCAAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGT
AAGAAATACAGACTGGATGTACCACCAACTACTACCTGTAATGACAGGCCTGTCCAACACAT
CTCCCTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTCGCTT
GGGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAAATGGGGCAGGGGAGGGAGAA
GTTTCTGTCTGTTAAAAACAGATTTGGAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGA
GCTTTGTCTACTTCAAAAGTTTGTGTGCTTACCCCTTCAGCCTCCAATTTTTTAAAGTAAAA
TATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTA
TAGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCC
ACATATTTTCAGTGAGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAGCATTTTTG
TAATAATAAAGAATAGCTTTAATGATATGCTTGTAATAAATAATTTTGTAAATGTATCAAA
TACATTTAAAAACATTAAAAATATAATCTCTATAATAATTTAAAAATCTAATATGGTTTTAATAG
AACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGAC
TGGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGT
ATCATGCTATTGCTTCCCGTATGGCTTTTCAATTTTCTCCTCCTTGTATAAATCCTGGTTGCTG
TCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGC
TGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCG
CTTTCCCCCTCCCTATTGCCACGGCGGAACCTCATCGCCGCTGCCTTGCCCGCTGCTGGACA
GGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGTGTGTCGGGGAAATCATCGTCCTTTCC
TTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTT
CGGCCCTCAATCCAGCGGACCTTCCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCG
CGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCCTCCCCGCGAATTCA
TCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGCCATCAAGCTGGCTGTGCCTTCTA
GTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCCCTTGACCCTGGAAGGTGCCACT
CCCCTGTCTTTTCTAATAAAAATGAGGAAATTGCATCGCATTTGTCTGAGTAGGTGTCATTCT
TATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGC
ATGCTGGGGACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTC
CCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGTCTGCCCCGACGCCCGGGC
TTTGCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCG
GTATTTTCTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCAACCATAGTA
CGCGCCCTGTAGCGGCGCATTAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTA
CACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTTCTTCCCTTCCCTTTCTCGCCACGTTT
GCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTT
ACGGCACCTCGACCCCAAAAACTTGATTTGGGTGATGGTTACGTAAGTGGGCCATCGCCCT
GATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTT
CAAAGTGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAGGGATTTTGCC
GATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACA
AAATATTAACGTTTACAATTTTATGGTGCACCTCTCAGTACAATCTGCTCTGATGCCGCATAG
TTAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCC
GGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTGAGAGGTTTTAC
CGTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAAT
GTCATGATAAATAGGTTTCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAAC
CCCTATTTGTTTATTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCT

GATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTCGCC
 CTTATTCCCTTTTTTTCGGCATTTCCTTCCTGTTTTTCTCACCCAGAAACGCTGGTGAA
 AGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTACATCGAACTGGATCTCAACA
 GCGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAACGTTTTTCCAATGATGAGCACTTTTAAA
 GTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCG
 CATACTACTATTCTCAGAATGACTTGGTTGAGTACTACCAGTCACAGAAAAGCATCTTACGG
 ATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCC
 AACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGG
 GGATCATGTAACCTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACG
 AGCGTGACACCA

[00135] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 76. An exemplary nucleotide sequence for vector c.81.5 is set forth in SEQ ID NO: 76 (*hGJB2* GRE5 underlined; mouse GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAACCTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
 TTCATTTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
 CCTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
 CGGTGGTTTTGTTTGCCGGATCAAGAGCTACCAACTCTTTTTTCCGAAGGTAAGTGGCTTCAGC
 AGAGCGCAGATACCAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
 CTCTGTAGCACC GCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
 GCGATAAGTCGTGTCTTACC GGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
 TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCAGCTTGGAGCGAACGACCTACACCGAACT
 GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
 GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
 GCCTGGTATCTTTATAGTCCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
 ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
 TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
 GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
 GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTGCGGCCGCACGCGTA
 AGCTACTAACTACAACCACGAGATTATAGATGTTTGCTGATATTGTTCTCAGTTTGGTTATT
 GTGTTGTTTATGAATGAAAGTAGTGTATGTTTGTTGTAATTTTTGTTTTTAATTTTTTATGA
 GTGCCCTAACAAAGATTACAAATTGGGAATACAACTCCAGAGCAATGGAGACAGTGACACT
 TTTGTGGAGGGGTACATGTGGCTGTTCCGGTGGTTATTAACACAGGCTGCTGCCCCTGCCCT
 GCAATGGGAATCCCCAGGGCATTGGAGGATTCAACCTCTTGCACTTACCTCTTGTAAGACAG
 CAGATGGCAGCAGAGAGAGGCTTTCACATCCCTGCAGGTTCTAGTTTGCACAAAGGGCTTC
 TGAGAGACCTATCAACCAATTATAACATCAAGTGGCAAAAAGAGTCCTTGATAAGTTATTTTC
 GCTTCTCAAAGAAACCGAAAACGCCAACTAATCACTAGTCTTGTTTTTTTTTTTCTGGCA
 AAAGCCTGCTATCTTTTCATGATTTAGCTTTCATGAAATTGTTTCCTGAAGACCCCCAAAAGAA
 ACAATTTTCATGCCCCGAACCTCTGTTTCAGAGACTTTGCTGTGCCTGTCATGTCCAGCTTGCCA

TATCCTGTTTTGTAAAGTAGCCACCTTATATACACACCTGCTGTCTGCACTGTGACCTCCTT
TCAAAATCATCTTTGGTTCTTCAGAGGCCTGGAATAATGCTCTGCCCAGATGAAGATCTCCG
TAAATGTGTTTTTGAATGGCTAATCAAATAATGGATACCCTTAGGTATTTTTGCAGAAACA
CTTGCCAGCCTTCATAATATCCCTACTATGAAATGGAACTTGTGAATGAGATGTGGCTTT
AATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTTCGGGGGCGGTTCGGGGTTTCGCG
GACCCGGGAAGCTCTGAGGACCCAGAGGCGGGGCGCTCCGCGCGCGCGCGCCGCCCTCC
GTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAGGCGCCACGG
CGGGAGACAGGTGTTGCGGCCCCGACGCGCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCCT
CGGCGGCGCCCCGCCCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCCAACG
CCGAGACCCCCGCCCCGCCCCGCGCTTCTCTCCGACGCAGAGCAAACCGCCCAGAGTA
GAAGCC**ATGGATTGGGGCACACTCCAGAGCATCCTCGGGGGTGTCAACAAACACTCCACCAG
CATTGGAAAGATCTGGCTCACGGTCTCTTCATCTTCCGCATCATGATCCTCGTGGTGGCTG
CAAAGGAGGTGTGGGGAGATGAGCAAGCCGATTTTTGTCTGCAACACGCTCCAGCCTGGCTGC
AAGAATGTATGCTACGACCACCACTTCCCCATCTCTCACATCCGGCTCTGGGCTCTGCAGCT
GATCATGGTGTCCACGCCAGCCCTCCTGGTAGCTATGCATGTGGCCTACCGGAGACATGAAA
AGAAACGGAAGTTCATGAAGGGAGAGATAAAGAACGAGTTTAAGGACATCGAAGAGATCAAA
ACCCAGAAGGTCCGTATCGAAGGGTCCCTGTGGTGGACCTACACCACCAGCATCTTCTTCCG
GGTCATCTTTGAAGCCGTCTTCATGTACGTCTTTTACATCATGTACAATGGCTTCTTCATGC
AACGTCTGGTGAAATGCAACGCTTGGCCCTGCCCAATACAGTGGACTGCTTCATTTCCAGG
CCCACAGAAAAGACTGTCTTACCCTGTTTATGATTTCTGTGTCTGGAATTTGCATTCTGCT
AAATATCACAGAGCTGTGCTATTTGTTTCGTTAGGTATTGCTCAGGAAAGTCCAAAAGACCAG
TCTACCCATACGATGTTCCAGATTACGCTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCA
TTGCCAGTTGTTAGATTAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGC
TGTCAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACCTTAAATGCAACCATT
GAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGCCACAATGGAGCTCTGCTCCCCCTAAAG
CCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTTCACCTAAGTTAGTTCCAC
TGAGACCCCAGGCTGTTAGGGGTATTGGTGTAAAGTACTTTCATATTTTAAACAGAGGATA
TCGGCATTTGTTTCTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCCACAGAGGACACAGA
GAAGGTTTGGGTGTCCTCCTGGGGTCTTTTTGCCAACTTTCCCCACGTTAAAGGTGAACAT
TGGTTCTTTTCAATTGCTTTGGAAGTTTAACTCTCTAACAGTGGACAAAGTTACCAGTGCCTT
AACTCTGTTACACTTTTTGGAAGTGAAACTTTGTAGTATGATAGGTTATTTTGTATGTA
GATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGTAAAT
GGTATGTCATTTCGCTACTATGATTTAATTTGAAATATGGTCTTTTGGTTATGAATACTTTGC
AGCACAGCTGAGAGGCTGTCTGTTGTATTCTTGTGGTCATAGCACCTAACACATTGTAGC
CTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAATGGCCTCAT
GTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCACTACTAC
CTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCATCGGA
AAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATGGGGA
GGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCGTTAAAAACAGATTTGAAAAGACTGG
ACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAGTTTGTGTTGCTTACCC
TTCAGCCTCCAATTTTTTAAAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAGCTAA
GGTTTAGATAAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTATGCTT
GACATGGTTTCCAAAAAATGGTACTCCACATATTTTCAGTGAGGGTAAGTATTTTCTGTTGT
CAAGAATAGCATTGTAAAAGCATTTTGTAAATAATAAAGAATAGCTTTAATGATATGCTTGTA
ACTAAAATAATTTTGTAAATGTATCAAATACATTTAAAACATTAAAATATAATCTCTATAATA
ATTTAAAATCTAATATGGTTTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAACCTCT
GGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTAT
GTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCAATTTT
TCCTCCTTGATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCA
ACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTGCCACCA
CCTGTCAGCTCCTTTCCGGGACTTTTCGTTTCCCCCTCCCTATTGCCACGGCGGAACATCATC**

GCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCCGTGGT
GTTGTGCGGGGAAATCATCGTCCTTTTCTTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGC
GCGGGACGTCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCTTTCCCGCGGC
CTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTC
CCTTTGGGCCGCTCCCCGCGAATTCATCGATACCGAGCGCTGCTCGAGAGATCTGTGATAG
CGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTG
CCTTCTTGGACCTGGAAGGTGCCACTCCCACTGTCTTTTCTAATAAAATGAGGAAATTGC
ATCGCATTGTCTGAGTAGGTGTCAATTCTATTCTGGGGGTGGGGTGGGGCAGGACAGCAAGG
GGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCGCAGG
AACCCTTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGG
CGACCAAAGGTGCGCCGACGCGCGGGCTTTGCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCG
CAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTTAC
ACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAGCGCGGCGGGTG
TGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGT
TTCTTCCCTTCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCT
CCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCCAAAAAATTGATTTGGGTG
ATGGTTCACGTAGTGGCCATCGCCCTGATAGACGGTTTTTCGCCCTTTGACGTTGGAGTCC
ACGTTCTTTAATAGTGACTCTTGTTCAAACTGGAACAACACTCAACCCTATCTCGGGCTA
TTCTTTTGTATTTATAAGGGATTTTTCGGATTTTCGCCCTATTGGTTAAAAAATGAGCTGATTT
AACAAAAATTTAACGCGAATTTTAAACAAAATATTAACGTTTACAATTTTATGGTGCCTCTC
AGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTGA
CGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCCG
GGAGCTGCATGTGTCTAGAGGTTTTTACCCTCATCACCGAAACGCGCGAGACGAAAGGGCCTC
GTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTTCTTAGACGTCAGGTGG
CACTTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTCTAAATACATTCAAATA
TGTATCCGCTCATGAGACAATAACCCGTATAAATGCTTCAATAATATTGAAAAAGGAAGAGT
ATGAGTATTCAACATTTCCGTGTGCGCCCTTATTCCTTTTTTTGCGGCATTTTGCCTTCCTGT
TTTTGCTCACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAG
TGGGTTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAA
CGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGA
CGCCGGGCAAGAGCAACTCGGTGCGCCGCATACACTATTCTCAGAATGACTTGGTTGAGTACT
CACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCC
ATAACCATGAGTGATAAAGTACTGCGGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGGA
GCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACCTCGCCTTGATCGTTGGGAACCG
AGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00136] In some embodiments, an AAV vector described herein comprises an AAV 5' ITR, a *GJB2* GRE enhancer (*hGJB2* GRE7), a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, Kozak sequence, nucleotide sequence encoding a gene product (e.g., *GJB2* or GFP), a *GJB2* exon 2 3' UTR, a WPRE, a bovine growth hormone poly A signal, and an AAV 3' ITR (e.g., vector c.81.7).

[00137] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 51. An exemplary nucleotide sequence

for vector c.81.7 is set forth in SEQ ID NO: 51 (*hGJB2* GRE7 underlined; eGFP coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACCTGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTGACACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
TTCATTTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTTGTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCAGGTTGGACTCAAGACGATAGTTACCAGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCTGTGCGGTTTTGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTGCGGCCGCACGCGTC
TCAGCTGGAGTGACGCACCTCATCCATGCGGGCCTGGCGTCTGGAAGGTGGCTGGGTCTCTC
GGGCTTGAGCACCATCATCTTAGCTCCAACATGTCATTATTCCTTCCTCACTGAGGACTTTT
CTGCTTCCTAATTGGTTGTTGAAGATGAGGCCCCCATGCTCTTTTAAGAAAACCTGTTGTGC
CCCAGGCTTGGCTGTGATGGGCACTGACTCATACAGAAGTAGAAAGGCCTGCTGAGTCATCA
ACACTCGTGCGACGCCCTCGCATTTTTCATTAATGATGGCCTCCCTGCCACACGTGAATCACT
CCAGCCCCGAGATCTGAAACCAGGACACACCCCGAGGGGCGAGGTGACGCTGAGTGAGCCAGC
TGTGTCCCTTTTCATGAGAACTCAGAGCACAGGGCTCTGTGTGCATGGCCGTCCCCCTCCAGAG
AGGAGGAAGTAAATGCCGGGATTAGTGGAAGATCATTTCCCTTCTATTTGCCTTGGCTTACGT
CTTTCAGAATTCAAACACGTGCACTGTTGACCCTGCAATGGTGGAGTTTTTGGATTTTCCTT
CAGTCCGATTGCTAAAATACTTCCCTCTCATGTGAGCTGTTGTGAAAGTCATCAGCCAGATA
CCATTCTAAAAACAAAGAATGTGCTTCTCGTATGTTGCATGCTGGTTACTGAAATATTAGGG
AATTACATAAAGGTTTTCTGGGGCACATATTCAAGCTGAATGATAAAATTGAAGGTCACACA
AAGCTAAGGTCTTTCAAATCCTGACCCAATTAGCTCTCTGTTAGCTCTCTGACTTTGGACAA
GCTGTCTGGTCTCTGAAGCATACTTTGTTGCCCCCTGGGTAGGGGCCCTCTGTTTTAACAGC
GTTTGGCATTAAATTAAGACCTCGAAGGGGACTTGGGGGTTTCGGGGCTTTTCGGGGGCGGTCTG
GGGGTTTCGCGGACCCGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGC
CGCCCCCTCCGTAACTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAA
GGCGCCACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCCCCGACT
CGGAGCCCCCTCGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGA
GACCCCAACGCCGAGACCCCGCCCCGGCCCCGCGCGCTTCTCCCGACGCAGAGCAAACC
GCCAGAGTAGAAGCC**ATGGTGAGCAAGGGCGAGGAGCTGTTACCGGGGTGGTGGCCATCC**
TGGTCGAGCTGGACGGCGACGTAAACGGCCACAAGTTCAGCGTGTCCGGCGAGGGCGAGGGC
GATGCCACCTACGGCAAGCTGACCCTGAAGTTCATCTGCACCACCGCAAGCTGCCCGTGCC
CTGGCCCACCTCGTGACCACCCTGACCTACGGCGTGAGTGCTTCAGCCGCTACCCCGACC
ACATGAAGCAGCACGACTTCTTCAAGTCCGCCATGCCCGAAGGCTACGTCCAGGAGCGCACC
ATCTTCTTCAAGGACGACGGCAACTACAAGACCCGCGCCGAGGTGAAGTTCGAGGGCGACAC
CCTGGTGAACCGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGGC

ACAAGCTGGAGTACAACACTACAACAGCCACAACGTCTATATCATGGCCGACAAGCAGAAGAAC
GGCATCAAGGTGAACCTTCAAGATCCGCCACAACATCGAGGACGGCAGCGTGCAGCTCGCCGA
CCACTACCAGCAGAACACCCCCATCGGCCAGGGCCCCGTGCTGCTGCCCCGACAACCACTACC
TGAGCACCCAGTCCGCCCTGAGCAAAGACCCCAACGAGAAGCGCGATCACATGGTCCTGCTG
GAGTTCGTGACCGCCGCCGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAAAGGCGCGC
CACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAAGAAATAGACAGCATGAGAGG
GATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCTCAACACAAAGATT
CTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGCCACA
ATGGAGCTCTGCTCCCCTAAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTT
CTTTCACTTAAGTTAGTTCCACTGAGACCCAGGCTGTTAGGGGTTATTGGTGTAAGGTACT
TTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAAGC
CAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCCTGGGGTTCTTTTTGCCAAGTT
TCCCCACGTTAAAGGTGAACATTGGTTCTTTTCAATTTGCTTTGGAAGTTTTAATCTCTAACAG
TGGACAAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTTGAAGTGAAAAGTTTGTAGTA
TGATAGGTTATTTTGTATGTAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAG
GCTCAGATTGTAATATGTAATGGTATGTCATTTCGCTACTATGATTTAATTTGAAATATGGT
CTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCA
TAGCACCTAACCAACTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGC
TTATGATAGCAAAATGGCCTCATGTCAAAATTTTAGATGTAATTTTGTGTAAGAAATACAGAC
TGGATGTACCACCACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCAT
GACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTG
ACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTA
AAAACAGATTTGGAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTT
CAAAAGTTTGTGTGCTTACCCCTTCAGCCTCCAATTTTTTAAAGTGAAAATATAGCTAATAAC
ATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAA
CCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTTCAGTG
AGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTGTAATAATAAAGAA
TAGCTTTAATGATATGCTTGTAATAAATAATTTTGAATGTATCAAATACATTTAAAACA
TTAAAATATAATCTCTATAATAATTTAAAATCTAATATGGTTTTAATAGAACAGCGATATCA
AGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAAC
TATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGC
TTCCCGTATGGCTTTTCAATTTTCTCCTCCTTGATAAATCCTGGTTGCTGTCTCTTTATGAGG
AGTTGTGGCCCGTTGTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCC
ACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCC
TATTGCCACGGCGGAACCTCATCGCCGCTGCCTTGCCGCTGCTGGACAGGGGCTCGGCTGT
TGGGCACTGACAATTCCGTGGTGTGTGTCGGGGAATCATCGTCCTTTCTTGCTGCTCGCC
TATGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCTTTCGGCCCTCAATCC
AGCGGACCTTCCCTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTC
GCCCTCAGACGAGTCGGATCTCCCTTTGGGGCCGCTCCCCGGAATTCATCGATAACGAGCG
CTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATC
TGTTGTTTGGCCCTCCCCCGTGCCTTCTTGACCCTGGAAGGTGCCACTCCCCTGTCTTTT
CCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGGGGGT
GGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACAC
GTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGC
TCGCTCGCTCACTGAGGCCGGGCGACCAAAGTTCGCCCCGACGCCCGGGCTTTGCCCGGGCGG
CCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTT
ACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGC
GGCGCATTAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGC
CCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCTTTCTCGCCACGTTCCGCGGCTTTCCCC
GTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGAC
CCCAAAAACTTGATTTGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTT

TCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAACTGGAACAA
 CACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTAT
 TGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACAAAATATTAACGTT
 TACAATTTTATGGTGCACCTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCC
 GACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGCTCTGCTCCCGGCATCCGCTTAC
 AGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTGAGAGGTTTTACCGTCATCACCGAA
 ACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAA
 TGGTTTCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTA
 TTTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCA
 ATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTT
 TTGCGGCATTTTGCCTTCCTGTTTTTGTCTACCCAGAAACGCTGGTGAAAGTAAAAAGATGCT
 GAAGATCAGTTGGGTGCACGAGTGGGTACATCGAACTGGATCTCAACAGCGGTAAGATCCT
 TGAGAGTTTTTCGCCCCGAAGAACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTG
 GCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCCGCATACACTATTCT
 CAGAATGACTTGTTGAGTACTCACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGT
 AAGAGAATTATGCAGTGTGCCATAACCATGAGTGATAAACTGCGGCCAACTTACTTCTGA
 CAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAAC
 CGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00138] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 77. An exemplary nucleotide sequence for vector c.81.7 is set forth in SEQ ID NO: 77 (*hGJB2* GRE7 underlined; human GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAAGTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCCTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACTGTGACACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
 TTCATTTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
 CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAACAAAAAACCACCGCTACCAG
 CGGTGGTTTTGTTGCCGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGC
 AGAGCGCAGATACCAAATACTGTCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
 CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
 GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
 TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCAGCTTGGAGCGAACGACCTACACCGAACT
 GAGATACCTACAGCGTGAGCTATGAGAAAAGCGCCACGCTTCCCGAAGGGAGAAAAGGCGGACA
 GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
 GCCTGGTATCTTTATAGTCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
 ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
 TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
 GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
 GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCATCACTAGGGGTTCTGCGGCCGCACGCGTC
 TCAGCTGGAGTGACGCACCTCATCCATGCGGGCCTGGCGTCTGGAAGGTGGCTGGGTCTCTC
 GGGCTTGAGCACCATCATCTTAGCTCCAACATGTCATTATTCCTTCCTCACTGAGGACTTTT

CTGCTTCCTAATTGGTTGTTGAAGATGAGGCCCCCATGCTCTTTTAAGAAAACCTGTTGTGC
CCCAGGCTTGGCTGTGATGGGCACTGACTCATACAGAAGTAGAAAGGCCTGCTGAGTCATCA
ACACTCGTGCGACGCCCTCGCATTTCATTAATGATGGCCTCCCTGCCACACGTGAATCACT
CCAGCCCCGAGATCTGAAACCAGGACACACCCAGGGGCGAGGTGACGCTGAGTGAGCCCAGC
TGTGTCCCTTTTCATGAGAACTCAGAGCACAGGGCTCTGTGTGCATGGCCGTCCCCTCCAGAG
AGGAGGAAGTAAATGCCGGGATTAGTGGAAGATCATTTCCCTTCTATTTGCCTTGGCTTACGT
CTTTTCAAGAAATCAAACACGTGCACTGTTGACCCTGCAATGGTGGAGTTTTTGGATTTTCCTT
CAGTCCGATTGCTAAAATACTTCCCTCTCATGTGAGCTGTTGTGAAAGTCATCAGCCAGATA
CCATTCTAAAAACAAAGAATGTGCTTCTCGTATGTTGCATGCTGGTTACTGAAATATTAGGG
AATTACATAAAGTTTTCTGGGGCACATATTCAAGCTGAATGATAAAATTGAAGGTCACACA
AAGCTAAGGTCTTTCAAATCCTGACCCAATTAGCTCTCTGTTAGCTCTCTGACTTTGGACAA
GCTGTCTGGTCTCTGAAGCATACTTTGTTCCCTTGGGTAGGGGCCCTCTGTTTTAACAGC
GTTTGGCATTAAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTTCGGGGCGGTGC
GGGGTTTCGCGGACCCGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCCGCGCGC
CGCCCCCTCCGTAACTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTTCGGTTAAAA
GGCGCCACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCCCCGACT
CGGAGCCCCCTCGGCGGCGCCCGGCCAGGACCCGCCTAGGAGCGCAGGAGCCCCAGCGCAGA
GACCCCAACGCCGAGACCCCCGCCCGGCCCGCGCTTCTCCCGACGCAGAGCAAACC
GCCAGAGTAGAAGCC**ATGGATTGGGGCACGCTGCAGACGATCCTGGGGGGTGTGAACAAAC**
ACTCCACCAGCATTGGAAAGATCTGGCTCACCGTCCTCTTCATTTTTCGCATTATGATCCTC
GTTGTGGCTGCAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACACCCCTGCA
GCCAGGCTGCAAGAAGCTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGCTATGGG
CCCTGCAGCTGATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCAGTGGCTTACCGG
AGACATGAGAAGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAGTGAATTTAAGGACATCGA
GGAGATCAAAAACCCAGAAGGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAAGCAGCA
TCTTCTTCCGGGTCATCTTCGAAGCCGCCCTTCATGTACGTCTTCTATGTACGTACGACGGC
TTCTCCATGCAGCGGCTGGTGAAGTGCAACGCCTGGCCTTGTCCCAACACTGTGGACTGCTT
TGTGTCCCGGCCACGGAGAAGACTGTCTTACAGTGTTCATGATTGCAGTGTCTGGAATTT
GCATCCTGCTGAATGTCACCTGAATTGTGTTATTTGCTAATTAGATATTGTTCTGGGAAGTCA
AAAAAGCCAGTTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGAT
TAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGC
TAGCATTTCCCAACACAAAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCT
CAGGTGAAACTCCAGATGCCACAATGGAGCTCTGCTCCCCTAAAGCCTCAAAACAAAGGCCT
AATTCTATGCCTGTCTTAATTTTCTTTCACCTAAGTTAGTTCCACTGAGACCCCAGGCTGTT
AGGGGTTATTGGTGTAAAGTACTTTTATATTTTAAACAGAGGATATCGGCATTTGTTTCTTT
CTCTGAGGACAAGAGAAAAAGCCAGGTTCACAGAGGACACAGAGAAGGTTTGGGTGTCCT
CCTGGGGTTCTTTTTGCCAAGTTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCAATTGCT
TTGGAAGTTTTAATCTCTAACAGTGGACAAAGTTACCAGTGCCTTAAACTCTGTTACACTTT
TTGGAAGTGAAAACCTTTGTAGTATGATAGGTTATTTTGTATGTAAAGATGTTCTGGATACCAT
TATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTGCTAC
TATGATTTAATTTGAAATATGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCT
GTCTGTTGTATTCAATTGTGGTCATAGCACCTAACAACATTGTAGCCTCAATCGAGTGAGACA
GACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAATGGCCTCATGTCAAATATTTAGATGT
AATTTTGTGTAAAGAAATACAGACTGGATGTACCACCACTACTACCTGTAATGACAGGCCTG
TCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAAGCTGATTTAAA
GAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGG
GGAGGGAGAAGTTTCTGTCGTTAAAAACAGATTTGGAAAGACTGGACTCTAAAGTCTGTTGA
TTAAAGATGAGCTTTGTCTACTTCAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTT
TAAGTGAAAATATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAATATTG
AGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAA
ATGGTACTCCACATATTTCAAGTGAAGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAA

AAGCATTTTGTAAATAATAAAGAATAGCTTTAATGATATGCTTGTAATAAAATAATTTTGT
ATGTATCAAATACATTTAAACATTAAAAATATAATCTCTATAATAATTTAAATCTAATATG
GTTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTG
AAAGATTGACTGGTATTCTTAAGTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTA
ATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCATTTTCTCCTCCTTGATAAATC
CTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCAACGTGGCGTGGTGTGCA
CTGTGTTTGTGCTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCC
GGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACATCGCCGCCTGCCTTGCCCG
CTGCTGGACAGGGGCTCGGCTGTTGGGCACCTGACAATTCCGTGGTGTGTCGGGGAAATCAT
CGTCTTTTTCCTTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCTTTCTGC
TACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCTTCCCGCGGCCTGCTGCCGGCTCTGCG
GCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCC
CGCAATTTCATCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCT
GTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCTTGACCTGGA
AGGTGCCACTCCCCTGCTCTTTTCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTA
GGTGTCAATTCTATTCTGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGAC
AATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAG
TTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTCGCCCG
ACGCCCCGGGCTTTGCCCGGGCGGCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGC
GCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTTACACCGCATACTCAAAGC
AACCATAGTACGCGCCCTGTAGCGGCGCATTAAAGCGCGGCGGGTGTGGTGGTTACGCGCAGC
GTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCTTTCT
CGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGAT
TTAGTGCTTTACGGCACCTCGACCCCCAAAAAAGTATTTGGGTGATGGTTTACGTAGTGGG
CCATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGG
ACTCTTGTTCCAACTGGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAG
GGATTTTTCGGGATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCG
AATTTTAAACAAAATATTAACGTTTACAATTTTATGGTGCACTCTCAGTACAATCTGCTCTGA
TGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTT
GTCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTCAG
AGGTTTTTACCGTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTT
ATAGGTTAATGTCATGATAATAATGGTTTCTTAGACGTCAGGTGGCACTTTTTCGGGGAAATG
TGCGCGGAACCCCTATTTGTTTATTTTCTAAATACATTCAAATATGTATCCGCTCATGAGA
CAATAACCCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTT
CCGTGTCGCCCTTATTTCCCTTTTTTTCGGGCATTTTGCCTTCTGTTTTTGTCTACCCAGAAA
CGCTGGTGAAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTACATCGAACTG
GATCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAACGTTTTTCCAATGATGAG
CACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAAC
TCGGTTCGCCGCATACACTATTCTCAGAAATGACTTGGTTGAGTACTACCCAGTCACAGAAAAG
CATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAA
CACTGCGGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTTCG
ACAACATGGGGGATCATGTAACCTGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATA
CCAAACGACGAGCGTGACACCA

[00139] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 78. An exemplary nucleotide sequence

for vector c.81.7 is set forth in SEQ ID NO: 78 (*hGJB2* GRE7 underlined; mouse GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACCTGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
TTCATTTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTTGTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGCTTCAGC
AGAGCGCAGATACCAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCAGGTTGGACTCAAGACGATAGTTACCAGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAAGCGCCACGCTTCCCGAAGGGAGAAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCTGTGCGGTTTTGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCTGCGGCCGCACGCGTC
TCAGCTGGAGTGACGCACCTCATCCATGCGGGCCTGGCGTCTGGAAGGTGGCTGGGTCTCTC
GGGCTTGAGCACCATCATCTTAGCTCCAACATGTCATTATTCCTTCCTCACTGAGGACTTTT
CTGCTTCCTAATTGGTTGTTGAAGATGAGGCCCCCATGCTCTTTTAAGAAAACCTGTTGTGC
CCCAGGCTTGGCTGTGATGGGCACTGACTCATACAGAAGTAGAAAGGCCTGCTGAGTCATCA
ACACTCGTGCGACGCCCTCGCATTTTTCATTAATGATGGCCTCCCTGCCACACGTGAATCACT
CCAGCCCCGAGATCTGAAACCAGGACACACCCCGAGGGGCGAGGTGACGCTGAGTGAGCCAGC
TGTGTCCCTTTTCATGAGAACTCAGAGCACAGGGCTCTGTGTGCATGGCCGTCCCTCCAGAG
AGGAGGAAGTAAATGCCGGGATTAGTGGAAAGATCATTTCCCTTCTATTTGCCTTGGCTTACGT
CTTTCAGAATTCAAACACGTGCACTGTTGACCCTGCAATGGTGGAGTTTTTGGATTTTCCTT
CAGTCCGATTGCTAAAATACTTCCCTCTCATGTGAGCTGTTGTGAAAGTCATCAGCCAGATA
CCATTCTAAAAACAAAGAATGTGCTTCTCGTATGTTGCATGCTGGTTACTGAAATATTAGGG
AATTACATAAAGTTTTCTGGGGCACATATTCAAGCTGAATGATAAAATTGAAGGTCACACA
AAGCTAAGGTCTTTCAAATCCTGACCCAATTAGCTCTCTGTTAGCTCTCTGACTTTGGACAA
GCTGTCTGGTCTCTGAAGCATACTTTGTTCCGCTGGGTAGGGGCCCTCTGTTTTAACAGC
GTTTGGCATTAATTAAGACCTCGAAGGGGACTTGGGGGTTTCGGGGCTTTTCGGGGGCGGTCTG
GGGGTTTCGCGGACCCGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGC
CGCCCCCTCCGTAACTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGGGTGTTAAAA
GGCGCCACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCCCCGACT
CGGAGCCCCCTCGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGA
GACCCCAACGCCGAGACCCCGCCCCGCCCCGCGCGCTTCTCCCGACGCAGAGCAAACC
GCCAGAGTAGAAGCC**ATGGATTGGGGCACACTCCAGAGCATCCTCGGGGGTGTCAACAAAC**
ACTCCACCAGCATTTGGAAGATCTGGCTCACGGTCCTTTCATCTTCCGCATCATGATCCTC
GTGGTGGCTGCAAGGAGGTGTGGGGAGATGAGCAAGCCGATTTTGTCTGCAACACGCTCCA
GCCTGGCTGCAAGAATGTATGCTACGACCACCACTTCCCCATCTCTCACATCCGGCTCTGGG
CTCTGCAGCTGATCATGGTGTCCACGCCAGCCCTCCTGGTAGCTATGCATGTGGCTACCGG
AGACATGAAAAGAAACGGAAGTTCATGAAGGGAGAGATAAAGAACGAGTTTAAGGACATCGA
AGAGATCAAAACCAGAAGGTCCGTATCGAAGGGTCCCTGTGGTGGACCTACACCACCAGCA

TCTTCTTCCGGGTCATCTTTGAAGCCGTCTTCATGTACGTCTTTTACATCATGTACAATGGC
TTCTTTCATGCAACGTCTGGTGAAATGCAACGCTTGGCCCTGCCCAATACAGTGGACTGCTT
CATTTCAGGCCCCACAGAAAAGACTGTCTTCACCGTGTTTATGATTTCTGTGTCTGGAATTT
GCATTCTGCTAAATATCACAGAGCTGTGCTATTTGTTTCGTTAGGTATTGCTCAGGAAAAGTCC
AAAAGACCAGTCTACCCATACGATGTTCCAGATTACGCTTAAAGGCGCGCCACCCCTGCAGG
GAATTCGCGATTGCCAGTTGTTAGATTAAAGAAATAGACAGCATGAGAGGGATGAGGCAACC
CGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCTAACACAAAGATTCTGACCTTAAAT
GCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGCCACAATGGAGCTCTGC
TCCCTTAAAGCCTCAAAACAAAGGCCAATTCTATGCCTGTCTTAATTTTCTTTTACTTAAAG
TTAGTTCCACTGAGACCCAGGCTGTTAGGGGTTATTGGTGTAAGGTACTTTTATATTTTAA
ACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAGCCAGGTTCCACAG
AGGACACAGAGAAGGTTTGGGTGTCTCCTGGGGTTCTTTTTGCCAACTTTCCCCACGTTAA
AGGTGAACATTGGTTCTTTTCAATTTGCTTTGGAAGTTTTAATCTCTAACAGTGGACAAAAGTTA
CCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATAGGTTATT
TTGATGTAAAGATGTTCTGGATAACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTA
ATATGTAAATGGTATGTCATTTCGCTACTATGATTTAATTTGAAATATGGTCTTTTGGTTATG
AATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCATAGCACCTAACA
ACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAA
ATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCAC
CAACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGC
CAGCATCGGAAAAGAACGCTGATTTAAAGAGGTGCTTGGGAATTTTATTGACACAGTACCAT
TTAATGGGGAGGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAACAGATTG
GAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAGTTTGT
TGCTTACCCCTTCAGCCTCCAATTTTTTAAGTGAAAATATAGCTAATAACATGTGAAAAGAA
TAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGC
CATTATGCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTAGTGAGGGTAAAGTATT
TTCCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTGTAATAATAAAGAATAGCTTTAATGA
TATGCTTGTAATAAATAAATTTTTGTAATGTATCAAATACATTTAAACATTTAAATATAAT
CTCTATAATAATTTAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGATA
ATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCT
TTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGC
TTTCATTTTTCTCCTCCTTGATATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCG
TTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGCTGACGCAACCCCCACTGGTTGGGGC
ATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGC
GGAATCATCGCCGCTGCCTTGCCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACA
ATTCCGTGGTGTGTCGGGGAATCATCGTCTTTTCTTGGCTGCTCGCCTATGTTGCCACC
TGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCTTTCGGCCCTCAATCCAGCGGACCTTCC
TTCCCGCGGCTGCTGCCGGCTCTGCCGCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGA
GTCGGATCTCCCTTTGGGCGCCTCCCCGCGAATTCATCGATAACGAGCGCTGCTCGAGAGA
TCTGTGATAGCGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCC
CTCCCCCGTGCCTTCTTGACCCTGGAAGTGCCACTCCCACTGTCCTTTCTAATAAAAATG
AGGAAATTGCATCGCATTGTCTGAGTAGGTGTCAATTCTATTCTGGGGGTGGGGTGGGGCAG
GACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAG
CGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCAC
TGAGGCCGGGCGACCAAGGTGCCCCGACGCCGGGCTTTGCCGGGCGGCCTCAGTGAGCG
AGCGAGCGCGCAGCTGCCTGCAGGGGCGCTGATGCGGTATTTTCTCCTTACGCATCTGTGC
GGTATTTTACACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAGC
GCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGC
TCCTTTTCGCTTTCTTCCCTTCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAA
ATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAACTT
GATTTGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTGAC

GTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACTGGAACAACACTCAACCCTA
 TCTCGGGCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAAAT
 GAGCTGATTTAACAAAAATTTAACGCGAATTTTAACAAAAATATTAACGTTTACAATTTTATG
 GTGCACTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAA
 CACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCCGCTTACAGACAAGCTGTG
 ACCGTCTCCGGGAGCTGCATGTGTGTCAGAGGTTTTACCGTCATCACCGAAACGCGCGAGACG
 AAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTTCTTAGA
 CGTCAGGTGGCACTTTTTCGGGAAATGTGCGCGGAACCCCTATTTGTTATTTTTCTAAATA
 CATTCAAATATGTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAA
 AAGGAAGAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCCTTTTTTTCGGGCATTTT
 GCCTTCTGTTTTTGCTCACCCAGAAAACGCTGGTGAAAGTAAAAGATGCTGAAGATCAGTTG
 GGTGCACGAGTGGGTTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTCG
 CCCCAGAAACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTAT
 CCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCGCATACTATTCTCAGAATGACTTG
 GTTGAGTACTCACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATG
 CAGTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGATCGGAG
 GACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACCTCGCCTTGATCGT
 TGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00140] In some embodiments, an AAV vector described herein comprises an AAV 5' ITR, a *GJB2* GRE enhancer (*hGJB2* GRE8), a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, Kozak sequence, nucleotide sequence encoding a gene product (e.g., *GJB2* or GFP), a *GJB2* exon 2 3' UTR, a WPRE, a bovine growth hormone poly A signal, and an AAV 3' ITR (e.g., vector c.81.8).

[00141] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 79. An exemplary nucleotide sequence for vector c.81.8 is set forth in SEQ ID NO: 79 (*hGJB2* GRE8 underlined; eGFP coding sequence in bold face):

[00142] CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACCTGGCGAACTACTT
 ACTCTAGCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACT
 TCTGCGCTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTG
 GGTCTCGCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATC
 TACACGACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGC
 CTCACTGATTAAGCATTGGTAACCTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATT
 TAAAACTTCATTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACC
 AAAATCCCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGG
 ATCTTCTTGAGATCCTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAAACCACCGC
 TACCAGCGGTGGTTTGTGTTGCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGC
 TTCAGCAGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTT
 CAAGAACTCTGTAGCACC GCCTACATACCTCGCTCTGCTAATCCTGTTACCA GTGGCTGCTG
 CCAGTGGCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCG
 CAGCGGTGCGGCTGAACGGGGGGTTCGTGCACACAGCCAGCTTGGAGCGAACGACCTACAC
 CGAACTGAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGG

CGGACAGGTATCCGGTAAGCGGCAGGGTTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGG
GGAAACGCCTGGTATCTTTATAGTCCTGTCGGGTTTCGCCACCTCTGACTTGAGCGTCGATT
TTTGTGATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTAC
GGTTCCTGGCCTTTTGTGCTGGCCTTTTGTCTACATGTCCTGCAGGCAGCTGCGCGCTCGCTCG
CTCACTGAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGT
GAGCGAGCGAGCGCGCAGAGAGGGAGTGGCCAACTCCATCACTAGGGGTTCTGCGGCCGCA
CGCGTCGACCTGAACGATTAAGGCAAACTTCGAAATGTGCCCCAGCAGAGATTTATTTTTTC
AGGGGGTGTTTTGCATTCCAGCCCCCTCTGCCTTCCTGGCGTTTAGTGCGATTTGTTTAGCCA
TGIGCTCCCTGGTGTGTGTTTTTGAATGTGTGTGAGATGGGTGTCTCTCGGGACCTGGCAG
GTGCGGCCACCAGGTGAGGGCTGCCCCCAACCCTGTGCCTCCTTCCTCTAGACTCTGGCC
CCCTCAGTGCTGAGGGTGATACAGAGCACTTTTCAAGCTGGATTGGAATGTGGCCTCTCCC
CTCCAAACTCCTGGAGATCATGCAAAGGCCTTTGGAGCCAGCCAGTCACCTGGAAGGTGACA
TTCCCACCAGCTGAGGCCTCACCTTCAGCGGGGGCTGGGCAGCTTTGGAGCCTGGGGCCAGC
CAAGCTCACTCTGCCCATATCCCTGCCACGTGTGGCCCAGCGGATGATCACCTGTCTTCATC
TGCGTACTGGGCCACATCCCTCCTGCCGTCCCCCACTTCCCTGATGACACCTACAGCAAGCC
CCTACCCAAGTGTTCTGTGATCCCCGTGAAATGTGGCCTCCCTAGCTACTTGCTTTTATGAA
ACCAACAATCCTGGGGACACAGTTTTTCGGCTGTCTCAAGACGGGGCAACCCTCTTTTCCCC
AGGCCTGTGGGTCCCAGGCCTGGAGCTAGGGTTGGCATTCTTGCTGAATTCTCCACTCTAT
CCCAACCCCTGAGGCCGCCTGAGGAGGCTCAGACTGTGTGAGGCTAGGAGGACAGTCAAACC
ACAAAAACATGCCTTTTAAAGAAGTATAAGCACAAATCCCTCTTTGATGTTATATAAAAAGCTC
AGTGTCACTTTAATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTTCGGGGCGGTTC
GGGGGTTTCGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCCGCGCG
CCGCCCCCTCCGTAACCTTTCCAGTCTCCGAGGGAAGAGGCCGGGGTGTGGGGTTCGGTTAAA
AGGCGCCACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCCGCGCGCTCCTCTCCCCGAC
TCGGAGCCCCCTCGGCGCGCCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAG
AGACCCCAACGCCGAGACCCCCGCCCCGGCCCCGCGCGCTTCTCCCGACGCAGAGCAAAC
CGCCCAGAGTAGAAGCC**ATGGTGAGCAAGGGCGAGGAGCTGTTACCGGGGTGGTGCCCATC**
CTGGTTCGAGCTGGACGGCGACGTAAACGGCCACAAGTTCAGCGTGTCCGGCGAGGGCGAGGG
CGATGCCACCTACGGCAAGCTGACCCTGAAGTTCATCTGCACCACCGGCAAGCTGCCCCGTGC
CCTGGCCCCACCTCGTGACCACCTGACCTACGGCGTGCAGTGCTTCAGCCGCTACCCCGAC
CACATGAAGCAGCAGCACTTCTTCAAGTCCGCCATGCCCCGAAGGCTACGTCCAGGAGCGCAC
CATCTTCTTCAAGGACGACGGCAACTACAAGACCCGCGCCGAGGTGAAGTTCGAGGGCGACA
CCCTGGTGAACCGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGG
CACAAGCTGGAGTACAACATAACAGCCACAACGTCTATATCATGGCCGACAAGCAGAAGAA
CGGCATCAAGGTGAACCTTCAAGATCCGCCACAACATCGAGGACGGCAGCGTGCAGCTCGCCG
ACCACTACCAGCAGAACACCCCCATCGGCGACGGCCCCGTGCTGCTGCCCGACAACCACTAC
CTGAGCACCCAGTCCGCCCTGAGCAAAGACCCCCAACGAGAAGCGCGATCACATGGTCCTGCT
GGAGTTTCGTGACCGCCGCCGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAATAAAGGC
GCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAAGAAATAGACAGCATGA
GAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACAAA
GATTCTGACCTTAAATGCAACCATTGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGC
CACAATGGAGCTCTGCTCCCCTAAAGCCTCAAACAAAGGCCTAATTCTATGCCTGTCTTAA
TTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCCAGGCTGTTAGGGGTTATTGGTGTAAGG
TACTTTTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAA
AAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCCTGGGGTTCTTTTTGCCA
ACTTTCCCCACGTAAAGGTGAACATTGGTTCTTTTCATTTGCTTTGGAAGTTTTAATCTCTA
ACAGTGGACAAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACCTTGT
AGTATGATAGGTTATTTTGTATGTAAAGATGTTCTGGATAACATTATATGTTCCCCCTGTTTC
AGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTTCGCTACTATGATTTAATTTGAAATA
TGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTG
GTCATAGCACCTAACAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGA

TGGCTTATGATAGCAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGTAAGAAATAC
AGACTGGATGTACCACCACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTT
CCATGACTGTGGTAGCCAGCATCGGAAAAGACGCTGATTTAAAGAGGTCGCTTGGGAATTTT
ATTGACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTC
GTTAAAAACAGATTTGGAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCT
ACTTCAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAGTGAAAATATAGCTAA
TAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGAT
TGAACCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTT
AGTGAGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTGTAAATAATAA
AGAATAGCTTTAATGATATGCTTGTAACATAAATAATTTTGTAAATGTATCAAATACATTTAA
AACATTAAAAATATAATCTCTATAATAATTTAAAATCTAATATGGTTTTAATAGAACAGCGAT
ATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCT
TAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTA
TTGCTTCCCGTATGGCTTTTCATTTTCTCCTCCTTGATAAAATCCTGGTTGCTGTCTCTTTAT
GAGGAGTTGTGGCCCGTTGTGTCAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAAC
CCCCACTGGTTGGGGCATTGCCACCACCTGTGAGCTCCTTTCCGGGACTTTTCGCTTTCCCCC
TCCCTATTGCCACGGCGGAACCTCATCGCCGCCTGCCTTGCCCGCTGCTGGACAGGGGCTCGG
CTGTTGGGCACTGACAATTCCGTGGTGTGTGCGGGGAAATCATCGTCCTTTTCTTGCTGCT
CGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCTTCTGCTACGTCCCTTCGGCCCTCA
ATCCAGCGGACCTTCTTCCCGCGGCTGCTGCCGGCTCTGCGGCCTCTTCCCGCTCTTCGC
CTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCGCCTCCCCGCGAATTCATCGATACCG
AGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGC
CATCTGTTGTTTGGCCCTCCCCCGTGCCTTCTTGACCCTGGAAGGTGCCACTCCCCTGCTC
CTTTCCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGG
GGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGG
ACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGC
GCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTGCGCCGACGCCCCGGGCTTTGCCCGG
GCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCT
CCTTACGCATCTGTGCGGTATTTTACACCGCATACGTCAAAGCAACCATAGTACGCGCCCTG
TAGCGGCGCATTAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCA
GCGCCCTAGCGCCCGCTCCTTTTCGCTTTCTTCCCTTCTTCTCGCCACGTTTCGCCGGCTTT
CCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCT
CGACCCCCAAAAAATTGATTTGGGTGATGGTTACGTAGTGGGCCATCGCCCTGATAGACGG
TTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACTGGA
ACAACACTCAACCCTATCTCGGGCTATTCTTTTGTATTTATAAGGGATTTTGCCGATTTTCGGC
CTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACAAAAATATTA
CGTTTACAATTTTATGGTGCCTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAG
CCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGCTGCTCCCGGCATCCGC
TTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTCAGAGGTTTTTACCGTCATCAC
CGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATA
ATAATGGTTTCTTAGACGTCAGGTGGCACTTTTTCGGGGAAATGTGCGCGGAACCCCTATTTG
TTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCTGATAAATGC
TTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCC
TTTTTTGCGGCATTTTGCCTTCTGTTTTTGTCTACCCAGAAACGCTGGTGAAAGTAAAAGA
TGCTGAAGATCAGTTGGGTGCACGAGTGGGTTACATCGAACTGGATCTCAACAGCGGTAAGA
TCCTTGAGAGTTTTTCGCCCGAAGAACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTA
TGTTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTCGCCGCATACACTA
TTCTCAGAATGACTTGGTTGAGTACTCACCAGTCACAGAAAAGCATCTTACGGATGGCATGA
CAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAAACTGCGGCCAACTTACTT
CTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGT

AACTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00143] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 80. An exemplary nucleotide sequence for vector c.81.8 is set forth in SEQ ID NO: 80 (*hGJB2* GRE8 underlined; human GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAAGTGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGTAAGTGTGACACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
TTCATTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTGTGTGCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGC
AGAGCGCAGATACCAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTCGTGCACACAGCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGA AAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTGTGTCGCTTTTGTCTACATGTCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCCCTGCGGCCGCACGCGTC
GACCTGAACGATTAAGGCAAACTTCGAAATGTGCCCCAGCAGAGATTTATTTTTCAGGGGG
TGTTTTGCATTCCAGCCCCCTCTGCCTTCTGGCGTTTAGTGCGATTTGTTTAGCCATGTGCT
CCCTGGTGTGTGTTTTTGAATGTGTGTGAGATGGGTTGTCTCTCGGGACCTGGCAGGTGCGG
CCACCAGGTCAGGGCTGCCCCCAACCTGTGCCTCCTTCTCCTAGACTCTGGCCCCCTCA
GTGCTGAGGGTGATACAGAGCACTTTTCAAGCTGGATTTGGAATGTGGCCTCTCCCCCTCAA
ACTCCTGGAGATCATGCAAAGGCCTTTGGAGCCAGCCAGTCACCTGGAAGGTGACATTCCCA
CCAGCTGAGGCCTCACCTTCAGCGGGGGCTGGGCAGCTTTGGAGCCTGGGGCCAGCCAAGCT
CACTCTGCCCCATATCCCTGCCACGTGTGGCCAGCGGATGATCACCTGTCTTTCATCTGCGTA
CTGGGCCACATCCCTCCTGCCGTCCCCCACTTCCCTGATGACACCTACAGCAAGCCCCCTACC
CAAGTGTTCTGTGATCCCCTGTAAATGTGGCCTCCCTAGCTACTTGCTTTTATGAAACCAAC
AATCCTGGGGACACAGTTTTTCGGCTGTCTCAAGACGGGGCAACCACTCTTTTCCCCAGGCCT
GTGGGTCCCAGGCCTGGAGCTAGGGTTGGCATTCTTGCTGAATTCTCCACTCTATCCCAAC
CCCTGAGGCCGCTGAGGAGGCTCAGACTGTGTGAGGCTAGGAGGACAGTCAAACCAAAAA
ACATGCCTTTTTAAGAAGTATAAGCACAAATCCCTCTTTGATGTTATATAAAAGCTCAGTGTC
ACTTTAATTAAGACCTCGAAGGGGACTTGGGGGGTTTCGGGGCTTTTCGGGGGCGGTGCGGGGT
TCGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCGCGGGCGCGGCC
CCTCCGTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGTGCGGTTAAAAGGCGC

CACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCCCCGACTCGGAG
CCCCTCGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCC
CAACGCCGAGACCCCCGCCCGGCCCGCGCGCTTCTCCCGACGCAGAGCAAACCGCCCA
GAGTAGAAGCC**ATGGATTGGGGCACGCTGCAGACGATCCTGGGGGGTGTGAACAAACACTCC**
ACCAGCATTGGAAAGATCTGGCTCACCGTCCTCTTCATTTTTTCGCATTATGATCCTCGTTGT
GGCTGCAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACACCCTGCAGCCAG
GCTGCAAGAACGTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGCTATGGGCCCTG
CAGCTGATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCACGTGGCCTACCGGAGACA
TGAGAAGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAGTGAATTTAAGGACATCGAGGAGA
TCAAAACCCAGAAGGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAAGCAGCATCTTC
TTCCGGGTCTCTTCGAAGCCGCTTCATGTACGTCTTCTATGTCTATGTACGACGGCTTCTC
CATGCAGCGGCTGGTGAAGTGAACGCTGGCCTTGTCCCAACACTGTGGACTGCTTTGTGT
CCCGGCCACGGAGAAGACTGTCTTCACAGTGTTTCATGATTGCAGTGTCTGGAATTTGCATC
CTGCTGAATGTCACTGAATTGTGTTATTTGCTAATTAGATATTGTTCTGGGAAGTCAAAAAA
GCCAGTTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAGA
AATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCA
TTTCCCAACACAAAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCCTCAGGT
GAAACTCCAGATGCCACAATGGAGCTCTGCTCCCTAAAGCCTCAAAACAAAGGCCTAATTC
TATGCCTGTCTTAATTTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCAGGCTGTTAGGGG
TTATTGGTGTAAGGTACTTTTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTCTG
AGGACAAGAGAAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCTCCTGG
GGTTCTTTTTGCCAATTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCAATTTGCTTTGGA
AGTTTTAATCTCTAACAGTGGACAAAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTGGA
AGTGAAAACCTTTGTAGTATGATAGGTTATTTTGATGTAAAGATGTTCTGGATAACATTATAT
GTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTTCGCTACTATGA
TTTAATTTGAAATATGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTG
TTGTATTCAATTGTGGTCATAGCACCTAACACATTGTAGCCTCAATCGAGTGAGACAGACTA
GAAGTTCCTAGTGATGGCTTATGATAGCAAATGGCCTCATGTCAAATATTTAGATGTAATTT
TGTGTAAGAAATACAGACTGGATGTACCACCACTACTACCTGTAATGACAGGCCTGTCCAA
CACATCTCCCTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGT
CGCTTGGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAATGGGGCAGGGGAGG
GAGAAGTTTCTGTCGTTAAAAACAGATTTGGAAAGACTGGACTCTAAAGTCTGTTGATTAAA
GATGAGCTTTGTCTACTTCAAAAGTTTGTTTGCTTACCCCTTCAGCCTCCAATTTTTTAAGT
GAAAATATAGCTAATAACATGTGAAAAAGTAAGCTAAGGTTTAGATAAATATTGAGCAG
ATCTATAGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTTCAAAAAATGGT
ACTCCACATATTTCACTGAGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCA
TTTTGTAATAATAAAGAATAGCTTTAATGATATGCTTGTAATAAATAATTTTGTAAATGTA
TCAAATACATTTAAACATTAAATATAATCTCTATAATAATTTAAATCTAATATGGTTTT
AATAGAACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGA
TTGACTGGTATTCTTAACATATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCC
TTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCAATTTTCTCCTCCTTGTATAAATCCTGGT
TGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTGAGGCAACGTGGCGTGGTGTGCACTGTG
TTTGCTGACGCAACCCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGAC
TTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAACCTCATCGCCGCTGCCTTGCCCGCTGCT
GGACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTGGTGTGTCGGGGAAATCATCGTCC
TTTCCTTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGT
CCCTTCGGCCCTCAATCCAGCGGACCTTCCTTCCCGCGGCTGCTGCCGGCTCTGCGGCCTC
TTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCCGCTCCCCGCGA
ATTCATCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGGCCATCAAGCTGGCTGTGCC
TTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCCTTGACCCTGGAAGGTG
CCTCTCCACTGTCCTTTCCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGT

CATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAG
 CAGGCATGCTGGGGACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGC
 CACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAGGTCGCCCCGACGCC
 CGGGCTTTGCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGGCGCCTG
 ATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCAACCA
 TAGTACGCGCCCTGTAGCGGCGCATTAAAGCGCGCGGGTGTGGTGGTTACGCGCAGCGTGAC
 CGCTACACTTGGCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTTCTTCCCTTCTTTTCGCCA
 CGTTTCGCCGGCTTTCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGT
 GCTTTACGGCACCTCGACCCCAAAAACTTGATTTGGGTGATGGTTCACGTAGTGGGCCATC
 GCCCTGATAGACGGTTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCT
 TGTTCCAAACTGGAACAACACTCAACCCATCTCGGGCTATTCTTTTGATTTATAAGGGATT
 TTGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACCGGAATTT
 TAACAAAAATATTAACGTTTACAATTTTATGGTGCACCTCTCAGTACAATCTGCTCTGATGCCG
 CATAGTTAAGCCAGCCCCGACACCCGCCAACCCGCTGACGCGCCCTGACGGGCTTGTCTG
 CTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTGACAGGTT
 TTCACCGTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTTATAGG
 TTAATGTGATGATAATAATGGTTTTCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTGCGC
 GGAACCCCTATTTGTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATA
 ACCCTGATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCAACATTTCCGTG
 TCGCCCTTATTCCCTTTTTTTCGGGCATTTTGCCTTCTGTTTTTGTCTACCCAGAAACGCTG
 GTGAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTACATCGAACTGGATCT
 CAACAGCGGTAAAGATCCTTGAGAGTTTTTCGCCCCGAAGAACGTTTTTCCAATGATGAGCACTT
 TTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGT
 CGCCGCATACACTATTCTCAGAATGACTTGGTTGAGTACTCACCAGTCACAGAAAAGCATCT
 TACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAACACTG
 CGGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAAC
 ATGGGGGATCATGTAACCTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAA
 CGACGAGCGTGACACCA

[00144] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 81. An exemplary nucleotide sequence for vector c.81.8 is set forth in SEQ ID NO: 81 (*hGJB2* GRE8 underlined; mouse GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAACCTGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAAGTTGCAGGACCACTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
 TTCATTTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
 CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAACAAAAAAACCACCGCTACCAG
 CGGTGGTTTTGTTTGGCGGATCAAGAGCTACCAACTCTTTTTTCCGAAGGTAAGTGGCTTCAGC
 AGAGCGCAGATACCAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
 CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
 GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG

TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCCTGTTCGGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCCGGGCAAAGCCCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACTCCATCACTAGGGGTTCCCTGCGGCCGCACGCGTC
GACCTGAACGATTAAGGCAAACTTTCGAAATGTGCCCCAGCAGAGATTTATTTTTTCAGGGGG
TGTTTTGCATTCCAGCCCCCTCTGCCTTCCCTGGCGTTTAGTGCGATTTGTTTAGCCATGTGCT
CCCTGGTGTGTGTTTTGAATGTGTGTGAGATGGGTTGTCTCTCGGGACCTGGCAGGTGCGG
CCACCAGGTGAGGGCTGCCCCCAACCTGTGCCTCCTTCCCTCCTAGACTCTGGCCCCCTCA
GTGCTGAGGGTGATACAGAGCACTTTTCAAGCTGGATTTGGAATGTGGCCTCTCCCCCTCCAA
ACTCCTGGAGATCATGCAAAGGCCTTTGGAGCCAGCCAGTCACCTGGAAGGTGACATTCCCA
CCAGCTGAGGCCTCACCTTCAGCGGGGGCTGGGCAGCTTTGGAGCCTGGGGCCAGCCAAGCT
CACTCTGCCCCATATCCCTGCCACGTGTGGCCAGCGGATGATCACCTGTCTTCATCTGCGTA
CTGGGCCACATCCCTCCTGCCGTCCCCCACTTCCCTGATGACACCTACAGCAAGCCCCCTACC
CAAGTGTTCTGTGATCCCCTGTAAATGTGGCCTCCCTAGCTACTTGCTTTTTATGAAACCAAC
AATCCTGGGGACACAGTTTTTCGGCTGTCTCAAGACGGGGCAACCACTCTTTTTCCCCAGGCCT
GTGGGTCCCAGGCCTGGAGCTAGGGTTGGCATTCTTGCTGAATTCTCCACTCTATCCCAAC
CCCTGAGGCCGCTGAGGAGGCTCAGACTGTGTGAGGCTAGGAGGACAGTCAAACCACAAAA
ACATGCCTTTTAAGAAGTATAAGCACAAATCCCTCTTTGATGTTATATAAAAGCTCAGTGTC
ACTTTAATTAAGACCTCGAAGGGGACTTGGGGGGTTTCGGGGCTTTTCGGGGCGGTGCGGGGT
TCGCGGACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCGCGGCGCCGCC
CCTCCGTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGCGGTTAAAAGGCGC
CACGGCGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCCCCGACTCGGAG
CCCCTCGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCC
CAACGCCGAGACCCCCGCCCGGCCCGCGCGCTTCCCTCCCGACGCAGAGCAAACCGCCCA
GAGTAGAAGCC**ATGGATTGGGGCACACTCCAGAGCATCCTCGGGGGTGTCAACAAACACTCC**
ACCAGCATTGGAAGATCTGGCTCACGGTCCTCTTCATCTTCCGCATCATGATCCTCGTGGT
GGCTGCAAAGGAGGTGTGGGGAGATGAGCAAGCCGATTTTGTCTGCAACACGCTCCAGCCTG
GCTGCAAGAATGTATGCTACGACCACCCTTCCCCATCTCTCACATCCGGCTCTGGGCTCTG
CAGCTGATCATGGTGTCCACGCCAGCCCCCTCTGGTAGCTATGCATGTGGCCTACCGGAGACA
TGAAAAGAAACGGAAGTTCATGAAGGGAGAGATAAAGAACGAGTTTAAGGACATCGAAGAGA
TCAAACCCAGAAGGTCCGTATCGAAGGGTCCCTGTGGTGGACCTACACCACCAGCATCTTC
TTCCGGGTCACTCTTTGAAGCCGTCTTCATGTACGTCTTTTACATCATGTACAATGGCTTCTT
CATGCAACGTCTGGTGAATGCAACGCTTGGCCCTGCCCCAATACAGTGGACTGCTTCATTT
CCAGGCCCACAGAAAAGACTGTCTTCACCGTGTTTTATGATTTCTGTGTCTGGAATTTGCATT
CTGCTAAATATCACAGAGCTGTGCTATTTGTTTCGTTAGGTATTGCTCAGGAAAGTCCAAAAG
ACCAGTCTTACCCATACGATGTTCCAGATTACGCTTAAAGGCGCGCCACCCCTGCAGGGAATT
CCGCATTGCCAGTTGTTAGATTAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGC
TCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACCTTAAATGCAAC
CATTTGAAACCCCTGTAGGCCTCAGGTGAAACTCCAGATGCCACAATGGAGCTCTGCTCCCC
TAAAGCCTCAAAACAAAGGCCTAATTCTATGCCTGTCTTAATTTTCTTTCACTTAAAGTTAGT
TCCACTGAGACCCAGGCTGTTAGGGGTTATTGGTGTAAGGTACTTTTCATATTTTAAACAGA
GGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCCACAGAGGAC
ACAGAGAAGGTTTGGGTGTCCTCCTGGGGTTCTTTTTGCCAACTTTCCCCACGTTAAAGGTG
AACATTGGTTCTTTTCATTTGCTTTGGAAGTTTAAATCTCTAACAGTGGACAAAGTTACCAGT
GCCTTAAACTCTGTTACACTTTTTGGAAGTGAACACTTTGTAGTATGATAGGTTATTTTGAT
GTAAAGATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATG
TAAATGGTATGTCATTCGCTACTATGATTTAATTTGAAATATGGTCTTTTGGTTATGAATAC

TTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCATAGCACCTAACAACATT
GTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAAATGGC
CTCATGTCAAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCAACT
ACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCA
TCGGAAGAAGACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAAT
GGGGAGGACAAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAACAGATTTGGAAAG
ACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAGTTTGTGTTGCTT
ACCCCTTTCAGCCTCCAATTTTTTAAAGTGAATAATAGCTAATAACATGTGAAAAGAATAGAA
GCTAAGGTTTGTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTA
TGCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTTCAAGTGGGGTAAAGTATTTTCCCT
GTTGTCAAGAATAGCATTGTAAAAAGCATTTTGTAAATAATAAAGAATAGCTTTAATGATATGC
TTGTAATAAAAAATATTTTGTAAATGTATCAAATACATTTAAAAACATTAAAAATATAATCTCTA
TAATAATTTAAAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAA
CCTCTGGATTACAAAATTTGTGAAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTAC
GCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTCA
TTTTCTCCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCCGTTGTC
AGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTGC
CACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACGGCGGAAC
TCATCGCCGCTGCCTTGGCCGCTGCTGGACAGGGGCTCGGCTGTTGGGCACTGACAATTCC
GTGGTGTGTCGGGGAAATCATCGTCCTTTCTTGGCTGCTCGCCTATGTTGCCACCTGGAT
TCTGCGCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCCCTCCC
GCGGCCTGCTGCCGGCTCTGCGGCCTCTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGG
ATCTCCCTTTGGGCGCCTCCCCGCGAATTCATCGATACCGAGCGCTGCTCGAGAGATCTGT
GATAGCGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCC
CCGTGCCTTCCCTGACCCTGGAAGGTGCCACTCCCCTGTCTTTTCTAATAAAAATGAGGAA
ATTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGGGGGTGGGGTGGGGCAGGACAG
CAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGGCC
GCAGGAACCCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGG
CCGGGCGACCAAAAGTTCGCCCCGACGCCCCGGGCTTTGCCCCGGCGGCCTCAGTGAGCGAGCGA
GCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTAT
TTCACACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAGCGCGGC
GGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCCGCTCCTT
TCGCTTTTCTTCCCTTCCCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGG
GGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAACTTGATTT
GGGTGATGGTTACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTGACGTTGG
AGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACTGGAACAACACTCAACCCTATCTCG
GGCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCT
GATTTAACAAAAATTTAACGCGAATTTTAACAAAATATTAACGTTTACAATTTTATGGTGCA
CTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCC
GCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGCATCCGCTTACAGACAAGCTGTGACCGT
CTCCGGGAGCTGCATGTGTGAGAGGTTTTACCGTCTATCACCAGAACGCGGAGACGAAAGG
GCCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTTCTTAGACGTCA
GGTGGCACTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTTCTAAATACATTC
AAATATGTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGAAAAAGGA
AGAGTATGAGTATTCACATTTCCGTGTCGCCCTTATTCCCTTTTTTTCGGGCATTTTGCCTT
CCTGTTTTTGTCAACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGATCAGTTGGGTGC
ACGAGTGGGTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCCG
AAGAACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGT
ATTGACGCCGGCAAGAGCAACTCGGTGCGCGCATACACTATTCTCAGAATGACTTGGTTGA
GTACTCACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTG
CTGCCATAACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGATCGGAGGACCG

AAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACCTCGCCTTGATCGTTGGGA
ACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00145] In some embodiments, an AAV vector described herein comprises an AAV 5' ITR, a *GJB2* GRE enhancer (*hGJB2* GRE9), a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, Kozak sequence, nucleotide sequence encoding a gene product (e.g., *GJB2* or GFP), a *GJB2* exon 2 3' UTR, a WPRE, a bovine growth hormone poly A signal, and an AAV 3' ITR (e.g., vector c.81.9).

[00146] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 52. An exemplary nucleotide sequence for vector c.81.9 is set forth in SEQ ID NO: 52 (*hGJB2* GRE9 underlined; eGFP coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAACCTGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
TTCATTTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTCTGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTGTGTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACCTGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTCTGTGCACACAGCCCAGCTTGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCCTGTGCGGTTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAACACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTGCTGGCCTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCCCTGCGGCCGCACGCGTT
CTAGGTAGACAACCTAAGATGTTTATCTTATGGTTTAAATGTTTAGTTGTAAAGGTTGTTTGTCT
TCTCATTTGGTTCCAAGAAAGAGTATTTAGGCCAATTTTCAGGGAGAAATATGTGTATAGATA
TATTCATATGTCAAACCTGATTAGTGCTGAATGTCACATTTCCATATTCTAATAACATTTCTA
GCAAAGAAGAGGACACAGTGAAGAGAGAATTGCCCGCATTGTCATTGTCTCTTTCTGAGCCT
AGAACGCCTAACACTTGGGTGTGGAGAGACTCAGCCTCAATTCATTTCTAGCAGCCACTGA
GATGTGCTTGCCTGGGGTGCCCCCTGGCAGGCAGGGCTGGAACCTGCTTTCCAGTACCCACAC
GGACTGTGAACGAATCTTTCTTTGTGCTTTGTGTACAGAATGGAAGTTCAACAAATATTTGT
TGAATGTGTATGTCCTTCCAATACGCAGCAGCCAGAGCAAACGTGGTAATCTTGTGTGTGT
TCATGTGAAAGCAGAATTTAATGGTGCTTTTAAGCACAAAGTTTAAGATGCACGAGAAAAC
TGTATCTCCATTTTTTCTTTTCTGTTTACAATTACTTGTATAAGCCAGGCACGGTGGTGGCT

CACGCCTGTAATCCCAGCACTTTGGGAGGCCGAGGCGGGCGGATCACATGAGGTCGGGAGTT
AATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTTCGGGGCGGTTCGGGGTTCGCG
GACCCGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCGCGGCGCCGCCCCCTCC
GTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGCAGTTAAAGGCGCCACGG
CGGGAGACAGGTGTTGCGGCCCCGACGCGCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCCT
CGGCGGCGCCCCGCCCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCCAACG
CCGAGACCCCCGCCCCGGCCCCGCGCTTCTCCCGACGCAGAGCAAACCGCCCAGAGTA
GAAGCC**ATGGTGAGCAAGGGCGAGGAGCTGTTACCGGGGTGGTGCCCATCTGGTCGAGCT**
GGACGGCGACGTAAACGGCCACAAGTTCAGCGTGTCCGGCGAGGGCGAGGGCGATGCCACCT
ACGGCAAGCTGACCCTGAAGTTCATCTGCACCACCGGCAAGCTGCCCCTGCCCTGGCCCACC
CTCGTGACCACCTGACCTACGGCGTGCAGTGCTTCAGCCGCTACCCCGACCACATGAAGCA
GCACGACTTCTTCAAGTCCGCCATGCCCGAAGGCTACGTCCAGGAGCGCACCATCTTCTTCA
AGGACGACGGCAACTACAAGACCCGCGCCGAGGTGAAGTTCGAGGGCGACACCCTGGTGAAC
CGCATCGAGCTGAAGGGCATCGACTTCAAGGAGGACGGCAACATCCTGGGGCACAAGCTGGA
GTACAACCTACAACAGCCACAACGTCTATATCATGGCCGACAAGCAGAAGAAGCGCATCAAGG
TGAACCTTCAAGATCCGCCACAACATCGAGGACGGCAGCGTGCAGCTCGCCGACCCTACCAG
CAGAACACCCCCATCGGCGACGGCCCCGTGCTGCTGCCCCGACAACCCTACCTGAGCACCCA
GTCCGCCCTGAGCAAAGACCCCCAACGAGAAGCGCGATCACATGGTCTGCTGGAGTTCTGTA
CCGCCGCGGGGATCACTCTCGGCATGGACGAGCTGTACAAGTAAAGGCGCGCCACCCCTGCA
GGGAATTCCGCATTGCCAGTTGTTAGATTAAAGAAATAGACAGCATGAGAGGGATGAGGCAA
CCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACCTTAA
ATGCAACCATTTGAAACCCCTGTAGGCCCTCAGGTGAAACTCCAGATGCCACAATGGAGCTCT
GCTCCCCCTAAAGCCTCAAAACAAAGGCCCTAATTCTATGCCTGTCTTAATTTTTCTTTACTTA
AGTTAGTTCCACTGAGACCCAGGCTGTTAGGGGTTATTGGTGTAAGGTACTTTTCATATTTT
AAACAGAGGATATCGGCATTTGTTTCTTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCCAC
AGAGGACACAGAGAAGGTTTGGGTGTCTCCTGGGGTTCTTTTTGCCAACTTTCCCCACGTT
AAAGGTGAACATTGGTTCTTTTCAATTTGCTTTGGAAGTTTTAATCTCTAACAGTGACAAAAGT
TACCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGAAAACTTTGTAGTATGATAGGTTA
TTTTGATGTAAAGATGTTCTGGATAACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTG
TAATATGTAAATGGTATGTCATTTCGCTACTATGATTTAATTTGAAATATGGTCTTTTGGTTA
TGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTATTTCATTGTGGTCATAGCACCTAA
CAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGC
AAATGGCCTCATGTCAAATATTTAGATGTAAATTTTGTGTAAGAAATACAGACTGGATGTACC
ACCAACTACTACCTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTA
GCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTGCTTGGGAATTTTATTGACACAGTACC
ATTTAATGGGGAGGACAAAATGGGGCAGGGGAGGAGAAGTTTCTGTCTGTTAAAAACAGATT
TGGAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAAGTTTG
TTTGCTTACCCCTTCAGCCTCCAATTTTTTAAAGTGAAAATATAGCTAATAACATGTGAAAAG
AATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATT
GCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCCACATATTTTCAGTGAGGGTAAGTA
TTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTGTAAATAATAAAGAATAGCTTTAAT
GATATGCTTGTAACATAAATAATTTTGTAAATGTATCAAATACATTTAAACATTTAAATATA
ATCTCTATAATAATTTAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGA
TAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTC
CTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATG
GCTTTTCAATTTTCTCCTTGTATAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCC
CGTTGTACAGGCAACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGG
GCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCGCTTTCCCCCTCCCTATTGCCACG
GCGGAACCTCATCGCCGCTGCCTTGCCCGTGTGACAGGGGCTCGGCTGTTGGGCACTGA
CAATTCGCTGGTGTTGTGCGGGAAATCATCGTCCTTTCTTGGCTGCTCGCCTATGTTGCCA
CCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCTTCGGCCCTCAATCCAGCGGACCTT

CCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGAC
 GAGTCGGATCTCCCTTTGGGCGCCTCCCCGGAATTCATCGATACCGAGCGCTGCTCGAGA
 GATCTGTGATAGCGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGC
 CCTCCCCCGTGCCTTCCTTGACCCTGGAAGGTGCCACTCCCCTGTCCTTTCTAATAAAAA
 TGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCTATTCTGGGGGGTGGGGTGGGGC
 AGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCG
 AGCGGCCCGCAGGAACCCCTAGTGATGGAGTTGGCCACTCCCCTCTGCGCGCTCGCTCGCTC
 ACTGAGGCCGGGCGACCAAAGGTGCCCCGACGCCGGGCTTTGCCGGGCGGCCTCAGTGAG
 CGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGT
 GCGGTATTTACACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAA
 GCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCC
 GCTCCTTTTCGCTTTCTTCCCTTCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCT
 AAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAAAC
 TTGATTTGGGTGATGGTTACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTTG
 ACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACTGGAACAACACTCAACCC
 TATCTCGGGCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAA
 ATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAAACAAAAATATTAACGTTTACAATTTTA
 TGGTGCACCTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCC
 AACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCCGCTTACAGACAAGCTG
 TGACCGTCTCCGGGAGCTGCATGTGTCAGAGTTTTTACCGTCATCACCGAAACGCGCGAGA
 CGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTTCTTA
 GACGTGAGGTGGCACTTTTTCGGGGAATGTGCGCGGAACCCCTATTTGTTTATTTTCTAAA
 TACATTCAAATATGTATCCGCTCATGAGACAATAACCCTGATAAATGCTTCAATAATATTGA
 AAAAGGAAGAGTATGAGTATTCAACATTTCCGTGTCGCCCTTATTCCTTTTTTTCGGGCATT
 TTGCCTTCTGTTTTTTGTCTACCCAGAAACGCTGGTGAAAGTAAAAGATGCTGAAGATCAGT
 TGGGTGCACGAGTGGGTTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTT
 CGCCCCGAAGAACGTTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATT
 ATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCGCATACACTATTCTCAGAATGACT
 TGGTTGAGTACTACCAAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTA
 TGCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGATCGG
 AGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACCTCGCCTTGATC
 GTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

[00147] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 82. An exemplary nucleotide sequence for vector c.81.9 is set forth in SEQ ID NO: 82 (*hGJB2* GRE9 underlined; human GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACTATTAACGGCGAACTACTTACTCTA
 GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAAGTTGCAGGACCACTTCTGCG
 CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
 GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
 ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
 GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAAC
 TTCATTTTTAATTTAAAAGGATCTAGGTGAAGATCCTTTTTTGATAATCTCATGACCAAAATC
 CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
 TTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAACAAAAAAACCACCGCTACCAG

CGGTGGTTTGTGGCCGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGC
AGAGCGCAGATACCAAATACTGTCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACC GCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAAGCGCCACGCTTCCC GAAGGGAGAAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCTGTGCGGTTTCGCCACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCCGGGCAAAGCCCCGGGCGTCGGGCGACCTTTGGTCGCCCCGGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACTCCATCACTAGGGGTTCCCTGCGGCCGCACGCGTT
CTAGGTAGACAACCTAAGATGTTTCATCTTATGGTTTTAATGTTTAGTTGTAAAGGTTGTTTGCT
TCTCATTTGGTTTCCAAGAAAGAGTATTTAGGCCAATTTTCAGGGAGAAATATGTGTATAGATA
TATTCATATGTCAAACCTGATTAGTGTGAATGTCACATTTCCATATTCTAATAACATTTCTA
GCAAAGAAGAGGACACAGTGAAGAGAGAATTGCCCGCATTGTCATTGTCTCTTTCTGAGCCT
AGAACGCCTAACACTTGGGTGTGGAGAGACTCAGCCTCAATTCACCTTTCTAGCAGCCACTGA
GATGTGCTTGCCTGGGGTGCCCCCTGGCAGGCAGGGCTGGAACCTGCTTTCCAGTACCCACAC
GGACTGTGAACGAATCTTTCTTTGTGCTTTGTGTACAGAATGGAAGTTCAACAAATATTTGT
TGAATGTGTATGTCCTTCCAATACGCAGCAGCCCAGAGCAAACGTGGTAATCTTGTGTGTGT
TCATGTGAAAGCAGAATTTAATGGTGCTTTTAAGCACCAAAGTTTAAGATGCACGAGAAAAC
TGTATCTCCATTTTTCTTTTCGTTTACAATTACTTGTATAAGCCAGGCACGGTGGTGGCT
CACGCCTGTAATCCCAGCACTTTGGGAGGCCGAGGCGGGCGGATCACATGAGGTCGGGAGTT
AATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGGCTTTTCGGGGGCGGTTCGGGGGTTTCGCG
GACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCCCGCGCGCCGCCCTCC
GTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGGTGCGGTTAAAGGCGCCACGG
CGGGAGACAGGTGTTGCGGCCCGCAGCGCCCGCGCGCTCCTCTCCCCGACTCGGAGCCCCT
CGGCGGCGCCCCGGCCCAGGACCCGCTAGGAGCGCAGGAGCCCCAGCGCAGAGACCCCAACG
CCGAGACCCCCGCCCCGGCCCCGCGCGCTTCTCCCGACGCAGAGCAAACCGCCCAGAGTA
GAAGCC**ATGGATTGGGGCAGCTGCAGACGATCCTGGGGGGTGTGAACAAACACTCCACCAG**
CATTGGAAAGATCTGGCTCACCGTCTCTTCATTTTTTCGCATTATGATCCTCGTTGTGGCTG
CAAAGGAGGTGTGGGGAGATGAGCAGGCCGACTTTGTCTGCAACACCCTGCAGCCAGGCTGC
AAGAACGTGTGCTACGATCACTACTTCCCCATCTCCACATCCGGCTATGGGCCCTGCAGCT
GATCTTCGTGTCCACGCCAGCGCTCCTAGTGGCCATGCACGTGGCCTACCGGAGACATGAGA
AGAAGAGGAAGTTCATCAAGGGGGAGATAAAGAGTGAATTTAAGGACATCGAGGAGATCAAA
ACCCAGAAGGTCCGCATCGAAGGCTCCCTGTGGTGGACCTACACAAGCAGCATCTTCTTCCG
GGTCATCTTCGAAGCCGCCTTCATGTACGTCTTCTATGTCATGTACGACGGCTTCTCCATGC
AGCGGCTGGTGAAGTGCAACGCCTGGCCTTGTCCTCAACACTGTGGACTGCTTTGTGTCCCGG
CCCACGGAGAAGACTGTCTTACAGTGTTCATGATTGCAGTGTCTGGAATTTGCATCCTGCT
GAATGTCACTGAATTGTGTTATTTGCTAATTAGATATTGTTCTGGGAAGTCAAAAAAGCCAG
TTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCATTGCCAGTTGTTAGATTAAGAAATAG
ACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGCTGTCAAGGCTCAGTCGCTAGCATTTCC
CAACACAAAGATTCTGACCTTAAATGCAACCATTTGAAACCCCTGTAGGCCTCAGGTGAAAC
TCCAGATGCCACAATGGAGCTCTGCTCCCCTAAAGCCTCAAAACAAAGGCCTAATTCTATGC
CTGTCTTAATTTTCTTTCACTTAAGTTAGTTCCACTGAGACCCAGGCTGTTAGGGGTTATT
GGTGTAAAGGTACTTTTCATATTTTAAACAGAGGATATCGGCATTTGTTTCTTTCTGAGGAC
AAGAGAAAAAGCCAGGTTCCACAGAGGACACAGAGAAGGTTTGGGTGTCCTCCTGGGGTTC
TTTTTGCCAACCTTTCCCCACGTTAAAGGTGAACATTGGTTCTTTTCATTTGCTTTGGAAGTTT
TAATCTCTAACAGTGGACAAAGTTACCAGTGCCTTAAACTCTGTTACACTTTTTGGAAGTGA
AACTTTGTAGTATGATAGGTTATTTTGATGTAAAGATGTTCTGGATACCATTATATGTTCC
CCCTGTTTCAGAGGCTCAGATTGTAATATGTAAATGGTATGTCATTTCGCTACTATGATTTAA

TTTGAAATATGGTCTTTTGGTTATGAATACTTTGCAGCACAGCTGAGAGGCTGTCTGTTGTA
TTCATTGTGGTCATAGCACCTAACAACATTGTAGCCTCAATCGAGTGAGACAGACTAGAAGT
TCCTAGTGATGGCTTATGATAGCAAAATGGCCTCATGTCAAATATTTAGATGTAATTTTGTGT
AAGAAATACAGACTGGATGTACCACCACTACTACCTGTAATGACAGGCCTGTCCAACACAT
CTCCCTTTTCCATGACTGTGGTAGCCAGCATCGGAAAGAACGCTGATTTAAAGAGGTGCGCTT
GGGAATTTTATTGACACAGTACCATTTAATGGGGAGGACAAAAATGGGGCAGGGGAGGGAGAA
GTTTCTGTGCTTAAAAACAGATTTGGAAAGACTGGACTCTAAAGTCTGTTGATTAAAGATGA
GCTTTGTCTACTTCAAAAGTTTGTGTTGCTTACCCCTTCAGCCTCCAATTTTTTAAAGTAAAA
TATAGCTAATAACATGTGAAAAGAATAGAAGCTAAGGTTTAGATAAATATTGAGCAGATCTA
TAGGAAGATTGAACCTGAATATTGCCATTATGCTTGACATGGTTTCCAAAAAATGGTACTCC
ACATATTTTCACTGAGGGTAAGTATTTTCTGTTGTCAAGAATAGCATTGTAAAAGCATTTTTG
TAATAATAAAGAATAGCTTTAATGATATGCTTGTAATAAAATAATTTTGTAAATGTATCAAA
TACATTTAAAAACATTAAAAATATAATCTCTATAATAATTTAAAAATCTAATATGGTTTTAATAG
AACAGCGATATCAAGCTTATCGATAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGAC
TGGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGT
ATCATGCTATTGCTTCCCGTATGGCTTTTCAATTTTCTCCTCCTTGTATAAATCCTGGTTGCTG
TCTCTTTATGAGGAGTTGTGGCCCGTTGTGAGGCAACGTGGCGTGGTGTGCACTGTGTTTGC
TGACGCAACCCCACTGGTTGGGGCATTGCCACCACCTGTCAGCTCCTTTCCGGGACTTTTCG
CTTTCCCCCTCCCTATTGCCACGGCGGAACCTCATCGCCGCTGCCTTGCCCGCTGCTGGACA
GGGGCTCGGCTGTTGGGCACTGACAATTCGTTGGTGTGTCGGGGAAATCATCGTCCTTTCC
TTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGCGCGGGACGTCCTTCTGCTACGTCCCTT
CGGCCCTCAATCCAGCGGACCTTCCCTTCCCGCGGCCTGCTGCCGGCTCTGCGGCCTCTCCG
CGTCTTTCGCTTCGCCCTCAGACGAGTCGGATCTCCCTTTGGGCGCCTCCCCGCGAATTCA
TCGATACCGAGCGCTGCTCGAGAGATCTGTGATAGCGCCATCAAGCTGGCTGTGCCTTCTA
GTTGCCAGCCATCTGTTGTTTGGCCCTCCCCCGTGCCTTCCCTTGACCCTGGAAGGTGCCACT
CCCCTGTCTTTTCTAATAAAATGAGGAAATTGCATCGCATTGTCTGAGTAGGTGTCATTCT
TATTCTGGGGGGTGGGGTGGGGCAGGACAGCAAGGGGGAGGATTGGGAAGACAATAGCAGGC
ATGCTGGGGACACGTGCGGACCGAGCGGCCGAGGAACCCCTAGTGATGGAGTTGGCCACTC
CCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGGCGACCAAAAGTCGCCCCGACGCCCGGGC
TTTGCCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCGCAGCTGCCTGCAGGGGCGCCTGATGCG
GTATTTTCTCCTTACGCATCTGTGCGGTATTTACACCCGCATACGTCAAAGCAACCATAGTA
CGCGCCCTGTAGCGGCGCATTAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTA
CACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTTTCTTCCCTTCCCTTCTCGCCACGTTT
GCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTT
ACGGCACCTCGACCCCAAAAACTTGATTTGGGTGATGGTTACGTAAGTGGGCCATCGCCCT
GATAGACGGTTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTT
CAAAGTGAACAACACTCAACCCTATCTCGGGCTATTCTTTTGATTTATAAGGGATTTTGCC
GATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACA
AAATATTAACGTTTACAATTTTATGGTGCCTCTCAGTACAATCTGCTCTGATGCCGCATAG
TTAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGCCCTGACGGGCTTGTCTGCTCCC
GGCATCCGCTTACAGACAAGCTGTGACCGTCTCCGGGAGCTGCATGTGTGAGAGGTTTTTCAC
CGTCATCACCGAAACGCGCGAGACGAAAGGGCCTCGTGATACGCCTATTTTTATAGGTTAAT
GTCATGATAATAATGGTTTCTTAGACGTCAGGTGGCACTTTTCGGGGAAATGTGCGCGGAAC
CCCTATTTGTTTATTTTTCTAAATACATTCAAATATGTATCCGCTCATGAGACAATAACCCT
GATAAATGCTTCAATAATATTGAAAAAGGAAGAGTATGAGTATTCACATTTCCGTGTCGCC
CTTATTTCCCTTTTTTGCGGCATTTTGCCTTCTGTTTTTGTCTACCCAGAAACGCTGGTGAA
AGTAAAGATGCTGAAGATCAGTTGGGTGCACGAGTGGGTACATCGAACTGGATCTCAACA
GCGGTAAGATCCTTGAGAGTTTTGCCCCGAAGAACGTTTTTCCAATGATGAGCACTTTTAAA
GTTCTGCTATGTGGCGCGGTATTATCCCGTATTGACGCCGGGCAAGAGCAACTCGGTGCGCG
CATACACTATTCTCAGAATGACTTGGTTGAGTACTACCAGTCACAGAAAAGCATCTTACGG
ATGGCATGACAGTAAGAGAATTATGCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCC

AACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACCGCTTTTTTGCACAACATGGG
GGATCATGTAACTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGACG
AGCGTGACACCA

[00148] In some embodiments, an AVV vector described herein comprises a nucleotide sequence at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to SEQ ID NO: 83. An exemplary nucleotide sequence for vector c.81.9 is set forth in SEQ ID NO: 83 (*hGJB2* GRE9 underlined; mouse GJB2 coding sequence in bold face):

CGATGCCTGTAGCAATGGCAACAACGTTGCGCAAACCTATTAAGTGGCGAACTACTTACTCTA
GCTTCCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCCTTCTGCG
CTCGGCCCTTCCGGCTGGCTGGTTTATTGCTGATAAATCTGGAGCCGGTGAGCGTGGGTCTC
GCGGTATCATTGCAGCACTGGGGCCAGATGGTAAGCCCTCCCGTATCGTAGTTATCTACACG
ACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCTCACT
GATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAC
TTCATTTTTAATTTAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATC
CCTTAACGTGAGTTTTTCGTTCCACTGAGCGTCAGACCCCGTAGAAAAGATCAAAGGATCTTC
TTGAGATCCTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAACCACCGCTACCAG
CGGTGGTTTTGTTGCCGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAAGTGGCTTCAGC
AGAGCGCAGATACCAATACTGTCCTTCTAGTGTAGCCGTAGTTAGGCCACCACTTCAAGAA
CTCTGTAGCACCGCCTACATACCTCGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTG
GCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGTTACCGGATAAGGCGCAGCGG
TCGGGCTGAACGGGGGGTTCGTGCACACAGCCCAGCTTGGAGCGAACGACCTACACCGAACT
GAGATACCTACAGCGTGAGCTATGAGAAAGCGCCACGCTTCCCGAAGGGAGAAAGGCGGACA
GGTATCCGGTAAGCGGCAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAAC
GCCTGGTATCTTTATAGTCCTGTCGGTTTTCCGACCTCTGACTTGAGCGTCGATTTTTGTG
ATGCTCGTCAGGGGGGCGGAGCCTATGGAAAAACGCCAGCAACGCGGCCTTTTTACGGTTCC
TGGCCTTTTTGCTGGCCTTTTTGCTCACATGTCCTGCAGGCAGCTGCGCGCTCGCTCGCTCACT
GAGGCCGCCCGGGCAAAGCCCGGGCGTCGGGCGACCTTTGGTCGCCCAGCCTCAGTGAGCGA
GCGAGCGCGCAGAGAGGGAGTGGCCAACCTCCATCACTAGGGGTTCCCTGCGGCCGCACGCGTT
CTAGGTAGACAACCTAAGATGTTTCATCTTATGGTTTAAATGTTTAGTTGTAAAGGTTGTTTGT
TCTCATTTGGTTTCCAAGAAAGAGTATTTAGGCCAATTTTCAGGGAGAAATATGTGTATAGATA
TATTCATATGTCAAACCTGATTAGTGCTGAATGTCACATTTCCATATTCTAATAACATTTCTA
GCAAAGAAGAGGACACAGTGAAGAGAGAATTGCCCGCATTGTCATTGTCTCTTTCTGAGCCT
AGAACGCCTAACACTTGGGTGTGGAGAGACTCAGCCTCAATTCACCTTTCTAGCAGCCACTGA
GATGTGCTTGCCTGGGGTGCCCCCTGGCAGGCAGGGCTGGAAGTCTTTCCAGTACCCACAC
GGACTGTGAACGAATCTTTCTTTGTGCTTTGTGTACAGAATGGAAGTTCAACAAATATTTGT
TGAATGTGTATGTCCTTCCAATACGCAGCAGCCAGAGCAAACGTGGTAATCTTGTGTGTGT
TCATGTGAAAGCAGAATTTAATGGTGCTTTTAAAGCACAAAGTTTAAAGATGCACGAGAAAAC
TGTATCTCCATTTTTTCTTTTTCGTTTACAATTACTTGTATAAGCCAGGCACGGTGGTGGCT
CACGCCTGTAATCCCGACCTTTGGGAGGCCGAGGCGGGCGGATCACATGAGGTGCGGGAGTT
AATTAAGACCTCGAAGGGGACTTGGGGGGTTCGGGGCTTTTCGGGGGCGGTGCGGGGTTTCGCG
GACCCGGGAAGCTCTGAGGACCCAGAGGCCGGGCGCGCTCCGCCGCGGCGCCGCCCTCC
GTAACCTTTCCAGTCTCCGAGGGAAGAGGCGGGGTGTGGGTGCGGTTAAAGGCGCCACGG
CGGGAGACAGGTGTTGCGGCCCGCAGCGCCGCGCGCTCCTCTCCCGACTCGGAGCCCT
CGGCGGCGCCCGGCCAGGACCCGCTAGGAGCGCAGGAGCCCGCAGCGAGAGACCCCAACG
CCGAGACCCCGCCCGGCCCGCGCGCTTCTCCCGACGCAGAGCAAACCGCCCGAGAGTA

GAAGCCATGGATTGGGGCACACTCCAGAGCATCCTCGGGGGTGTCAACAAACACTCCACCAG
CATTGGAAAGATCTGGCTCACGGTCCCTCTTCATCTTCCGCATCATGATCCTCGTGGTGGCTG
CAAAGGAGGTGTGGGGAGATGAGCAAAGCCGATTTTGTCTGCAACACGCTCCAGCCTGGCTGC
AAGAATGTATGCTACGACCACCACTTCCCCATCTCTCACATCCGGCTCTGGGCTCTGCAGCT
GATCATGGTGTCCACGCCAGCCCTCCTGGTAGCTATGCATGTGGCCTACCGGAGACATGAAA
AGAAACGGAAAGTTCATGAAGGGAGAGATAAAGAACGAGTTTAAGGACATCGAAGAGATCAAA
ACCCAGAAGGTCCGTATCGAAGGGTCCCTGTGGTGGACCTACACCACCAGCATCTTCTTCCG
GGTCATCTTTGAAGCCGTCTTCATGTACGTCTTTTACATCATGTACAATGGCTTCTTCATGC
AACGTCTGGTGAAATGCAACGCTTGGCCCTGCCCCAATACAGTGGACTGCTTCATTTCCAGG
CCCACAGAAAAGACTGTCTTACCCTGTTTATGATTTCTGTGTCTGGAATTTGCATTCTGCT
AAATATCACAGAGCTGTGCTATTTGTTTCGTTAGGTATTGCTCAGGAAAGTCCAAAAGACCAG
TCTACCCATACGATGTTCCAGATTACGCTTAAAGGCGCGCCACCCCTGCAGGGAATTCCGCA
TTGCCCAGTTGTTAGATTAAAGAAATAGACAGCATGAGAGGGATGAGGCAACCCGTGCTCAGC
TGTC AAGGCTCAGTCGCTAGCATTTCCCAACACAAAGATTCTGACCTTAAATGCAACCATT
GAAACCCCTGTAGGCCCTCAGGTGAAACTCCAGATGCCACAATGGAGCTCTGCTCCCTTAAAG
CCTCAAAACAAAGGCCATAATTCTATGCCGTCTTAATTTTCTTTCACCTAAGTTAGTTCCAC
TGAGACCCCAAGGCTGTTAGGGGTTATTGGTGTAAAGGTACTTTCATATTTTAAACAGAGGATA
TCGGCATTTGTTTCTTCTCTGAGGACAAGAGAAAAAAGCCAGGTTCCACAGAGGACACAGA
GAAGGTTTGGGTGTCCTCCTGGGGTCTTTTTGCCAACTTTCCCCACGTTAAAGGTGAACAT
TGGTTCTTTTCAATTGCTTTGGAAGTTTAACTCTTAACAGTGGACAAAGTTACCAGTGCCTT
AAACTCTGTTACACTTTTTGGAAGTGAAAACCTTTGTAGTATGATAGGTTATTTTGTATGTA
GATGTTCTGGATACCATTATATGTTCCCCCTGTTTCAGAGGCTCAGATTGTAATATGTAAAT
GGTATGTCATTGCTACTATGATTTAATTTGAAATATGGTCTTTTGGTTATGAATACTTTGC
AGCACAGCTGAGAGGCTGTCTGTTGTATTCAATTGTGGTCATAGCACCTAACAACATTGTAGC
CTCAATCGAGTGAGACAGACTAGAAGTTCCTAGTGATGGCTTATGATAGCAAATGGCCTCAT
GTCAAATATTTAGATGTAATTTTGTGTAAGAAATACAGACTGGATGTACCACCAACTACTAC
CTGTAATGACAGGCCTGTCCAACACATCTCCCTTTTCCATGACTGTGGTAGCCAGCATCGGA
AAGAACGCTGATTTAAAGAGGTCGCTTGGGAATTTTATTGACACAGTACCATTTAATGGGGA
GGACAAAATGGGGCAGGGGAGGGAGAAGTTTCTGTCTGTTAAAAACAGATTTGAAAAGACTGG
ACTCTAAAGTCTGTTGATTAAAGATGAGCTTTGTCTACTTCAAAAGTTTGTGTTGCTTACCC
TTCAGCCTCCAATTTTTTAAGTGAAAAATATAGCTAATAACATGTGAAAAGAATAGAAGCTAA
GGTTTAGATAAAATATTGAGCAGATCTATAGGAAGATTGAACCTGAATATTGCCATTATGCTT
GACATGGTTTCCAAAAAATGGTACTCCACATATTTCAAGTGGGGTAAGTATTTTCTGTTGT
CAAGAATAGCATTTGTAAGCATTTTGTAATAATAAAGAATAGCTTTAATGATATGCTTGTA
ACTAAAATAATTTGTAATGTATCAAATACATTTAAACATTAAAATATAATCTCTATAATA
ATTTAAAATCTAATATGGTTTTAATAGAACAGCGATATCAAGCTTATCGATAATCAACCTCT
GGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTAT
GTGGATACGCTGCTTTAATGCCTTTGTATCATGCTATTGCTTCCCGTATGGCTTTTCAATTTT
TCCTCCTTGATAAAATCCTGGTTGCTGTCTCTTTATGAGGAGTTGTGGCCCGTTGTCAGGCA
ACGTGGCGTGGTGTGCACTGTGTTTGTGACGCAACCCCCACTGGTTGGGGCATTGCCACCA
CCTGTGAGCTCCTTTCCGGGACTTTTCGCTTTCCCTCCTTATGCCACGGCGGAACCTCATC
GCCGCCTGCCTTGCCCGCTGTGACAGGGGCTCGGCTGTTGGGCACTGACAATCCGTGGT
GTTGTGCGGGGAAATCATCGTCCTTTTCTTGGCTGCTCGCCTATGTTGCCACCTGGATTCTGC
GCGGGACGTCCTTCTGCTACGTCCCTTCGGCCCTCAATCCAGCGGACCTTCTTCCCGCGGC
CTGCTGCCGGCTCTGCGGCCTCTTCCGCGTCTTCGCCTTCGCCCTCAGACGAGTCGGATCTC
CCTTTGGGCCGCTCCCGCGAATTCATCGATACCGAGCGCTGCTCGAGAGATCTGTGATAG
CGGCCATCAAGCTGGCTGTGCCTTCTAGTTGCCAGCCATCTGTTGTTTGGCCCTCCCCGTG
CCTTCTTACCCTGGAAGGTGCCACTCCCACTGTCTTTTCTAATAAAATGAGGAAATTGC
ATCGCATTGTCTGAGTAGGTGTCTATTCTTCTGGGGGTGGGGTGGGGCAGGACAGCAAGG
GGGAGGATTGGGAAGACAATAGCAGGCATGCTGGGGACACGTGCGGACCGAGCGCCGAGG
AACCCTAGTGATGGAGTTGGCCACTCCCTCTCTGCGCGCTCGCTCGCTCACTGAGGCCGGG

CGACCAAAGGTCGCCCCGACGCCGGGCTTTGCCCGGGCGGCCTCAGTGAGCGAGCGAGCGCG
 CAGCTGCCTGCAGGGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTTAC
 ACCGCATACGTCAAAGCAACCATAGTACGCGCCCTGTAGCGGCGCATTAAAGCGCGGGCGGGTG
 TGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCT
 TTCTTCCCTTCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCT
 CCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGACCCCCAAAAAAGTTGATTTGGGTG
 ATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTCGCCCTTTGACGTTGGAGTCC
 ACGTTCTTTAATAGTGGAAGTCTTGTTCCAAAGTGAACAACACTCAACCCTATCTCGGGCTA
 TTCTTTTGATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTT
 AACAAAAATTTAACGCGAATTTTAAACAAAATATTAACGTTTACAATTTTATGGTGCACCTCTC
 AGTACAATCTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTGA
 CGCGCCCTGACGGGCTTGTCTGCTCCCGGCATCCGCTTACAGACAAGCTGTGACCGTCTCCG
 GGAGCTGCATGTGTGAGAGGTTTTACCGTTCATCACCGAAACGCGCGAGACGAAAGGGCCTC
 GTGATACGCCTATTTTTATAGGTTAATGTCATGATAATAATGGTTTCTTAGACGTCAGGTGG
 CACTTTTTCGGGGAAATGTGCGCGGAACCCCTATTTGTTTATTTTTCTAAATACATTCAAATA
 TGTATCCGCTCATGAGACAATAACCCGATAAATGCTTCAATAATATTGAAAAAGGAAGAGT
 ATGAGTATTCAACATTTCCGTGTGCGCCCTATTCCCTTTTTTGCGGCATTTTGCCTTCCTGT
 TTTTGCTCACCCAGAAACGCTGGTGAAAAGTAAAAGATGCTGAAGATCAGTTGGGTGCACGAG
 TGGGTTACATCGAACTGGATCTCAACAGCGGTAAGATCCTTGAGAGTTTTTCGCCCCGAAGAA
 CGTTTTCCAATGATGAGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTATTGA
 CGCCGGGCAAGAGCAACTCGGTGCGCCGCATACACTATTCTCAGAATGACTTGGTTGAGTACT
 CACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTATGCAGTGCTGCC
 ATAACCATGAGTGATAACACTGCGGCCAATTACTTCTGACAACGATCGGAGGACCGAAGGA
 GCTAACCGCTTTTTTGCACAACATGGGGGATCATGTAACCTCGCCTTGATCGTTGGGAACCG
 AGCTGAATGAAGCCATACCAAACGACGAGCGTGACACCA

II. Recombinant Adeno-Associated Viruses (rAAVs)

[00149] In some aspects, the disclosure provides isolated AAVs. As used herein with respect to AAVs, the term “isolated” refers to an AAV that has been artificially produced, engineered, or obtained. Isolated AAVs may be produced using recombinant methods. Such AAVs are referred to herein as “recombinant AAVs”. Recombinant AAVs (rAAVs) preferably have tissue-specific targeting capabilities, such that a transgene of the rAAV will be delivered specifically to one or more predetermined tissue(s). The AAV capsid is an important element in determining these tissue-specific targeting capabilities. Thus, a rAAV having a capsid appropriate for the tissue being targeted can be selected.

[00150] Methods for obtaining recombinant AAVs having a desired capsid protein are known in the art. (See, for example, US 2003/0138772, which is incorporated herein by reference). Typically the methods involve culturing a host cell which contains a nucleic acid sequence encoding an AAV capsid protein; a functional *rep* gene; a recombinant AAV vector composed of AAV inverted terminal repeats (ITRs) and an expression cassette (*e.g.*, GJB2 expression cassette); and a helper plasmid expressing the E2b and E4 transcripts from adenovirus to permit packaging of the recombinant AAV vector into the AAV capsid. In

some embodiments, capsid proteins are structural proteins encoded by the cap gene of an AAV. AAVs comprise three capsid proteins, virion proteins 1 to 3 (named VP1, VP2 and VP3), all of which are transcribed from a single cap gene via alternative splicing. In some embodiments, the molecular weights of VP1, VP2 and VP3 are respectively about 87 kDa, about 72 kDa, and about 62 kDa. In some embodiments, upon translation, capsid proteins form a spherical 60-mer protein shell around the viral genome. In some embodiments, the functions of the capsid proteins are to protect the viral genome, deliver the genome, and/or interact with the host. In some aspects, capsid proteins deliver the viral genome to a host in a tissue specific manner (*e.g.*, to cells in the inner ear).

[00151] The present disclosure is based in part on the finding that certain AAV serotype capsids are capable of delivering a transgene (*e.g.*, *GJB2* gene) to the ear (*e.g.*, cells in the inner ear). In some embodiments, an AAV capsid protein is of an AAV serotype selected from the group consisting of AAV9.PHP.B, AAV9.PHP.eB, exoAAV, Anc80, AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, AAVrh8, AAV9, AAV10, AAVrh10, and AAV-S. AAV2.7m8 is capable of delivering a transgene targeting cochlear hair cells and supporting cells and the retina. AAV2.7m8 shows good transduction to the inner ear (Isgrig et al., “AAV2.7m8 is a powerful viral vector for inner ear gene therapy,” *Nature Communications* volume 10, Article number: 427 (2019)). In some embodiments, the capsid protein is of AAV serotype 9 (AAV9). In some embodiments, an AAV capsid protein is of a serotype derived from AAV9 (*e.g.*, an AAV9 capsid variant), for example, AAV9.PHP.B. In some embodiments, the AAV9 capsid variant is AAV9.PHP.B. In some embodiments, the AAV9 capsid variant is AAV-S. AAV-S is an AAV9 capsid protein variant originally developed for targeting central nervous system (CNS) (Hanlon et al, Selection of an Efficient AAV Vector for Robust CNS Transgene Expression, *Molecular Therapy Method & Clinical Development*, vol. 15, pp. 320-332, December 13, 2019, and PCT/US2020/025720, which are incorporated herein by reference). Surprisingly, AAV-S showed good transducing efficiency for inner ear cells, (see., *e.g.*, Hanlon et al., AAV-S: A novel AAV vector selected in brain transduces the inner ear with high efficiency, *Molecular Therapy* Vol 18 No 4S1, April 28, 2020, Abstract 151, which is incorporated herein by reference), including, but not limited to: outer hair cells (OHCs), inner hair cells (IHCs), supporting cells (*e.g.*, border cell, inner phalangeal cell, inner pillar cell, outer pillar cell, Deiters' cell, Hensen's, or Claudius' cell), spiral ganglion neuron, spiral limbus cells (*e.g.*, glial cell or interdental cell), outer sulcus cells, lateral wall, stria vascularis (*e.g.*, basal cell and intermediate cell), inner sulcus, spiral ligament (*e.g.*, fibrocytes), or cells of the vestibular system. In some embodiments, the AAV

capsid is AAV-S. An exemplary amino acid sequence for AAV-S is set forth in SEQ ID NO: 33. In some embodiments, the AAV capsid is an exoAAV. An exoAAV refers to an exosome-associated AAV. An exoAAV capsid protein may be selected from the group consisting of AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, AAVrh8, AAV9, AAV10, AAVrh10, and AAV.PHP.B. In some examples, the exoAAV is exoAAV1 or exoAAV9.

[00152] Exemplary amino acid sequence for AAV-S is set forth in SEQ ID NO: 33:

MAADGYLPDWLEDNLSEGIREWALKPGAPQPKANQQHQDNARGLVLPGYKYLPGNGLDKG
EPVNAADAAALEHDKAYDQQLKAGDNPYLKYNHADADEFQERLKEDTSFGGNGLGRAVFAQKKR
LLEPLGLVEEAAKTAPGKKRPVEQSPQEPDSSAGIGKSGAQPAKKRLNFGQTGDTESVPDPQ
PIGEPPAAPSGVGSALTMASSGGGAPVADNNEGADGVGSSSGNWHCDSQWLGDRVITTTSTRTWA
LPTYNNHLYKQISNSTSGGSSNDNAYFGYSTPWGYFDFNRFHCHFSPRDWQRLINNNWGFRRP
KRLNFKLFNIQVKEVTDNNGVKTIANNLSTSTVQVFTDSDYQLPYVLGSAHEGCLPPFPADVF
MIPQYGYLTLDNGSQAVGRSSFYCLEYFPSQMLRTGNNFQFSYEFENVFPFHSSYAHSQSLDR
LMNPLIDQYLYLSKTINGSGQNQQTLKFSVAGPSNMAVQGRNYIPGPSYRQQRVSTTVTQN
NNSEFAWP GASSWALNGRNSLMNPGPAMASHKEGEDRFFPLSGSLIFGKQGTGRDNVDADKV
MITNEEEIKTTNPVATESYGQVATNHQSAQSTTLYSPAQAQTGWVQNQGILPGMVWQDRDVY
LQGPIWAKIPHTDGNFHPSPMLGGFGMKHPPQILIKNTVPADPPTAFNKDKLNSFITQYS
TGQVSVEIEWELQKENS KRWNPEIQYTSNYYKSNNVEFAVNTEGVYSEPRPIGTRYLTRNL

[00153] The skilled artisan will also realize that conservative amino acid substitutions may be made to provide functionally equivalent variants or homologs of the capsid proteins. In some aspects, the disclosure embraces sequence alterations that result in conservative amino acid substitutions. As used herein, a conservative amino acid substitution refers to an amino acid substitution that does not alter the relative charge or size characteristics of the protein in which the amino acid substitution is made. Variants can be prepared according to methods for altering polypeptide sequence known to one of ordinary skill in the art such as are found in references that compile such methods, e.g., *Molecular Cloning: A Laboratory Manual*, J. Sambrook, *et al.*, eds., Second Edition, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York, 1989, or *Current Protocols in Molecular Biology*, F.M. Ausubel, *et al.*, eds., John Wiley & Sons, Inc., New York. Conservative substitutions of amino acids include substitutions made among amino acids within the following groups: (a) M, I, L, V; (b) F, Y, W; (c) K, R, H; (d) A, G; (e) S, T; (f) Q, N; and (g) E, D. Therefore, one can make conservative amino acid substitutions to the amino acid sequence of the proteins and polypeptides described herein (e.g., GJB2 protein sequence).

[00154] In some embodiments, the rAAV is a single stranded AAV (ssAAV). A ssAAV, as used herein, refers to a rAAV with the coding sequence and complementary sequence of the transgene expression cassette on separate strands and packaged in separate viral capsids. In

some embodiments, the rAAV is a self-complementary AAV (scAAV). A scAAV, as used herein, refers to a rAAV with both the coding and complementary sequence of the transgene expression cassette present on the single strand of an AAV genome. The coding region of a scAAV was designed to form an intra-molecular double-stranded DNA template. Upon infection, rather than waiting for cell mediated synthesis of the second strand, the two complementary halves of scAAV will associate to form one double stranded DNA (dsDNA) unit that is ready for immediate replication and transcription.

[00155] In some embodiments, the rAAV as provided herein, is capable of delivering the transgene (*e.g.*, *GJB2*) to a mammal. In some examples, the mammal can be a human or a non-human mammal, such as a mouse, a rat, or a non-human primate (*e.g.*, cynomolgus monkey), a cat, a dog, a pig, a horse, a donkey, a camel, a sheep, or a goat. In certain embodiments, the mammal is a human.

[00156] In some embodiments, the rAAV, as provided herein, is capable of delivering the transgene (*e.g.*, *GJB2*) to the ear. In some instances, the rAAV, as provided herein, is capable of delivering the transgene (*e.g.*, *GJB2*) to the cells in the inner ear (*e.g.*, cochlea, saccule, utricle and semicircular canals). Non-limiting examples of the target cells are outer hair cells (OHC), inner hair cells (IHC), spiral ganglion neurons, cells of stria vascularis, cells of inner sulcus, cells of spiral ligament, cells of vestibular system, organ of Corti supporting cells (*e.g.*, epithelial cells of the inner and outer sulcus, and interdental cells), interdental cells in the spiral limbus, root cells within the spiral ligament, pillar cells, Deiters' cells, Hensen's cells, Claudius cells, inner phalangeal cells; and border cells, strial intermediate cells, fibrocytes of the lateral wall and supраstrial zone, basal cells of the stria vascularis, fibrocytes in the spiral ligament, fibrocytes in the spiral limbus, mesenchymal cells lining the bony otic capsule facing the scala vestibuli, and supralimbal dark cells. In some embodiments, the combination of an AAV capsid having tropism to the inner ear (*e.g.*, AAV-S or AAV-PHP.B) and the isolated nucleic acid described herein (*e.g.*, an isolated nucleic acid driving *GJB2* expression under the control of *GJB2* gene regulatory elements) is superior in *GJB2* gene replacement therapy to that it limits *GJB2* expression to cells that normally express it, and reduces toxicity associated with promiscuous *GJB2* expression (*e.g.*, toxicity associated with *GJB2* being expressed in hair cells and/or the central nervous system (CNS)).

[00157] The components to be cultured in the host cell to package a rAAV vector in an AAV capsid may be provided to the host cell in *trans*. Alternatively, any one or more of the required components (*e.g.*, recombinant AAV vector, rep sequences, cap sequences, and/or helper functions) may be provided by a stable host cell which has been engineered to contain

one or more of the required components using methods known to those of skill in the art. Most suitably, such a stable host cell will contain the required component(s) under the control of an inducible promoter. However, the required component(s) may be under the control of a constitutive promoter. Examples of suitable inducible and constitutive promoters are provided herein, in the discussion of regulatory elements suitable for use with the transgene. In still another alternative, a selected stable host cell may contain selected component(s) under the control of a constitutive promoter and other selected component(s) under the control of one or more inducible promoters. For example, a stable host cell may be generated which is derived from 293 cells (which contain E1 helper functions under the control of a constitutive promoter), but which contain the rep and/or cap proteins under the control of inducible promoters. Still other stable host cells may be generated by one of skill in the art.

[00158] In some embodiments, the instant disclosure relates to a host cell containing a nucleic acid that comprises a coding sequence encoding a protein (*e.g.*, GJB2 protein). In some embodiments, the host cell is a mammalian cell (*e.g.*, a human cell), a yeast cell, a bacterial cell, an insect cell, a plant cell, or a fungal cell.

[00159] The recombinant AAV vector, rep sequences, cap sequences, and helper functions required for producing the rAAV of the disclosure may be delivered to the packaging host cell using any appropriate genetic element (*e.g.*, vector). The selected genetic element may be delivered by any suitable method, including those described herein and known in the art. The methods used to construct any embodiment of this disclosure are known to those with skill in nucleic acid manipulation and include genetic engineering, recombinant engineering, and synthetic techniques. See, *e.g.*, Sambrook *et al.*, *Molecular Cloning: A Laboratory Manual*, Cold Spring Harbor Press, Cold Spring Harbor, N.Y. Similarly, methods of generating rAAV virions are known in the art, and the selection of a suitable method is not a limitation on the present disclosure. See, *e.g.*, K. Fisher *et al.*, *J. Virol.*, 70:520-532 (1993) and U.S. Pat. No. 5,478,745, each of which is incorporated herein by reference.

[00160] In some embodiments, recombinant AAVs may be produced using the triple transfection method (described in detail in U.S. Pat. No. 6,001,650, which is incorporated herein by reference). Typically, the recombinant AAVs are produced by transfecting a host cell with a recombinant AAV vector (comprising a transgene) to be packaged into AAV particles, an AAV helper function vector, and an accessory function vector. An AAV helper function vector encodes the “AAV helper function” sequences (*e.g.*, rep and cap), which function in *trans* for productive AAV replication and encapsidation. Preferably, the AAV helper function vector supports efficient AAV vector production without generating any

detectable wild-type AAV virions (*e.g.*, AAV virions containing functional rep and cap genes). Non-limiting examples of vectors suitable for use with the present disclosure include pHLP19, described in U.S. Pat. No. 6,001,650 and pRep6cap6 vector, described in U.S. Pat. No. 6,156,303, both of which are incorporated herein by reference. The accessory function vector encodes nucleotide sequences for non-AAV derived viral and/or cellular functions upon which AAV is dependent for replication (*i.e.*, “accessory functions”). The accessory functions include those functions required for AAV replication, including, without limitation, those moieties involved in activation of AAV gene transcription, stage specific AAV mRNA splicing, AAV DNA replication, synthesis of cap expression products, and AAV capsid assembly. Viral-based accessory functions can be derived from any of the known helper viruses, such as adenovirus, herpesvirus (other than herpes simplex virus type-1), and vaccinia virus.

[00161] In some aspects, the disclosure provides transfected host cells. The term “transfection” is used to refer to the uptake of foreign DNA by a cell, and a cell has been “transfected” when exogenous DNA has been introduced inside the cell membrane. A number of transfection techniques are generally known in the art. See, *e.g.*, Graham *et al.* (1973) *Virology*, 52:456, Sambrook *et al.* (1989) *Molecular Cloning, a Laboratory Manual*, Cold Spring Harbor Laboratories, New York, Davis *et al.* (1986) *Basic Methods in Molecular Biology*, Elsevier, and Chu *et al.* (1981) *Gene* 13:197. Such techniques can be used to introduce one or more exogenous nucleic acids into suitable host cells.

[00162] A “host cell” refers to any cell that harbors, or is capable of harboring, a substance of interest. Often a host cell is a mammalian cell. A host cell may be used as a recipient of an AAV helper construct, an AAV plasmid, an accessory function vector, or other transfer DNA associated with the production of recombinant AAVs. The term includes the progeny of the original cell which has been transfected. Thus, a “host cell,” as used herein, may refer to a cell which has been transfected with an exogenous DNA sequence. It is understood that the progeny of a single parental cell may not necessarily be completely identical in morphology or in genomic or total DNA complement as the original parent, due to natural, accidental, or deliberate mutation or engineering.

[00163] As used herein, the term “cell line” refers to a population of cells capable of continuous or prolonged growth and division *in vitro*. Often, cell lines are clonal populations derived from a single progenitor cell. It is further known in the art that spontaneous or induced changes can occur in karyotype during storage or transfer of such clonal populations.

Therefore, cells derived from the cell line referred to may not be precisely identical to the ancestral cells or cultures, and the cell line referred to includes such variants.

[00164] As used herein, the term “recombinant cell” refers to a cell into which an exogenous DNA segment, such as DNA segment that leads to the transcription of a biologically-active polypeptide (e.g., GJB2 protein), has been introduced.

[00165] As used herein, the term “vector” includes any genetic element, such as a plasmid, phage, transposon, cosmid, chromosome, artificial chromosome, virus, virion, *etc.*, which is capable of replication when associated with the proper control elements and which can transfer gene sequences between cells. Thus, the term includes cloning and expression vehicles, as well as viral vectors. In some embodiments, useful vectors are contemplated to be those vectors in which the nucleic acid segment to be transcribed is positioned under the transcriptional control of a promoter. The term “expression vector or construct” means any type of genetic construct containing a nucleic acid in which part or all of the nucleic acid encoding sequence is capable of being transcribed.

[00166] The foregoing methods for packaging recombinant vectors in desired AAV capsids to produce the rAAVs of the disclosure are not meant to be limiting and other suitable methods will be apparent to the skilled artisan.

[00167] The present disclosure, provides a rAAV comprising a vector (e.g., AAV vectors) for expressing a transgene (e.g., *GJB2*), such vectors include AAV LTRs (e.g., AAV2 LTRs) and an expression cassette comprising a promoter operably linked to a promoter (e.g., human *GJB2* promoter or fragment thereof). In addition, the vector can further comprise certain regulatory elements (e.g., *GJB2* enhancers, 5' and 3' UTRs of the *GJB2* gene, WPRE, and poly adenylation sites). In addition, the rAAV can comprise a capsid protein (e.g., AAV9.PHP.B capsid or AAV-S capsid). Such rAAV can deliver transgenes (e.g., *GJB2*) to target tissues (e.g., cells that normally express *GJB2* in the inner ear). In some embodiments, such a rAAV is capable of delivering transgenes (e.g., *GJB2*) into specific cells in the target tissue, for example, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions.

III. Pharmaceutical Composition

[00168] The rAAVs may be delivered to a subject in compositions according to any appropriate method known in the art. The rAAV, preferably suspended in a physiologically compatible carrier (*i.e.*, in a composition), may be administered to a subject, e.g., host animal, patient, experimental animal. In some embodiments, the subject is a mammal. In some

examples, the mammal is a human. In other embodiments, the mammal can be a non-human mammal, such as a human, mouse, rat, cat, dog, sheep, rabbit, horse, cow, goat, pig, guinea pig, hamster, chicken, turkey, or a non-human primate (*e.g.*, cynomolgus monkey). The subject may be at any stage of development and of any gender.

[00169] The rAAV can be delivered to any organ or tissue of interest. In some embodiments, the rAAV is delivered to the inner ear. Delivery of the rAAVs to a mammalian subject may be by, for example, injection to the ear. In some embodiments, the injection is to the ear through the round window membrane of the inner ear, into the scala media of the cochlea, into the scala vestibuli of the cochlea, into a semicircular canal of the inner ear, or into the saccule or the utricle of the inner ear. In some embodiments, the rAAV is delivered to the ear by topical administration (*e.g.*, ear drops). In some embodiments, the injection is not topical administration. Combinations of administration methods (*e.g.*, topical administration and injection through round window membrane of the inner ear) can also be used.

[00170] The compositions of the disclosure may comprise a rAAV described herein alone, or in combination with one or more other viruses (*e.g.*, a second rAAV encoding having one or more different transgenes). In some embodiments, a composition comprises 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or more different rAAVs each having one or more different transgenes.

[00171] In some embodiments, a composition further comprises a pharmaceutically acceptable carrier. Suitable carriers may be readily selected by one of skill in the art in view of the indication for which the rAAV is directed. “Acceptable” means that the carrier must be compatible with the rAAV or the isolated nucleic acid of the composition (and preferably, capable of stabilizing the active ingredient) and not deleterious to the subject to be treated. In some embodiments, the pharmaceutically acceptable carrier/excipient is compatible with the mode of administration. Pharmaceutically acceptable excipients (carriers) including buffers, which are well known in the art. See, *e.g.*, *Remington: The Science and Practice of Pharmacy* 20th Ed. (2000) Lippincott Williams and Wilkins, Ed. K. E. Hoover. For example, one acceptable carrier includes saline, which may be formulated with a variety of buffering solutions (*e.g.*, phosphate buffered saline). Other exemplary carriers include sterile saline, lactose, sucrose, calcium phosphate, gelatin, dextran, agar, pectin, peanut oil, sesame oil, and water. The selection of the carrier is not a limitation of the present disclosure.

[00172] The rAAV containing pharmaceutical composition disclosed herein may further comprise a suitable buffer agent. A buffer agent is a weak acid or base used to maintain the pH of a solution near a chosen value after the addition of another acid or base. In some examples, the buffer agent disclosed herein can be a buffer agent capable of maintaining

physiological pH despite changes in carbon dioxide concentration (*e.g.*, produced by cellular respiration). Exemplary buffer agents include, but are not limited to, HEPES (4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid) buffer, Dulbecco's phosphate-buffered saline (DPBS) buffer, or phosphate-buffered saline (PBS) buffer. Such buffers may comprise disodium hydrogen phosphate and sodium chloride, or potassium dihydrogen phosphate and potassium chloride.

[00173] Optionally, the compositions of the disclosure may contain, in addition to the rAAV and carrier(s), other pharmaceutical ingredients, such as preservatives or chemical stabilizers. Suitable exemplary preservatives include chlorobutanol, potassium sorbate, sorbic acid, sulfur dioxide, propyl gallate, the parabens, ethyl vanillin, glycerin, phenol, and parachlorophenol. Suitable chemical stabilizers include gelatin and albumin.

[00174] The rAAV containing pharmaceutical composition described herein comprises one or more suitable surface-active agents, such as a surfactant. Surfactants are compounds that lower the surface tension (or interfacial tension) between two liquids, between a gas and a liquid, or between a liquid and a solid. Surfactants may act as detergents, wetting agents, emulsifiers, foaming agents, and dispersants. Suitable surfactants include, in particular, non-ionic agents, such as polyoxyethylenesorbitans (*e.g.*, TweenTM 20, 40, 60, 80 or 85) and other sorbitans (*e.g.*, SpanTM 20, 40, 60, 80 or 85). Compositions with a surface active agent will conveniently comprise between 0.05 and 5% surface-active agent, and can be between 0.1 and 2.5%. It will be appreciated that other ingredients may be added, for example, mannitol or other pharmaceutically acceptable vehicles, if necessary.

[00175] The rAAVs are administered in sufficient amounts to transfect the cells of a desired tissue (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions) and to provide sufficient levels of gene transfer and expression without undue adverse effects. Examples of pharmaceutically acceptable routes of administration include, but are not limited to, direct delivery to the selected organ (*e.g.*, the ear) or tissue, intravenous, intramuscular, subcutaneous, intradermal, intratumoral, and other parental routes of administration. Routes of administration may be combined, if desired.

[00176] The dose of rAAV virions required to achieve a particular "therapeutic effect," *e.g.*, the units of dose in viral genome copies per kilogram of body weight (GC/kg or VG/kg), will vary based on several factors including, but not limited to: the route of rAAV virion administration, the level of gene or RNA expression required to achieve a therapeutic effect, the specific disease or disorder being treated, and the stability of the gene or rAAV product. One of skill in the art can readily determine a rAAV virion dose range to treat a patient

having a particular disease or disorder (e.g., nonsyndromic hearing loss and deafness, or any *GJB2*-associated disorders) based on the aforementioned factors, as well as other factors.

[00177] An effective amount of a rAAV is an amount sufficient to infect an animal (*e.g.*, mouse, rat, non-human primate or human) or target a desired tissue or cell (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions). The effective amount will depend primarily on factors, such as the species, age, weight, health of the subject, and the tissue to be targeted, and may thus vary among animals and tissue. For example, an effective amount of the rAAV is generally in the range of from about 1 ml to about 100 ml of solution containing from about 10^9 to 10^{16} genome copies. In some cases, a dosage between about 10^{11} to 10^{13} rAAV genome copies is appropriate. In certain embodiments, 10^9 rAAV genome copies are effective to target inner ear tissue (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions). In some embodiments, a dose more concentrated than 10^9 rAAV genome copies is toxic when administered to the ear of a subject. In some embodiments, an effective amount is produced by multiple doses of a rAAV.

[00178] In some embodiments, a dose of rAAV is administered to a subject no more than once per day (*e.g.*, a 24-hour period). In some embodiments, a dose of rAAV is administered to a subject no more than once per 2, 3, 4, 5, 6, or 7 days. In some embodiments, a dose of rAAV is administered to a subject no more than once per week (*e.g.*, 7 calendar days). In some embodiments, a dose of rAAV is administered to a subject no more than bi-weekly (*e.g.*, once in a two-week period). In some embodiments, a dose of rAAV is administered to a subject no more than once per month (*e.g.*, once in 30 calendar days). In some embodiments, a dose of rAAV is administered to a subject no more than once per six months. In some embodiments, a dose of rAAV is administered to a subject no more than once per year (*e.g.*, 365 days or 366 days in a leap year). In some embodiments, a dose of rAAV is administered to a subject once in a lifetime.

[00179] In some embodiments, rAAV compositions are formulated to reduce aggregation of AAV particles in the composition, particularly where high rAAV concentrations are present (*e.g.*, $\sim 10^{13}$ GC/ml or more). Appropriate methods for reducing aggregation may be used, including, for example, addition of surfactants, pH adjustment, salt concentration adjustment, *etc.* (See, *e.g.*, Wright *et al.*, *Molecular Therapy* (2005) 12, 171–178, the contents of which are incorporated herein by reference.)

[00180] Formulation of pharmaceutically acceptable excipients and carrier solutions is well known to those of skill in the art, as is the development of suitable dosing and treatment

regimens for using the particular compositions described herein in a variety of treatment regimens. Factors, such as solubility, bioavailability, biological half-life, route of administration, product shelf life, as well as other pharmacological considerations, will be contemplated by one skilled in the art of preparing such pharmaceutical formulations, and as such, a variety of dosages and treatment regimens may be desirable.

[00181] In some embodiments, rAAVs in suitably formulated pharmaceutical compositions disclosed herein are delivered directly to target tissue, *e.g.*, direct to inner ear tissue (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions). However, in certain circumstances it may be desirable to separately or in addition deliver the rAAV-based therapeutic constructs via another route, *e.g.*, subcutaneously, parenterally, intravenously, intramuscularly, intrathecally, orally, or intraperitoneally. In some embodiments, the administration modalities as described in U.S. Pat. Nos. 5,543,158; 5,641,515 and 5,399,363 (each specifically incorporated herein by reference in its entirety) may be used to deliver rAAVs.

[00182] The pharmaceutical forms suitable for injectable use include sterile aqueous solutions or dispersions and sterile powders for the extemporaneous preparation of sterile injectable solutions or dispersions. Dispersions may also be prepared in glycerol, liquid polyethylene glycols, and mixtures thereof and in oils. Under ordinary conditions of storage and use, these preparations contain a preservative to prevent the growth of microorganisms. In many cases, the form is sterile. It must be stable under the conditions of manufacture and storage and must be preserved to prevent contamination with microorganisms, such as bacteria, fungi, and other viruses. The carrier can be a solvent or dispersion medium containing, for example, water, ethanol, polyol (*e.g.*, glycerol, propylene glycol, and liquid polyethylene glycol, and the like), suitable mixtures thereof, and/or vegetable oils. Proper fluidity may be maintained, for example, by the use of a coating, such as lecithin, by the maintenance of the required particle size in the case of dispersion and by the use of surfactants. The prevention of contamination by microorganisms can be achieved by various antibacterial and antifungal agents, for example, parabens, chlorobutanol, phenol, sorbic acid, thimerosal, and the like. In many cases, it will be preferable to include isotonic agents, for example, sugars or salts (*e.g.*, sodium chloride). Prolonged absorption of the injectable composition can be achieved by the use in the composition of agents delaying absorption, for example, aluminum monostearate and gelatin.

[00183] For administration of an injectable aqueous solution, for example, the solution may be suitably buffered, if necessary, and the liquid diluent first rendered isotonic with sufficient

saline or glucose. These particular aqueous solutions are especially suitable for intravenous administration, intramuscular administration, subcutaneous administration, intraperitoneal administration, and injection through the round window membrane of the inner ear. In this respect, a suitable sterile aqueous medium may be employed. For example, one dosage may be dissolved in 1 ml of isotonic NaCl solution and either added to 1000 ml of hypodermoclysis fluid or injected at the proposed site of infusion (see for example, *Remington's Pharmaceutical Sciences* 15th Edition, pages 1035-1038 and 1570-1580). Some variation in dosage will necessarily occur depending on the condition of the host. The person responsible for administration will, in any event, determine the appropriate dose for the individual subject/host.

[00184] Sterile injectable solutions are prepared by incorporating the active rAAV in the required amount in the appropriate solvent with various of the other ingredients described herein, as required, followed by filter sterilization. Generally, dispersions are prepared by incorporating the various sterilized active ingredients into a sterile vehicle which contains the basic dispersion medium and the required other ingredients from those enumerated above. In the case of sterile powders for the preparation of sterile injectable solutions, the preferred methods of preparation are vacuum-drying and freeze-drying techniques which yield a powder of the active ingredient plus any additional desired ingredient from a previously sterile-filtered solution thereof.

[00185] The rAAV compositions disclosed herein may also be formulated in a neutral or salt form. Pharmaceutically-acceptable salts include but are not limited to hydrochloric or phosphoric acids, or such organic acids as acetic, oxalic, tartaric, mandelic, and the like. Salts formed with the free carboxyl groups can also be derived from inorganic bases such as, for example, sodium, potassium, ammonium, calcium, or ferric hydroxides, and such organic bases as isopropylamine, trimethylamine, histidine, procaine and the like. Upon formulation, solutions will be administered in a manner compatible with the dosage formulation and in such amount as is therapeutically effective. The formulations are easily administered in a variety of dosage forms such as injectable solutions, drug-release capsules, and the like.

[00186] As used herein, "carrier" includes any and all solvents, dispersion media, vehicles, solvents, coatings, diluents, antibacterial and antifungal agents, isotonic and absorption delaying agents, buffers, carrier solutions, suspensions, colloids, and the like. The use of such media and agents for pharmaceutically active substances is well known in the art. Supplemental active ingredients can also be incorporated into the compositions. The phrase

“pharmaceutically acceptable” refers to molecular entities and compositions that do not produce an allergic or similar untoward reaction when administered to a host.

[00187] Delivery vehicles such as liposomes, nanocapsules, microparticles, microspheres, lipid particles, vesicles, and the like, may be used for the introduction of the compositions of the present disclosure into suitable host cells. In particular, the rAAV vector delivered transgenes may be formulated for delivery either encapsulated in a lipid particle, a liposome, a vesicle, a nanosphere, a nanoparticle, or the like.

[00188] Such formulations may be preferred for the introduction of pharmaceutically acceptable formulations of the nucleic acids or the rAAV constructs disclosed herein. The formation and use of liposomes are generally known to those of skill in the art. Recently, liposomes were developed with improved serum stability and circulation half-times (U.S. Pat. No. 5,741,516, which is incorporated herein by reference). Further, various methods of liposome and liposome-like preparations as potential drug carriers have been described (U.S. Pat. Nos. 5,567,434; 5,552,157; 5,565,213; 5,738,868 and 5,795,587, each of which is incorporated herein by reference).

[00189] Alternatively, nanocapsule formulations of the rAAV may be used. Nanocapsules can generally entrap substances in a stable and reproducible way. To avoid side effects due to intracellular polymeric overloading, such ultrafine particles (sized around 0.1 μm) should be designed using polymers able to be degraded *in vivo*. Biodegradable polyalkyl-cyanoacrylate nanoparticles that meet these requirements are contemplated for use.

IV. Therapeutic Applications

[00190] The present disclosure also provides methods for delivering (*e.g.*, by an isolated nucleic acid, a vector, a rAAV, a host cell, or a pharmaceutical composition described herein) a transgene (*e.g.*, *GJB2*) to cells that normally express the transgene (*e.g.*, *GJB2*) in the ear (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions) of a subject for treating hearing loss. In some aspects, the present disclosure provides a method for treating *GJB2* associated diseases (*e.g.*, non-syndromic Hearing Loss and Deafness (DFNB1)) in a subject by delivering (*e.g.*, by an isolated nucleic acid, a vector, a rAAV, a host cell, or a pharmaceutical composition described herein) a transgene (*e.g.*, *GJB2*) to cells that normally express the transgene (*e.g.*, *GJB2*) in the ear (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions) of a subject. In some aspects, the present disclosure provides a method for targeted *GJB2* expression in inner ear supporting cells and/or detargeting *GJB2* in neuron and/or cochlear

hair cells by delivering (*e.g.*, by an isolated nucleic acid, a vector, a rAAV, a host cell, or a pharmaceutical composition described herein) a transgene (*e.g.*, *GJB2*) to cells that normally express the transgene (*e.g.*, *GJB2*) in the ear (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions) of a subject. In some embodiments, the targeted *GJB2* expression in inner ear supporting cells and/or detargeting *GJB2* in neuron and/or cochlear hair cells is designed to treat *GJB2* associated diseases described herein. In some embodiments, the subject is a mammal. In some examples, the subject is a human. In other embodiments, the subject is a non-human mammal, such as a mouse, rat, cow, goat, pig, camel, or non-human primate (*e.g.*, cynomolgus monkey).

[00191] In some embodiments, the subject is having or suspected of having hearing loss. In certain embodiments, the subject is diagnosed with having non-syndromic Hearing Loss and Deafness (DFNB1). In certain embodiments, the hearing loss is associated with a mutation in the *GJB2* gene. In some embodiments, the mutation of *GJB2* gene is a point mutation, a missense mutation, a nonsense mutation, a deletion, an insertion, or a combination thereof. Non-limiting examples of mutations in the *GJB2* gene are shown in Table 2. A mutation, as used herein, refers to a substitution of a residue within a sequence, *e.g.*, a nucleic acid or amino acid sequence, with another residue, or a deletion or insertion of one or more residues within a sequence. Mutations are typically described herein by identifying the original residue followed by the position of the residue within the sequence and by the identity of the newly substituted residue.

Table 2: Exemplary mutations in *GJB2* gene (Nucleotide number starting at the ATG of NM_004004.6).

Mutation	Amino Acid Change	Mutation	Amino Acid Change
c.677T>G	p.Val226Gly	c.509_522del	p.Asn170ThrfsTer35
c.677T>A	p.Val226Asp	c.521G>C	p.Cys174Ser
c.674C>T	p.Pro225Leu	c.520T>C	p.Cys174Arg
c.653G>A	p.Cys218Tyr	c.518C>G	p.Pro173Arg
c.647_650del	p.Arg216IlefsTer17	c.517C>T	p.Pro173Ser
c.650A>G	p.Tyr217Cys	c.516G>C	p.Trp172Cys
c.645del	p.Arg216AspfsTer18	c.516G>A	p.Trp172Ter
c.641T>C	p.Leu214Pro	c.514T>A	p.Trp172Arg
c.638T>A	p.Leu213Ter	c.512_513insAACG	p.Trp172ThrfsTer39
c.632_633del	p.Cys211LeufsTer5	c.508_511dup	p.Alal71GluTer40
c.633T>A	p.Cys211Ter	c.511G>T	p.Alal71Ser

c.632G>A	p.Cys211Tyr	c.509dup	p.Asn170LysfsTer40
c.622A>C	p.Thr208Pro	c.509A>C	p.Asn170Thr
c.617A>G	p.Asn206Ser	c.506G>A	p.Cys169Tyr
c.617A>C	p.Asn206Thr	c.504_505insAAGG	p.Cys169LysfsTer42
c.614T>C	p.Leu205Pro	c.505T>C	p.Cys169Arg
c.613C>G	p.Leu205Val	c.488T>C	p.Met163Thr
c.608_609delinsAA	p.Ile203Lys	c.487A>G	p.Met163Val
c.605G>T	p.Cys202Phe	c.487A>C	p.Met163Leu
c.592_600delinsCAGT GTTTCATGACATTC	p.Val198GlnfsTer4	c.486_487insT	p.Met163TyrfsTer47
c.599G>C	p.Gly200Ala	c.482T>C;	p.Phe161Ser
c.598G>T	p.Gly200Ter	c.476A>T	p.Asp159Val
c.598G>A	p.Gly200Arg	c.458_475dup	p.Val153_Tyr158dup
c.596C>T	p.Ser199Phe	c.475G>A	p.Asp159Asn
c.592G>A	p.Val198Met	c.473A>G	p.Tyr158Cys
c.589G>T	p.Ala197Ser	c.464_465del	p.Tyr155CysfsTer54
c.585G>C	p.Met195Ile	c.465T>A	p.Tyr155Ter
c.584T>C	p.Met195Thr	c.458T>C	p.Val153Ala
c.583A>G	p.Met195Val	c.456C>A	p.Tyr152Ter
c.576del	p.Val193CysfsTer3	c.452T>G	p.Met151Arg
c.575_576del	p.Thr192SerfsTer17	c.431_450del	p.Val144AspfsTer59
c.585G>C	p.Met195Ile	c.439G>T	p.Glu147Ter
c.584T>C	p.Met195Thr	c.439G>A	p.Glu147Lys
c.583A>G	p.Met195Val	c.435_436del	p.Phe146ArgfsTer63
c.576del	p.Val193CysfsTer3	c.428G>T	p.Arg143Leu
c.575_576del	p.Thr192SerfsTer17	c.428G>A	p.Arg143Gln
c.572del	p.Phe191SerfsTer5	c.427C>T	p.Arg143Trp
c.569T>A	p.Val190Asp	c.424_426del	p.Phe142del
c.564_565del	p.Lys188AsnfsTer21	c.426C>G	p.Phe142Leu
c.563A>G	p.Lys188Arg	c.426C>A	p.Phe142Leu
c.559_561del	p.Glu187del	c.424T>C	p.Phe142Leu
c.557C>T	p.Thr186Met	c.424T>A	p.Phe142Ile
c.557C>A	p.Thr186Lys	c.419T>G	p.Ile140Ser
c.551G>C	p.Arg184Pro	c.416G>A	p.Ser139Asn
c.551G>A	p.Arg184Gln	c.415A>T	p.Ser139Cys
c.550C>T	p.Arg184Trp	c.413G>A	p.Ser138Asn
c.550C>G	p.Arg184Gly	c.409dup	p.Thr137AsnfsTer73
c.548C>T	p.Ser183Phe	c.408C>A	p.Tyr136Ter
c.535G>C	p.Asp179His	c.407A>G	p.Tyr136Cys

c.523C>A	p.Pro175Thr	c.405del	p.Tyr136ThrfsTer32
c.535G>A	p.Asp179Asn	c.402del	p.Trp134Ter
c.533T>C	p.Val178Ala	c.401G>A	p.Trp134Ter
c.516_532del	p.Trp172CysfsTer32	c.400T>C	p.Trp134Arg
c.390_399del	p.Ser131GlyfsTer34	c.389G>A	p.Gly130Asp
c.398G>A	p.Trp133Ter	c.384C>G	p.Ile128Met
c.397T>G	p.Trp133Gly	c.377_383dup	p.Glu129ProfsTer83
c.394C>G	p.Leu132Val	c.382A>G	p.Ile128Val
c.389G>T	p.Gly130Val	c.380G>T	p.Arg127Leu
c.389G>C	p.Gly130Ala	c.379C>T	p.Arg127Cys
c.377_378insATGCGG A	p.Arg127CysfsTer85	c.344T>G	p.Phe115Cys
c.370C>T	p.Gln124Ter	c.340G>T	p.Glu114Ter
c.367del	p.Thr123ProfsTer45	c.339T>G	p.Ser113Arg
c.365A>T	p.Lys122Ile	c.336G>T;	p.Lys112Asn
c.363del	p.Thr123ProfsTer45	c.334_335del	p.Lys112GlufsTer2
c.355_363del	p.Glu119_Ile121del	c.335A>T	p.Lys112Met
c.358_360del	p.Glu120del	c.331A>G	p.Ile111Val
c.358G>A	p.Glu120Lys	c.329del	p.Glu110GlyfsTer2
c.355G>A	p.Glu119Lys	c.328del	p.Glu110ArgfsTer2
c.345dup	p.Lys116Ter	c.327_328del	p.Glu110AspfsTer4
c.328G>A	p.Glu110Lys	c.299_300del	p.His100ArgfsTer14
c.327_328delinsA	p.Glu110ArgfsTer2	c.300T>A	p.His100Gln
c.314_327del	p.Lys105ArgfsTer5	c.299A>T	p.His100Leu
c.313_326del	p.Lys105GlyfsTer5	c.299A>C	p.His100Pro
c.326G>T	p.Gly109Val	c.292_298dup	p.His100ProfsTer4
c.326G>A	p.Gly109Glu	c.298del	p.His100MetfsTer12
c.310_323del	p.Arg104GlyfsTer6	c.298C>T	p.His100Tyr
c.317T>A	p.Phe106Tyr	c.296_297del	p.Arg99ThrfsTer2
c.307A>T	p.Lys103Ter	c.290_295delinsCC CG	p.Tyr97SerfsTer4
c.301_303del	p.Glu101del	c.293G>A	p.Arg98Gln
c.302A>G	p.Glu101Gly	c.292C>T	p.Arg98Trp
c.314A>G	p.Lys105Arg	c.290dup	p.Tyr97Ter
c.280_284dup	p.Ala96ThrfsTer18	c.262G>T	p.Ala88Ser
c.283G>A	p.Val95Met	c.262G>C	p.Ala88Pro
c.279G>A	p.Met93Ile	c.258_260del	p.Pro87del
c.278T>C	p.Met93Thr	c.257C>T	p.Thr86Met
c.270_271insT	p.Val91CysfsTer11	c.257C>G	p.Thr86Arg

c.269dup	p.Val91SerfsTer11	c.253T>C	p.Ser85Pro
c.269del	p.Leu90GlnfsTer22	c.251T>C	p.Val84Ala
c.269T>G	p.Leu90Arg	c.250G>T	p.Val84Leu
c.269T>C	p.Leu90Pro	c.250G>C	p.Val84Leu
c.268C>G	p.Leu90Val	c.250G>A	p.Val84Met
c.263C>T	p.Ala88Val	c.247_249del	p.Phe83del
c.263C>G	p.Ala88Gly	c.247T>A	p.Phe83Ile
c.263C>A	p.Ala88Glu	c.246C>G	p.Ile82Met
c.241C>G	p.Leu81Val	c.232dup	p.Ala78GlyfsTer24
c.239A>T	p.Gln80Leu	c.232G>T	p.Ala78Ser
c.239A>G	p.Gln80Arg	c.232G>A	p.Ala78Thr
c.239A>C	p.Gln80Pro	c.231G>A	p.Trp77Ter
c.236_239delinsAGAT CCG	p.Leu79_Gln80delinsGlnI leArg	c.230G>A	p.Trp77Ter
c.238C>T	p.Gln80Ter	c.229T>C	p.Trp77Arg
c.238C>A	p.Gln80Lys	c.227T>C	p.Leu76Pro
c.236T>C	p.Leu79Pro	c.224G>A	p.Arg75Gln
c.235del	p.Leu79CysfsTer3	c.223C>T	p.Arg75Trp
c.235C>G	p.Leu79Val	c.218A>G	p.His73Arg,
c.217C>T	p.His73Tyr	c.195C>A	p.Tyr65Ter
c.212T>C	p.Ile71Thr	c.194A>G	p.Tyr65Cys
c.212T>A	p.Ile71Asn	c.193T>C	p.Tyr65His
c.209C>T	p.Pro70Leu	c.192C>A	p.Cys64Ter
c.208C>T	p.Pro70Ser	c.176_191del	p.Gly59AlafsTer18
c.208C>G	p.Pro70Ala	c.191G>A	p.Cys64Tyr
c.200A>G	p.His67Arg	c.188T>C	p.Val63Ala
c.196G>C	p.Asp66His	c.187del	p.Val63CysfsTer19
c.196G>A	p.Asp66Asn	c.187G>T	p.Val63Leu
c.195C>G	p.Tyr65Ter	c.187G>A	p.Val63Met
c.184_185insT	p.Asn62IlefsTer40	c.169C>T	p.Gln57Ter
c.181A>C	p.Lys61Gln	c.167del	p.Leu56ArgfsTer26
c.176del	p.Gly59AlafsTer23	c.167T>C	p.Leu56Pro
c.176G>T	p.Gly59Val	c.164C>A	p.Thr55Asn
c.176G>C	p.Gly59Ala	c.163A>C	p.Thr55Pro
c.176G>A	p.Gly59Asp	c.162C>A	p.Asn54Lys
c.175G>C	p.Gly59Arg	c.161A>T	p.Asn54Ile
c.175G>A	p.Gly59Ser	c.161A>G	p.Asn54Ser
c.173C>G	p.Pro58Arg	c.160A>C	p.Asn54His
c.172C>G	p.Pro58Ala	c.155_158del	p.Val52AlafsTer29

c.158G>A	p.Cys53Tyr	c.139G>T	p.Glu47Ter
c.157T>C	p.Cys53Arg	c.139G>C	p.Glu47Gln
c.154G>C	p.Val52Leu	c.139G>A	p.Glu47Lys
c.153del	p.Phe51LeufsTer31	c.138T>G	p.Asp46Glu
c.149A>C	p.Asp50Ala	c.136G>A	p.Asp46Asn
c.148G>T;	p.Asp50Tyr	c.134G>A	p.Gly45Glu
c.148G>A	p.Asp50Asn	c.132G>C	p.Trp44Cys
c.147del	p.Asp50ThrfsTer32	c.132G>A	p.Trp44Ter
c.146C>T	p.Ala49Val	c.131G>T	p.Trp44Leu
c.138_143del	p.Asp46_Gln48delinsGlu	c.131G>C	p.Trp44Ser
c.131G>A	p.Trp44Ter	c.109G>C	p.Val37Leu
c.125_127del	p.Glu42del	c.109G>A	p.Val37Ile
c.127G>A	p.Val43Met	c.107T>C	p.Leu36Pro
c.124G>A	p.Glu42Lys	c.104T>G	p.Ile35Ser
c.119C>T	p.Ala40Val	c.102G>A	p.Met34Ile
c.119C>G	p.Ala40Gly	c.101T>C	p.Met34Thr
c.119C>A	p.Ala40Glu	c.100A>T	p.Met34Leu
c.118G>T	p.Ala40Ser	c.100A>G	p.Met34Val
c.110T>C	p.Val37Ala	c.99del	p.Met34Ter
c.109G>T	p.Val37Phe	c.101 T>G	p.Met34Arg
c.98T>C	p.Ile33Thr	c.85_87del	p.Phe29del
c.98T>A	p.Ile33Asn	c.82C>A	p.Leu28Ile
c.95G>T	p.Arg32Leu	c.71G>A	p.Trp24Ter
c.95G>A	p.Arg32His	c.31_68del	p.Gly11LeufsTer24
c.94C>T	p.Arg32Cys	c.62G>A	p.Gly21Glu
c.94C>A	p.Arg32Ser	c.51_62delinsA	p.Thr18LysfsTer26
c.93del	p.Arg32AlafsTer3	c.61G>A	p.Gly21Arg
c.91T>A	p.Phe31Ile	c.60T>G	p.Ile20Met
c.89T>A	p.Ile30Asn	c.59T>C	p.Ile20Thr
c.88del	p.Ile30PhefsTer5	c.56G>C	p.Ser19Thr
c.88A>G	p.Ile30Val	c.53C>T	p.Thr18Ile
c.50C>T	p.Ser17Phe	c.35dup	p.Val13CysfsTer35
c.50C>A	p.Ser17Tyr	c.35del	p.Gly12ValfsTer2
c.47A>G	p.His16Arg	c.35G>T	p.Gly12Val
c.31_44del	p.Gly11ThrfsTer32	c.35G>A	p.Gly12Asp
c.44A>C	p.Lys15Thr	c.34G>T	p.Gly12Cys
c.42C>G	p.Asn14Lys	c.34G>C	p.Gly12Arg
c.40A>T	p.Asn14Tyr	c.32G>A	p.Gly11Glu
c.40A>G	p.Asn14Asp	c.29T>C	p.Leu10Pro

c.37G>A	p.Val13Met	c.28del	p.Leu10TrpfsTer4
c.24G>A	p.Thr8=	c.28_29delinsTG	p.Leu10Trp
c.23C>T	p.Thr8Met	c.7T>C	p.Trp3Arg
c.20A>C	p.Gln7Pro	c.1A>G	p.Met1?
c.19C>T	p.Gln7Ter	c.-1G>A	N/A
c.17T>C	p.Leu6Pro	c.-22-2A>C	N/A
c.11del	p.Gly4AlafsTer10	c.-22-6T>C	N/A
c.9G>A	p.Trp3Ter	c.-23+1G>A	N/A
c.7dup	p.Trp3LeufsTer45	c.-23G>T	N/A
c.37dup	p.Val13GlyfsTer35	c.475G>T	p.Asp159Tyr

[00192] Aspects of the present disclosure relate to methods of treating hearing loss (*e.g.*, DFNB1) by delivering a functional gene product (*e.g.*, GJB2 protein) using gene therapy (*e.g.*, rAAV encoding GJB2 protein) to a target cell (*e.g.*, cells that normally express *GJB2*, such as fibrocytes and supporting cells of the organ or Corti and nearby regions), which comprise one or more mutations in at least one alleles in a relevant gene (*e.g.*, *GJB2*) that results in the absence or malfunction of the gene product.

[00193] Aspects of the invention relate to certain protein-encoding transgenes (*e.g.*, *GJB2*) that when delivered to a subject are effective for treating hearing loss (*e.g.*, DFNB1). In some embodiments, the subject has or is suspected of having hearing loss. In some embodiments, the hearing loss is associated with a mutation in the *GJB2* gene. In some embodiments, the hearing loss is associated with a mutation in the *GJB2* gene listed in Table 2 (above). In some embodiments, the subject is diagnosed with DFNB1.

[00194] Accordingly, methods and compositions described by the disclosure are useful, in some embodiments, for the treatment of DFNB1 associated with one or more mutations or deletions in the *GJB2* gene.

[00195] Methods for delivering a transgene (*e.g.*, *GJB2*) to a subject are provided by the disclosure. The methods typically involve administering to a subject an effective amount of an isolated nucleic acid encoding a GJB2 protein, or a rAAV comprising a nucleic acid for expressing *GJB2*.

[00196] In some embodiments, the *GJB2* mutations are, but are not limited to, point mutations, missense mutations, nonsense mutations, insertions, and deletions. In some embodiments, the *GJB2* gene mutations associated with DFNB1 include, but are not limited to, mutations in Table 2. In some embodiments, the mutation in *GJB2* gene is c.101T>C. In some embodiments, the mutation in *GJB2* gene is 35DelG. The *GJB2* mutation in a subject

(*e.g.*, a subject having or suspected of having DFNB1 associated with a deletion or mutation of *GJB2* gene) may be identified from a sample obtained from the subject (*e.g.*, a DNA sample, RNA sample, blood sample, or other biological sample) by any method known in the art. For example, in some embodiments, a nucleic acid (*e.g.*, DNA, RNA, or a combination thereof) is extracted from a biological sample obtained from a subject and nucleic acid sequencing is performed in order to identify a mutation in the *GJB2* gene. In some embodiments, a mutation in the *GJB2* gene is detected indirectly, for example, by quantifying *GJB2* protein expression (*e.g.*, by Western blot) or function (*e.g.*, by analyzing structure, function, *etc.*), or by direct sequencing of the DNA and comparing the sequence obtained to a control DNA sequence (*e.g.*, a wild-type *GJB2* DNA sequence).

[00197] In some aspects, the disclosure provides a method for treating DFNB1 in a subject in need thereof, the method comprising administering to a subject having or suspected of having DFNB1 a therapeutically effective amount of an isolated nucleic acid, or a rAAV encoding a transgene (*e.g.*, *GJB2*). In some embodiments, the rAAV encoding a transgene (*e.g.*, *GJB2*) is injected through injections to the round window membrane of the inner ear, as described by the disclosure. In some aspects, the present disclosure provides an isolated nucleic acid or an rAAV encoding a transgene (*e.g.*, *GJB2*), or pharmaceutical compositions thereof, for use in the manufacturing of a medicament in a therapy. In some aspects, the present disclosure provides an isolated nucleic acid or an rAAV encoding a transgene (*e.g.*, *GJB2*), or pharmaceutical compositions thereof, for use in the manufacturing of a medicament for treating hearing loss and/or deafness associated with the *GJB2* gene. In some aspects, the present disclosure provides an isolated nucleic acid or an rAAV encoding a transgene (*e.g.*, *GJB2*), or pharmaceutical compositions thereof, for use in the manufacturing of a medicament for treating non-syndromic deafness and/or hearing loss (DFNB1).

[00198] An “effective amount” of a substance is an amount sufficient to produce a desired effect. In some embodiments, an effective amount of an isolated nucleic acid (*e.g.*, an isolated nucleic acid comprising a transgene encoding *GJB2* protein) is an amount sufficient to transfect (or infect in the context of rAAV mediated delivery) a sufficient number of target cells of a target tissue of a subject. In some embodiments, the target tissue is cochlear (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions as described herein). In some embodiments, an effective amount of an isolated nucleic acid (*e.g.*, which may be delivered via an rAAV) may be an amount sufficient to have a therapeutic benefit in a subject, *e.g.*, to increase or supplement the expression of a gene or protein of interest (*e.g.*, *GJB2* protein), to improve in the subject one or more symptoms of

the disease (*e.g.*, a symptom or sign of DFNB1), *etc.* The effective amount will depend on a variety of factors, such as, for example, the species, age, weight, health of the subject, and the tissue to be targeted, and may thus vary among subjects and tissue as described elsewhere in the disclosure. In some embodiments, an effective amount of a rAAV may be an amount sufficient to produce a stable somatic transgenic animal model.

[00199] An effective amount may also depend on the rAAV used. The invention is based in part on the recognition that a rAAV comprising capsid proteins having a particular serotype (*e.g.*, AAV9.PHP.B or AAV-S) mediates more efficient transduction of cochlear (*e.g.*, inner hair cells, out hair cells) tissue than a rAAV comprising capsid proteins having a different serotype.

[00200] In certain embodiments, the effective amount of rAAV is 10^{10} , 10^{11} , 10^{12} , 10^{13} , or 10^{14} genome copies per kg. In certain embodiments, the effective amount of rAAV is 10^{10} , 10^{11} , 10^{12} , 10^{13} , 10^{14} , or 10^{15} genome copies per subject.

[00201] An effective amount may also depend on the mode of administration. For example, targeting a cochlear (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions) tissue by injection through the round window membrane of the inner ear may require different (*e.g.*, higher or lower) doses, in some cases, than targeting a cochlear (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions) tissue by another method (*e.g.*, systemic administration, topical administration). Thus, in some embodiments, the injection is injection through round window membrane of the inner ear. In some embodiments, administration is topical administration (*e.g.*, topical administration to an ear). In some embodiments, the injection is posterior semicircular canal injection. In some cases, multiple doses of a rAAV are administered.

[00202] Without wishing to be bound by any particular theory, efficient transduction of cochlear cells (*e.g.*, connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions as described herein) by rAAV described herein may be useful for the treatment of a subject having a hereditary hearing loss (*e.g.*, DFNB1). In some embodiments, the composition and method described herein may be useful to treat other *GJB2*-associated diseases. *GJB2*-associated diseases, as used herein, refer to conditions and/or disorders caused by *GJB2* mutations (*e.g.*, loss of function mutations). Non-limiting *GJB2*-associated disease include Deafness, autosomal recessive 1A, Deafness, autosomal dominant 3A, DFNB1, Keratitis-ichthyosis- deafness (KID), Ichthyosis, hystrix-like-deafness (HID), Palmoplantar keratoderma- deafness (PPK), Porokeratotic eccrine ostial and dermal

duct nevus, Vohwinkel, Burt-Pumphrey, Unusual mucocutaneous- deafness (see, e.g., Srinivas *et al.*, Human diseases associated with connexin mutations, *Biochimica et Biophysica Acta (BBA) – Biomembranes*, Volume 1860, Issue 1, January 2018, Pages 192-201; Lossa *et al.*, GJB2 Gene Mutations in Syndromic Skin Diseases with Sensorineural Hearing Loss, *Curr Genomics*. 2011 Nov; 12(7): 475–785)

[00203] Accordingly, methods and compositions for treating hereditary hearing loss are also provided herein. In some aspects, the disclosure provides a method for treating hereditary hearing loss (e.g., DFNB1) or any other *GJB2*-associated diseases described herein, the method comprising administering to a subject having or suspected of having hereditary hearing loss an effective amount of rAAV, wherein the rAAV comprises (i) a capsid protein having a serotype of AAV9.PHP.B, or AAV-S, and (ii) an isolated nucleic acid comprising two adeno-associated virus (AAV) inverted terminal repeats (ITRs) flanking an expression cassette, wherein the expression cassette comprises a promoter operably linked to a nucleotide sequence encoding a *GJB2* gene regulatory element (GRE), and a nucleotide sequence encoding a gap junction beta 2 (GJB2) protein

[00204] In some embodiments, the rAAV (e.g., rAAV encoding GJB2) can be administered to a patient (e.g., a patient with DFNB1) at the age of 1 day, 10 days, 1 month, 3 months, 6 months, 1 year, 2 years, 3 years, 5 years, 6 years, 7 years, 8 years, 9, years, 10 years, 11 years, 12 years, 13 years, 14 years, 15 years, 16 years, 17 years, 18 years, or older. In some embodiments, the patient is an infant, a child, or an adult. In some embodiments, the window of treating *GJB2*-associated diseases (e.g., DFNB1) is normally from birth to pre-school age (e.g., from birth to 1 year old, from 1 to 2 years old, from 2-3 years old, from 3-4 years old, from 4-5 years old, or from 5-6 years old). In some embodiments, the rAAV (e.g., rAAV encoding GJB2) is administered to the patient (e.g., patients with DFNB1) once in a life-time, every 10 years, every 5 years, every 2 years, every year, every 6 months, every 3 months, every month, every two weeks, or every week. In other embodiments, the administration of the rAAV (e.g., rAAV encoding GJB2) is administered to the patient (e.g., patients with DFNB1) in combination with other known treatment methods for *GJB2*-associated diseases (e.g., DFNB1).

V. Kits and Related Composition

[00205] The agents described herein may, in some embodiments, be assembled into pharmaceutical or research kits to facilitate their use in therapeutic, or research applications. A kit may include one or more containers housing the components (e.g., nucleic acids,

rAAV) of the disclosure and instructions for use. Specifically, such kits may include one or more agents described herein, along with instructions describing the intended application and the proper use of these agents. In certain embodiments, agents in a kit may be in a pharmaceutical formulation and dosage suitable for a particular application and for a method of administration of the agents. Kits for research purposes may contain the components in appropriate concentrations or quantities for performing various experiments.

[00206] In some embodiments, the instant disclosure relates to a kit for administering a rAAV as described herein. In some embodiments, the kit comprises a container housing the rAAV, and devices (e.g., syringe) for extracting the rAAV from the housing. In some embodiments, the device for extracting the rAAV from the housing is also used for administration (e.g., injection).

[00207] In some embodiments, the instant disclosure relates to a kit for producing a rAAV, the kit comprising a container housing an isolated nucleic acid comprising a transgene encoding a protein (e.g., GJB2). In some embodiments, the kit further comprises a container housing an isolated nucleic acid encoding an AAV capsid protein, for example, an AAV.PHP.B capsid protein or an AAV-S capsid protein. In some embodiments, the kit further comprises vectors encoding the rep/cap genes, and the host for producing the rAAV.

[00208] In some embodiments, the instant disclosure relates to a kit for treating hearing loss (e.g., DFNB1). In some embodiments, the kit is for delivering a functional (e.g., DFNB1) to a target cell (e.g., connective tissue cells of the cochlea and supporting cells of the organ of Corti and nearby regions as described herein) using gene therapy (e.g., rAAV described herein).

[00209] The kit may be designed to facilitate use of the methods described herein by researchers and can take many different forms. Each of the compositions of the kit, where applicable, may be provided in liquid form (e.g., in solution), or in solid form (e.g., a dry powder). In certain cases, some of the compositions may be constitutable or otherwise processable (e.g., to an active form), for example, by the addition of a suitable solvent or other medium (for example, water or a cell culture medium), which may or may not be provided in the kit. As used herein, “instructions” can include a component of instruction and/or promotion, and typically involve written instructions on or associated with the packaging. Instructions also can include any oral or electronic instructions provided in any manner such that a user will clearly recognize that the instructions are to be associated with the kit, for example, audiovisual (e.g., videotape, DVD, CD-ROM, website links for downloadable file, etc.), Internet, and/or web-based communications, etc. The written

instructions may be in a form prescribed by a governmental agency regulating the manufacture, use, or sale of pharmaceuticals or biological products, which instructions can also reflect approval by the agency of manufacture, use, or sale for animal administration.

[00210] The kit may contain any one or more of the components described herein in one or more containers. As an example, in one embodiment, the kit may include instructions for mixing one or more components of the kit and/or isolating and mixing a sample and applying to a subject. The kit may include a container housing the rAAV described herein. The rAAV may be in the form of a liquid, gel, or solid (powder). The rAAV may be prepared sterilely, packaged in a syringe, and shipped refrigerated. Alternatively, the rAAV may be housed in a vial or other container for storage. A second container may have other agents prepared sterilely. Alternatively, the kit may include the rAAV premixed and shipped in a syringe, vial, tube, or other container.

VI. General Techniques

[00211] The practice of the present invention will employ, unless otherwise indicated, conventional techniques of molecular biology (including recombinant techniques), microbiology, cell biology, biochemistry, and immunology, which are within the skill of the art. Molecular Cloning: A Laboratory Manual, second edition (Sambrook, *et al.*, 1989) Cold Spring Harbor Press; Oligonucleotide Synthesis (M. J. Gait, ed., 1984); Methods in Molecular Biology, Humana Press; Cell Biology: A Laboratory Notebook (J. E. Cellis, ed., 1998) Academic Press; Animal Cell Culture (R. I. Freshney, ed., 1987); Introduction to Cell and Tissue Culture (J. P. Mather and P. E. Roberts, 1998) Plenum Press; Cell and Tissue Culture: Laboratory Procedures (A. Doyle, J. B. Griffiths, and D. G. Newell, eds., 1993-8) J. Wiley and Sons; Methods in Enzymology (Academic Press, Inc.); Handbook of Experimental Immunology (D. M. Weir and C. C. Blackwell, eds.); Gene Transfer Vectors for Mammalian Cells (J. M. Miller and M. P. Calos, eds., 1987); Current Protocols in Molecular Biology (F. M. Ausubel, *et al.*, eds., 1987); PCR: The Polymerase Chain Reaction, (Mullis, *et al.*, eds., 1994); Current Protocols in Immunology (J. E. Coligan *et al.*, eds., 1991); Short Protocols in Molecular Biology (Wiley and Sons, 1999); Immunobiology (C. A. Janeway and P. Travers, 1997); Antibodies (P. Finch, 1997); Antibodies: a practical approach (D. Catty, ed., IRL Press, 1988-1989); Monoclonal antibodies: a practical approach (P. Shepherd and C. Dean, eds., Oxford University Press, 2000); Using antibodies: a laboratory manual (E. Harlow and D. Lane (Cold Spring Harbor Laboratory Press, 1999)); The Antibodies (M. Zanetti and

J. D. Capra, eds., Harwood Academic Publishers, 1995).

[00212] Without further elaboration, it is believed that one skilled in the art can, based on the present disclosure, utilize the present invention to its fullest extent. The following specific embodiments are, therefore, to be construed as merely illustrative, and not limitative of the remainder of the disclosure in any way whatsoever. All publications cited herein are incorporated by reference for the purposes or subject matter referenced herein.

[00213] Exemplary embodiments of the invention will be described in more detail by the following examples. These embodiments are exemplary of the invention, which one skilled in the art will recognize is not limited to the exemplary embodiments.

EXAMPLES

[00214] Hearing impairment of genetic origin occurs in about 1 in 1,000 births; most are autosomal recessive and nonsyndromic. Although over 70 different deafness genes have been identified, nearly half of all cases of severe to profound autosomal recessive nonsyndromic hearing loss result from mutations in just one gene: *GJB2*, encoding the gap-junction protein connexin26, which contains six subunits to form a hemichannel. Each subunit has four transmembrane helices, which assemble in the plane of the membrane to form a large central pore (FIG. 1A). GJB2 hemichannels from adjacent cells join to create a channel from the cytoplasm of one cell to the cytoplasm of the other. Gap junctions are formed by hundreds or thousands of channels packed in a junctional plaque.

[00215] In the cochlea, *GJB2* is expressed in two cell groups: an epithelial system comprising supporting cells of the organ of Corti, epithelial cells of the inner and outer sulcus, and interdental cells; and a cytoplasmic system comprising fibrocytes of the lateral wall and suprastrial zone, basal cells of the stria vascularis, and supralimbal dark cells (See, *e.g.*, Kikuchi et al., (1995) Gap junctions in the rat cochlea: immunohistochemical and ultrastructural analysis. *Anat Embryol (Berl)* 191:101-118). It is not expressed in hair cells. In the cochlea, the epithelial system is largely post-mitotic. In contrast, fibroblasts of the cytoplasmic system turn over slowly, but there is some cell division observed with BrdU labeling (Lang et al., 2002; Li et al., 2017). Structure of the cochlea and the fibrocytes/Corti supporting cell network are shown in FIGs. 1A-1B.

[00216] *GJB2* expression is critical for cochlear function. For example, the K⁺ that enters hair cells through transduction channels and leaves through basal K⁺ channels is shuttled away from the organ of Corti by the epithelial system and conveyed by the cytoplasmic

system to the stria, where it is pumped back into the endolymph. Further, GJB2 plays a role in development of the cochlea, as mice lacking GJB2 in the inner ear have reduced endocochlear potential and profound apoptotic loss of hair cells and supporting cells by P30, even though hair cells do not express *Gjb2* (Cohen-Salmon et al., 2002; Wang et al., 2009; Sun et al., 2009; Crispino et al., 2011; Johnson et al., 2017). If *Gjb2* is deleted after P6, the phenotype is much milder (Chang et al., 2015). However there remains a long-term requirement for GJB2: hair cell loss occurs after months even with deletion as late as P14 (Ma et al., 2020). Not wishing to be bound by the theories described herein, GJB2's function in shuttling K^+ may be related in its role in development of the cochlea: If K^+ is not carried away from hair cells by a gap junction network, K^+ accumulation could depolarize hair cells, leading to Ca^{2+} influx and eventual cell death. The gap junction network may also be required to transport glucose and nutrients from blood vessels to the sensory epithelium and its absence could lead to cell death (Chang et al., 2008; Mammano, 2019).

[00217] Loss of GJB2 expression underlies a disorder termed Nonsyndromic Hearing Loss and Deafness, (DFNB1), characterized by recessive, mild-to-profound sensorineural hearing impairment (Kelsell et al., 1997; Kenna et al., 2010). Over 100 mutations have since been described in patients, but nearly 60% of patients have a single base deletion (35delG) leading to a frameshift and stop (Kenna et al., 2010). In the United States alone, about 3,500 children are born each year with two mutations in the causative gene, *GJB2* (Kelsell et al., 1997; Zelante et al., 1997; Azaiez et al., 2018). Many are born with profound hearing loss, which is probably irreversible even at birth. Two-thirds have some residual hearing at birth and the majority of those lose hearing over the next few years, suggesting that a window exists for therapeutic intervention (Kenna et al., 2010). There are thus 5-10,000 preschool-age children who are potential candidates for treatment of DFNB1 (FIG. 1D).

[00218] Because the cochlea is a surgically accessible and relatively immunoprotected environment, gene therapy using viral vectors is an attractive approach. The GJB2 coding sequence is small (~680 bp) and will easily fit in an AAV vector. Although AAV does not insert into the genome and is diluted in dividing cells, most cochlear cells do not divide and AAV can drive expression for decades or more. The injection of rAAV carrying the coding sequence of GJB2 is normally injected through the round window membrane (RWM) (FIG. 2A). However, previous trials of gene therapy failed to rescue hearing even though gene addition of GJB2 rescued cell survival and the gap junction network.

[00219] Surprisingly, it was found that indiscriminate expression of *GJB2* in the cochlea compromises the function of hair cells and neurons even as it rescues function in the

fibrocytes and supporting cells. Further, promiscuous expression of *GJB2* in the inner ear damaged hearing of the wild-type mice (FIG. 2B).

[00220] Gap junctions create a low-resistance path between adjacent cells. Hair cells and neurons of the cochlea, however, rely on high-resistance membranes to generate depolarization with small transduction or synaptic currents. If either is electrically coupled to adjacent cells, the depolarization would be shunted and the signal to the brain lost. The surprising phenomenon of hearing loss caused by promiscuous *GJB2* expression could be explained by indiscriminate gap-junction coupling of hair cells, which do not normally express *GJB2*. Therefore, effective gene therapy treatment should lead to cell-specific expression of exogenous *GJB2* in cells that normally express the gene (*e.g.*, fibrocytes and supporting cells) in order to rescue hearing in subjects with *GJB2* mutations.

[00221] To achieve cell specific *GJB2* expression, cis-regulatory elements of the *GJB2* gene were evaluated. Large genomic deletions upstream of *GJB2*, from 130 to >300 kb, have been found to cause congenital profound deafness. Overlap analysis of these deletions reveals a shared region of ~95 kb (FIG. 3A), suspected to house the critical enhancer(s) for *GJB2* expression in the inner ear.

[00222] To identify the cis-regulatory enhancer of *GJB2* in human patients, a combination of patient genomic data, ATAC-Seq and *in vitro* assays was used. Patients with suspected *GJB2*-related hearing loss were screened with either targeted genomic enrichment coupled with massively parallel sequencing or genome sequencing to search for non-coding disease-causing variants within the ~95.4 kb window (FIG. 3B). The genotype and phenotype of patients who were screened with the OtoSCOPE panel were reviewed. The initial round of selection included all patients that were heterozygous for a known or predicted pathogenic variant in the *GJB2* coding sequence and had a negative genetic diagnosis for their hearing loss. Next, the cohort of patients were refined based on phenotype. Patients carrying a loss-of-function mutation in trans with a mutation in the cis-regulatory element should have congenital severe to profound deafness. Families with recessive deafness that have linkage/allele segregation to the *GJB2* locus and absence of coding variants in *GJB2* were also studied.

[00223] After sequencing, the data was analyzed by a custom bioinformatics pipeline following The Broad Institute's GATK best practices. Briefly, raw sequences were mapped to the genome using Burrows-Wheeler Aligner, followed by Picard to remove duplicates, Genome Analysis Tool Kit (GATK) for variant calling, and Ensembl Variant Effect Predictor and dbNSFP to annotate for variant annotation. After annotation, variants were filtered based

on quality, minor allele frequency and location (within the ~95 kb window). Variants were prioritized based on variants that fall within regulatory elements, as defined by the Encyclopedia of DNA Elements (ENCODE) and the Genotype-Tissue Expression. Over 100 patients were sequenced, and more than 200 candidate variants were identified. Roughly 5-10% of DFNB1 patients have a second disease-causing allele in a non-coding region.

[00224] In mice and non-human primates, ATAC-Seq (Assay for Transposase-Accessible Chromatin using Sequencing; Buenrostro et al., 2013) was used to identify enhancers for genes active in the cochlea. ATAC-Seq employs a hyperactive mutant Tn5 transposase that inserts sequencing adapters into open regions of the genome. The genomic DNA was then sequenced from the adapters to identify open chromatin.

[00225] Cochleae were dissected from neonatal mice at ages P2, P5 and P8, the time that the cochlea acquires normal function. One cochlea was dissected from an adult macaque monkey. This data set is an important contribution to studies of gene regulation in the cochlea. It can be used, for instance, to drive gene expression in specific cell types that are frequently impaired in both hereditary and acquired hearing loss, such as hair cells, the adjacent stem cells, and spiral ganglion neurons.

[00226] Eighteen candidate enhancers associated with the mouse *Gjb2* gene were identified. FIG. 3C shows ~200 kb of mouse genomic sequence in the region of the mouse *Gjb2* gene; highlighted are regions with many ATAC-Seq reads. The subsequent studies focused on those enhancers that are near the mouse *Gjb2* gene, which are conserved among mammalian species. FIG. 3C (top) shows the identification of mouse *Gjb2* gene regulatory elements (GREs), in UCSC Genome Browser views of ATAC-Seq from mouse cochlea at developmental stages P2, P5 and P8, over ~300 kb in the region of the mouse *Gjb2* gene. Shaded regions mark regions containing putative GREs (Human and mouse regional sequences containing GREs are listed in Table 1). X-axis is the genomic region on chr14 in the mouse genome. Y-axis is the number of reads from the ATAC-Seq that align to a specific region in the genome. Light blue highlight denotes regions of open chromatin, which are the hallmarks of transcriptionally active regions that are enriched for read pile up, suggesting higher activity in these regions. Regions A and B mark the transcriptionally active sequences within mouse *Gjb2* itself. Regions C-M are regions that are transcriptionally active around *Gjb2* that might be part of a cis-regulatory network. GJB2 GRE sequences were identified with the regional sequences listed in Table 1. **FIG. 3C (bottom)** shows transcriptionally active regions in and around the light-blue shaded regions that have been identified as specific mouse *Gjb2* GREs (GREs 2, 3, 5, 7, and 9). Human *GJB2* GRE sequences were

identified *in silico* by modeling the mouse *Gjb2* GREs. The nucleotide sequences of human GREs 1, 2, 3, 4, 5, 7 and 9 are set forth in Table 3, and were tested in subsequent experiments.

[00227] Further, the promoter, 5' UTR and/or 3' UTR of the *GJB2* gene also contains native regulatory sequences. Constructs including the promoter, 5' UTR and/or 3' UTR were designed and tested for their capability in cell specific *GJB2* expression. The constructs were packaged into rAAVs and injected into the inner ear of mice. The cell types expressing the marker gene were compared against cell types that express *GJB2*. For instance, a C15 vector was constructed to include 500 bp of the human *GJB2* promoter, and 300 bp of the 5' UTR, followed by a coding sequence for GFP and human *GJB2* 3' UTR, (Vector C15 in FIG. 3D). The C15 vector packaged into rAAV using AAV9-PHP.B capsid, which is previously found to be effective in transducing many cochlear cell types (Gyorgy et al., 2018). The AAV9-PHP.B-C15 virus was injected into inner ears of P0 mouse pups. *GJB2* expression was detected by immunofluorescent using an antibody targeting GJB2 (FIG. 3F, middle panel). Cells transduced with the AAV9-PHP.B-c15 vector and expressing the GFP marker gene under *GJB2* enhancers are shown in the left panel. The expression pattern of *GJB2* in the inner ear was consistent with what was reported by Kikuchi. In the right panel, IHCs and OHCs (indicated) are also identified by labeling actin with fluorescent phalloidin. In the right panel, IHCs and OHCs (indicated) are also identified by labeling actin with fluorescent phalloidin. Notably, AAV9-PHP.B-C15 is capable of efficiently transducing hair cells, but no GFP expression was observed in hair cells. This is likely because the *Gjb2* enhancers are not active in hair cells. FIG. 3F shows a segment of the mouse cochlea, from the lateral wall (top) to the interdental cells (bottom). Cells transduced with the AAV9-PHP.B-C15 vector and expressing the GFP marker gene under *Gjb2* enhancers are shown in the left panel. Cells normally expressing *Gjb2* are shown in the middle panel. In the right panel, IHCs and OHCs (indicated) are also identified by labeling actin with fluorescent phalloidin. The expression pattern of GFP, which was driven by the c15 construct, is consistent with native *Gjb2* expression reported in Kikuchi et al., 1995 using the same antibody against GJB2. Notably, c15 does not drive GFP expression in hair cells.

[00228] Further, other constructs (C20-C23) were designed to test exogenous *GJB2* expression under a promiscuous chicken beta Actin (CBA) promoter. In C20 vector, the human GJB2 coding sequence was driven by the CBA promoter (Fig. 3E, vector C20). C20 vector was packaged into rAAVs and injected it into P0 cochleae in mice. *GJB2* expression was confirmed in hair cells with immunofluorescence using the GJB2 antibody (Fig. 3G).

Expression of *GJB2* by hair cells would produce electrical coupling to adjacent supporting cells and short-circuit the normal sensory receptor potential. To test this theory, several other vectors were designed. C21 vector includes a CBA promoter operably linked to the human *GJB2* coding sequence harboring a 35delG mutation. No active *GJB2* protein can be produced by C21 vector. C22 vector includes a CBA promoter with no *GJB2* coding sequence. C23 vector includes a CBA promoter driving the expression of human Clarin 1, which is a protein normally expressed by hair cells. The vectors were packaged into rAAVs using AAV1 or AAV9-PHP.B capsid. The rAAVs were injected into the inner ear of mice through the round window membrane at P1, and Auditory Brainstem Response (ABR) was measured at P30 (threshold at 8, 11 and 16 kHz averaged). As shown in FIG. 3H, uninfected wild-type mice had ABR thresholds near 30 dB, and saline mock injection did not change the ABR threshold in wild-type mice. *GJB2* expression with a CBA promoter in either AAV1 or AAV9-PHP.B capsids elevated thresholds by 30-40 dB. For comparison, the conditional knockout *Cre+*, *Gjb2*^{fl/fl} mice had no response at the highest level tested (90 dB). Further, it was observed that mice injected with AAV9-PHP.B-C20 often showed neurological symptoms including seizures and often death. No lethality was observed in vector AAV9-PHP.B-C21 (expressed *GJB2* with an inactivating mutation), AAV9-PHP.B-C22 (no *GJB2* coding sequence), or AAV9-PHP.B-C23 (expressed Clarin 1, a normal hair-cell protein). Further, if the rAAV was diluted 10-or 100-fold prior to injection, no toxicity or lethality was observed with any of the vectors. It is possible that a small amount of rAAV encoding *GJB2* was reaching the brain due to the brain tropism of AAV9-PHP.B, where electrical coupling of neurons is impairing neural regulation of homeostatic systems. This unexpectedly but dramatically illustrated the need to restrict *GJB2* expression to the appropriate cells to reduce toxicity.

[00229] The *Sox10-Cre+*, *Gjb2*^{fl/fl} knockout mice have no response at the highest level tested (90 dB) (FIG. 3H). In the knockout, AAV1-CBA-*GJB2* or AAV9-PHP.B-CBA-*GJB2* rAAVs produced no rescue. A C70 construct was produced to test the enhancers in rescuing hearing. The C70 construct includes an AAV 5' ITR, a *GJB2* basal promoter, a *GJB2* exon 1 5' UTR, Kozak sequence, mouse or human *GJB2* coding sequence, an optional HA tag, a *GJB2* exon 2 3' UTR, a WPRE, a bovine growth hormone poly A signal, and an AAV 3' ITR. The C70 construct was packaged into rAAVs using AAV9-PHP.B capsid protein and injected into the inner ear of both wild-type mice and the *Sox10-Cre+*, *Gjb2*^{fl/fl} knockout mice. *Gjb2* expression rescued hearing by 15-20 dB in *Sox10-Cre+*, *Gjb2*^{fl/fl} knockout mice. The same vector did not damage hearing in wild-type mice (FIG. 3H). **FIGs. 3I-3L** shows the map of

the c70 vector plasmid encoding mouse *GJB2* or human *GJB2* with or without an HA tag. FIG. 3M shows schematics of vector c.70 encoding mouse *GJB2* or human *GJB2* with or without the HA tag. FIG. 3N shows additional vectors that were created and tested.

[00230] Moreover, other AAV capsid proteins having tropisms to inner ear cells were tested for their capability in delivering a transgene (e.g., *GJB2* or GFP) to appropriate inner ear cells in both mouse and primates and rescuing hearing. AAV-S capsid protein, originally developed for brain tropism, showed good transduction of *GJB2*-expressing cells in both mouse and primate cochlea (FIG. 4). An rAAV comprising the AAV-S capsid protein and the c70 vector, which drives expression of *GJB2* under the *GJB2* basal promoter and 5' UTR, was packaged. The AAV-S-C70 rAAV is injected into *Gjb2* conditional knockout mice. The hearing of these mice is tested. The AAV-S-C70 rAAV is capable of rescuing hearing similarly to AAV9-PHP.B-C70 rAAV, or even better.

[00231] The AAV-S-C70 rAAV is injected into wild-type mice. The C70 vector includes an HA tag, which allows easy detection of *GJB2* expression in the inner ear with an anti-HA antibody. It is expected that *GJB2* expression is only detected in supporting cells of the organ of Corti and fibrocytes, which normally express *GJB2*. The hearing of the injected wild-type mice is also tested to assess *GJB2*-associated toxicity.

[00232] Further, the ability of AAV-S to transduce inner ear cells of non-human primates (NHP) was tested. An rAAV comprising an AAV-S capsid protein and a vector encoding GFP was injected into both ears of non-human primates. Animals were euthanized three weeks later and the cochleas prepared for histology. GFP expression is evaluated in the cochleas in these animals. Similar experiments in mice were carried out in parallel.

[00233] An AAV-S vector encoding GFP was injected into the inner ear of an adult mouse, using the posterior canal route (which robustly delivers vector throughout the inner ear in mouse). The animal was euthanized 20 days after the injection and the cochlea harvested.

[00234] In order to test whether *GJB2* GREs listed in Table 3 permit *GJB2* expression in cells that normally express it, and prevent *GJB2* expression in cells that do not normally express *GJB2*, the GREs were each incorporated into AAV vectors that drive GFP, human *GJB2*, or mouse *Gjb2* expression under the control of the basal *GJB2* promoter, and the *GJB2* exon 1 5' UTR. The vector maps are shown in FIGs. 5A-5U. The vectors include, from 5' to 3', an AAV 5' ITR, a human *GJB2* GRE, a *GJB2* basal promoter, a human *GJB2* exon 1 5' UTR, a nucleotide sequence encoding an eGFR, a human *GJB2* or a mouse *Gjb2*, and a *GJB2* exon 2 3' UTR. Vector c.81.1 includes human *GJB2* GRE1; Vector c.81.2 includes

human *GJB2* GRE2; Vector c.81.3 includes human *GJB2* GRE3; Vector c.81.4 includes human *GJB2* GRE4; Vector c.81.5 includes human *GJB2* GRE 5; Vector c.81.7 includes human *GJB2* GRE7; Vector c.81.8 includes human *GJB2* GRE8; Vector c.81.9 includes human *GJB2* GRE9 (FIGs. 5A-5U). FIG. 5V shows schematics of c81.2, c81.3, c81.5, c81.7 and c81.9 encoding eGFP, mouse *GJB2* and human *GJB2* as described above.

[00235] The c.81.2, c81.3, c81.5, c81.7, and c81.9 vectors encoding GFP were respectively packaged into rAAVs using AAV9.PHP.B capsid protein and injected through the round window membrane at postnatal day 1 of wild-type mice. The cochlea was fixed for histology at P6, and GFP expression was evaluated in the cochlea tissues.

[00236] It was found that *GJB2* gene regulatory element 5 (*GJB2* GRE5, in vector c81.5 encoding eGFP as a reporter) helped target expression of eGFP to *GJB2*-expressing cells. FIG. 6A shows a fluorescent image of eGFP expressing cells, including a variety of supporting cells in, and medial to, the organ of Corti. FIG. 6B shows antibody label of endogenous *GJB2* in the region of the organ of Corti. *GJB2* expression largely overlapped that of exogenous eGFP. FIG. 6C is an overlay of FIGs. 6A and 6B, with a third staining of actin, which revealed stereocilia of hair cells. No eGFP was expressed in the hair cells. FIG. 6D shows a frozen section immunofluorescence image of eGFP and a protein marker for hair cells, MYO7A. eGFP was expressed in a variety of supporting cells in the organ of Corti, but did not overlap with MYO7A expression, which was expressed in hair cells. The vectors encoding human *GJB2* or mouse *GJB2* will be tested for *GJB2* expression in the intended cells.

[00237] FIGs. 7A-7D show eGFP expression pattern by vector c.81.5 in the lateral wall of the cochlea. FIG. 7A shows eGFP expression in cells including fibrocytes of the lateral wall. FIG. 7B shows an antibody labeling of endogenous *GJB2* in the region of the lateral wall. *GJB2* expression largely overlaps that of exogenous GFP. FIG. 7C is an overlay image of FIGs. 7A and 7B. Note that eGFP was expressed in the cells expressing *Gjb2*. FIGs. 7D-7E show frozen section immunofluorescences of GFP (FIG. 7D) and *GJB2* in supporting cells of the organ of Corti and fibrocytes of the lateral wall (FIG. 7E).

[00238] Human *GJB2* enhancers identified based on human deletions are capable of rescue hearing, and similarly does not lead to *GJB2* associated toxicity.

REFERENCES

- [00239] Buenrostro JD, Giresi PG, Zaba LC, Chang HY, Greenleaf WJ (2013) Transposition of native chromatin for fast and sensitive epigenomic profiling of open chromatin, DNA-binding proteins and nucleosome position. *Nature methods* 10:1213-1218.
- [00240] Cohen-Salmon M, Ott T, Michel V, Hardelin JP, Perfettini I, Eybalin M, Wu T, Marcus DC, Wangemann P, Willecke K, Petit C (2002) Targeted ablation of connexin26 in the inner ear epithelial gap junction network causes hearing impairment and cell death. *Curr Biol* 12:1106-1111.
- [00241] Crispino G, Di Pasquale G, Scimemi P, Rodriguez L, Galindo Ramirez F, De Sisti RD, Santarelli RM, Arslan E, Bortolozzi M, Chiorini JA, Mammano F (2011) BAAV mediated *GJB2* gene transfer restores gap junction coupling in cochlear organotypic cultures from deaf Cx26Sox10Cre mice. *PloS one* 6:e23279.
- [00242] Deverman BE, Pravdo PL, Simpson BP, Kumar SR, Chan KY, Banerjee A, Wu WL, Yang B, Huber N, Pasca SP, Gradinaru V (2016) Cre-dependent selection yields AAV variants for widespread gene transfer to the adult brain. *Nat Biotechnol* 34:204-209.
- [00243] Feigenspan A, Janssen-Bienhold U, Hormuzdi S, Monyer H, Degen J, Sohl G, Willecke K, Ammermuller J, Weiler R (2004) Expression of connexin36 in cone pedicles and OFF-cone bipolar cells of the mouse retina. *J Neurosci* 24:3325-3334.
- [00244] Forge A, Becker D, Casalotti S, Edwards J, Marziano N, Nevill G (2003) Gap junctions in the inner ear: comparison of distribution patterns in different vertebrates and assessment of connexin composition in mammals. *J Comp Neurol* 467:207-231.
- [00245] Gyorgy B, Sage C, Indzhukulian AA, Scheffer DI, Brisson AR, Tan S, Wu X, Volak A, Mu D, Tamvakologos PI, Li Y, Fitzpatrick Z, Ericsson M, Breakefield XO, Corey DP, Maguire CA (2017) Rescue of hearing by gene delivery to inner-ear hair cells using exosome-associated AAV. *Mol Ther* 25:379-391.
- [00246] Gyorgy B, Meijer EJ, Ivanchenko MV, Tenneson K, Emond F, Hanlon KS, Indzhukulian AA, Volak A, Karavitaki KD, Tamvakologos PI, Vezina M, Berezovskii VK, Born RT, O'Brien M, Lafond JF, Arsenijevic Y, Kenna MA, Maguire CA, Corey DP (2018) Gene Transfer with AAV9-PHP.B Rescues Hearing in a Mouse Model of Usher Syndrome 3A and Transduces Hair Cells in a Non-human Primate. *Mol Ther Methods Clin Dev* 13:1-13.
- [00247] Iizuka T, Kamiya K, Gotoh S, Sugitani Y, Suzuki M, Noda T, Minowa O, Ikeda K (2015) Perinatal *Gjb2* gene transfer rescues hearing in a mouse model of hereditary deafness. *Hum Mol Genet* 24:3651-3661.

- [00248] Kelsell DP, Dunlop J, Stevens HP, Lench NJ, Liang JN, Parry G, Mueller RF, Leigh IM (1997) Connexin 26 mutations in hereditary non-syndromic sensorineural deafness. *Nature* 387:80-83.
- [00249] Kenna MA, Feldman HA, Neault MW, Frangulov A, Wu BL, Fligor B, Rehm HL (2010) Audiologic phenotype and progression in GJB2 (Connexin 26) hearing loss. *Arch Otolaryngol Head Neck Surg* 136:81-87.
- [00250] Kikuchi T, Kimura RS, Paul DL, Adams JC (1995) Gap junctions in the rat cochlea: immunohistochemical and ultrastructural analysis. *Anat Embryol (Berl)* 191:101-118.
- [00251] Li W, Wu J, Yang J, Sun S, Chai R, Chen ZY, Li H (2015) Notch inhibition induces mitotically generated hair cells in mammalian cochleae via activating the Wnt pathway. *Proceedings of the National Academy of Sciences of the United States of America* 112:166-171.
- [00252] Lin FR, Niparko JK, Ferrucci L (2011) Hearing loss prevalence in the United States. *Arch Intern Med* 171:1851- 1852.
- [00253] Mason JA, Herrmann KR (1998) Universal infant hearing screening by automated auditory brainstem response measurement. *Pediatrics* 101:221-228.
- [00254] Shu Y, Tao Y, Wang Z, Tang Y, Li H, Dai P, Gao G, Chen ZY (2016) Identification of Adeno-Associated Viral Vectors That Target Neonatal and Adult Mammalian Inner Ear Cell Subtypes. *Hum Gene Ther* 27:687-699.
- [00255] Sun Y, Tang W, Chang Q, Wang Y, Kong W, Lin X (2009) Connexin30 null and conditional connexin26 null mice display distinct pattern and time course of cellular degeneration in the cochlea. *J Comp Neurol* 516:569-579.
- [00256] Takada Y, Beyer LA, Swiderski DL, O'Neal AL, Prieskorn DM, Shivatzki S, Avraham KB, Raphael Y (2014) Connexin 26 null mice exhibit spiral ganglion degeneration that can be blocked by BDNF gene therapy. *Hearing research* 309:124-135.
- [00257] Wang Y, Chang Q, Tang W, Sun Y, Zhou B, Li H, Lin X (2009) Targeted connexin26 ablation arrests postnatal development of the organ of Corti. *Biochem Biophys Res Commun* 385:33-37.
- [00258] Watanabe K, Takeda K, Katori Y, Ikeda K, Oshima T, Yasumoto K, Saito H, Takasaka T, Shibahara S (2000) Expression of the Sox10 gene during mouse inner ear development. *Brain Res Mol Brain Res* 84:141-145.
- [00259] Wise AK, Tu T, Atkinson PJ, Flynn BO, Sgro BE, Hume C, O'Leary SJ, Shepherd RK, Richardson RT (2011) The effect of deafness duration on neurotrophin gene therapy for spiral ganglion neuron protection. *Hearing research* 278:69-76.

[00260] Yu Q, Wang Y, Chang Q, Wang J, Gong S, Li H, Lin X (2014) Virally expressed connexin26 restores gap junction function in the cochlea of conditional *Gjb2* knockout mice. *Gene Ther* 21:71-80.

[00261] Zelante L, Gasparini P, Estivill X, Melchionda S, D'Agruma L, Govea N, Mila M, Monica MD, Lutfi J, Shohat M, Mansfield E, Delgrosso K, Rappaport E, Surrey S, Fortina P (1997) Connexin26 mutations associated with the most common form of non-syndromic neurosensory autosomal recessive deafness (DFNB1) in Mediterraneans. *Hum Mol Genet* 6:1605-1609.

OTHER EMBODIMENTS

[00262] All of the features disclosed in this specification may be combined in any combination. Each feature disclosed in this specification may be replaced by an alternative feature serving the same, equivalent, or similar purpose. Thus, unless expressly stated otherwise, each feature disclosed is only an example of a generic series of equivalent or similar features.

[00263] From the above description, one skilled in the art can easily ascertain the essential characteristics of the present invention, and without departing from the spirit and scope thereof, can make various changes and modifications of the invention to adapt it to various usages and conditions. Thus, other embodiments are also within the claims.

EQUIVALENTS

[00264] While several inventive embodiments have been described and illustrated herein, those of ordinary skill in the art will readily envision a variety of other means and/or structures for performing the function and/or obtaining the results and/or one or more of the advantages described herein, and each of such variations and/or modifications is deemed to be within the scope of the inventive embodiments described herein. More generally, those skilled in the art will readily appreciate that all parameters, dimensions, materials, and configurations described herein are meant to be exemplary and that the actual parameters, dimensions, materials, and/or configurations will depend upon the specific application or applications for which the inventive teachings is/are used. Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific inventive embodiments described herein. It is, therefore, to be understood that the foregoing embodiments are presented by way of example only and that, within the scope of the appended claims and equivalents thereto, inventive embodiments may

be practiced otherwise than as specifically described and claimed. Inventive embodiments of the present disclosure are directed to each individual feature, system, article, material, kit, and/or method described herein. In addition, any combination of two or more such features, systems, articles, materials, kits, and/or methods, if such features, systems, articles, materials, kits, and/or methods are not mutually inconsistent, is included within the inventive scope of the present disclosure.

[00265] All definitions, as defined and used herein, should be understood to control over dictionary definitions, definitions in documents incorporated by reference, and/or ordinary meanings of the defined terms.

[00266] All references, patents and patent applications disclosed herein are incorporated by reference with respect to the subject matter for which each is cited, which in some cases may encompass the entirety of the document.

[00267] The indefinite articles “a” and “an,” as used herein in the specification and in the claims, unless clearly indicated to the contrary, should be understood to mean “at least one.”

[00268] The phrase “and/or,” as used herein in the specification and in the claims, should be understood to mean “either or both” of the elements so conjoined, i.e., elements that are conjunctively present in some cases and disjunctively present in other cases. Multiple elements listed with “and/or” should be construed in the same fashion, i.e., “one or more” of the elements so conjoined. Other elements may optionally be present other than the elements specifically identified by the “and/or” clause, whether related or unrelated to those elements specifically identified. Thus, as a non-limiting example, a reference to “A and/or B”, when used in conjunction with open-ended language such as “comprising” can refer, in one embodiment, to A only (optionally including elements other than B); in another embodiment, to B only (optionally including elements other than A); in yet another embodiment, to both A and B (optionally including other elements); etc.

[00269] As used herein in the specification and in the claims, “or” should be understood to have the same meaning as “and/or” as defined above. For example, when separating items in a list, “or” or “and/or” shall be interpreted as being inclusive, i.e., the inclusion of at least one, but also including more than one, of a number or list of elements, and, optionally, additional unlisted items. Only terms clearly indicated to the contrary, such as “only one of” or “exactly one of,” or, when used in the claims, “consisting of,” will refer to the inclusion of exactly one element of a number or list of elements. In general, the term “or” as used herein shall only be interpreted as indicating exclusive alternatives (i.e. “one or the other but not both”) when preceded by terms of exclusivity, such as “either,” “one of,” “only one of,” or

“exactly one of.” “Consisting essentially of,” when used in the claims, shall have its ordinary meaning as used in the field of patent law.

[00270] As used herein in the specification and in the claims, the phrase “at least one,” in reference to a list of one or more elements, should be understood to mean at least one element selected from any one or more of the elements in the list of elements, but not necessarily including at least one of each and every element specifically listed within the list of elements and not excluding any combinations of elements in the list of elements. This definition also allows that elements may optionally be present other than the elements specifically identified within the list of elements to which the phrase “at least one” refers, whether related or unrelated to those elements specifically identified. Thus, as a non-limiting example, “at least one of A and B” (or, equivalently, “at least one of A or B,” or, equivalently “at least one of A and/or B”) can refer, in one embodiment, to at least one, optionally including more than one, A, with no B present (and optionally including elements other than B); in another embodiment, to at least one, optionally including more than one, B, with no A present (and optionally including elements other than A); in yet another embodiment, to at least one, optionally including more than one, A, and at least one, optionally including more than one, B (and optionally including other elements); etc.

[00271] It should also be understood that, unless clearly indicated to the contrary, in any methods claimed herein that include more than one step or act, the order of the steps or acts of the method is not necessarily limited to the order in which the steps or acts of the method are recited.

CLAIMS

What is claimed is:

1. An isolated nucleic acid comprising an expression cassette, wherein the expression cassette comprises a Gap Junction beta 2 (*GJB2*) gene regulatory element (GRE), and a nucleotide sequence encoding a GJB2 protein.
2. The isolated nucleic acid of claim 1, wherein the GJB2 protein is a human GJB2 protein.
3. The isolated nucleic acid of claim 2, wherein the GJB2 protein comprises an amino acid sequence at least 80% identical to SEQ ID NO: 1.
4. The isolated nucleic acid of any one of claims 1-3, wherein the nucleotide sequence encoding a GJB2 protein comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 2.
5. The isolated nucleic acid of any one of claims 1-4, wherein the expression cassette further comprises a promoter operably linked to the nucleotide sequence encoding a GJB2 protein.
6. The isolated nucleic acid of claim 5, wherein the promoter is a human *GJB2* promoter.
7. The isolated nucleic acid of claim 6, wherein the promoter comprises 500 nucleotides of a human *GJB2* promoter.
8. The isolated nucleic acid of claim 7, wherein the promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 5.
9. The isolated nucleic acid of claim 6, wherein the promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 102, optionally 100% identical to SEQ ID NO: 102.

10. The isolated nucleic acid of any one of claims 1-9, wherein the Gap Junction beta 2 (*GJB2*) gene regulatory element (GRE) comprises a nucleotide sequence encoding a 5' UTR.
11. The isolated nucleic acid of claim 9, wherein the 5' UTR is positioned between the promoter and the nucleotide sequence encoding a *GJB2* protein.
12. The isolated nucleic acid of claims 10 or 11, wherein the 5' UTR comprises about 300 nucleotides of a human *GJB2* gene 5' UTR.
13. The isolated nucleic acid of claim 12, wherein the promoter and the 5' UTR comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 30.
14. The isolated nucleic acid of any one of claims 1-13, wherein the *GJB2* gene regulatory element further comprises an enhancer.
15. The isolated nucleic acid of claim 14, wherein the enhancer is positioned 5' to the promoter.
16. The isolated nucleic acid of claims 14 or 15, wherein the enhancer is normally present within approximately 200 kb upstream or downstream of a *GJB2* gene.
17. The isolated nucleic acid of any one of claims 14-16, wherein the enhancer is normally present within approximately 95 kb of a *GJB2* gene.
18. The isolated nucleic acid of any one of claims 14-17, wherein the *GJB2* GRE comprises one or more enhancers.
19. The isolated nucleic acid of claim 18, wherein the one or more enhancers are the same enhancers or different enhancers.
20. The isolated nucleic acid of any one of claims 14-19, wherein the enhancer comprises a nucleotide sequence at least 80% identical to a nucleotide sequence or a fragment thereof as set forth in any one of SEQ ID NOs: 6 to 29.

21. The isolated nucleic acid of any one of claims 14-20, wherein the enhancer comprises a nucleotide sequence at least 80% identical to a GJB2 enhancer as set forth in any one of SEQ ID NOs: 37-46.
22. The isolated nucleic acid of claim 21, wherein the enhancer comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 42.
23. An isolated nucleic acid comprising an expression cassette, wherein the expression cassette comprises a Gap Junction beta 2 (*GJB2*) promoter, and a nucleotide sequence encoding a GJB2 protein.
24. The isolated nucleic acid of claim 23, wherein the GJB2 promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 102, optionally 100% identical to SEQ ID NO: 102.
25. The isolated nucleic acid of claim 23 or 24, wherein the expression cassette further comprises a 5' UTR.
26. The isolated nucleic acid of claim 25, wherein the 5' UTR comprises:
a first nucleic acid sequence at least 80% identical to SEQ ID NO: 103, optionally 100% identical to SEQ ID NO: 103; and/or
a second nucleic acid sequence at least 80% identical to SEQ ID NO: 104, optionally 100% identical to SEQ ID NO: 104.
27. The isolated nucleic acid of any one of claims 23-27, wherein the isolated nucleic acid comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 105, optionally 100% identical to SEQ ID NO: 105.
28. The isolated nucleic acid of any one of claim 1-27, wherein the isolated nucleic acid is capable of expressing GJB2 in cells that normally express the *GJB2* gene.

29. The isolated nucleic acid of claim 28, wherein the isolated nucleic acid is capable of expressing GJB2 in cochlear connective tissue cells and supporting cells of the organ of Corti.
30. The isolated nucleic acid of claim 29, wherein the supporting cell of the organ of Corti are pillar cells, Deiters' cells, Hensen's cells, Claudius cells, inner phalangeal cells, and border cells.
31. The isolated nucleic acid of claim 29, wherein the cochlear connective tissue cells are stria intermediate cells, fibrocytes of the lateral wall and suprastrial zone, basal cells of the stria vascularis, fibrocytes in the spiral ligament, fibrocytes in the spiral limbus, mesenchymal cells lining the bony otic capsule facing the scala vestibuli, and supralimbal dark cells.
32. The isolated nucleic acid of any one of claims 1-31, wherein the expression cassette is flanked by two adeno-associated virus inverted terminal repeats (ITRs).
33. The isolated nucleic acid of claim 32, wherein the AAV ITR is from a serotype selected from the group consisting of AAV1 ITR, AAV2 ITR, AAV3 ITR, AAV4 ITR, AAV5 ITR, and AAV6 ITR.
34. The isolated nucleic acid of claims 32 or 33, wherein the AAV ITR is AAV2 ITR.
35. The isolated nucleic acid of claims 32 or 33, wherein the expression cassette comprises:
a 5' ITR having a nucleotide sequence at least 80% identical to SEQ ID NO: 106, optionally 100% identical to SEQ ID NO: 106; and/or
a 3' ITR having a nucleotide sequence at least 80% identical to SEQ ID NO: 107, optionally 100% identical to SEQ ID NO: 107.
36. The isolated nucleic acid of any one of claims 1-35, wherein the expression cassette further comprises a Woodchuck Hepatitis Virus (WHP) Posttranscriptional Regulatory Element (WPRE) 3' to the nucleotide sequence encoding the GJB2 protein.

37. The isolated nucleic acid of claim 36, wherein the WPRE comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 108, optionally 100% identical to SEQ ID NO: 108.
38. The isolated nucleic acid of any one of claims 1-37, wherein the expression cassette further comprises a nucleotide sequence encoding a 3' UTR located 3' of the WPRE.
39. The isolated nucleic acid of claim 38, wherein the 3' UTR is a GJB2 3' UTR.
40. The isolated nucleic acid of claim 39, wherein the GJB2 3' UTR comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 32.
41. The isolated nucleic acid of any one of claims 1-40, wherein the expression cassette further comprises a poly A signal.
42. The isolated nucleic acid of claim 41, wherein the poly A signal is a bovine growth hormone poly A signal.
43. The isolated nucleic acid of claim 41, wherein the poly A signal comprises a nucleotide sequence at least 80% identical to SEQ ID NO: 109, optionally 100% identical to SEQ ID NO: 109.
44. An isolated nucleic acid comprising a nucleotide sequence at least 80% identical to SEQ ID NO: 110 or 111, optionally 100% identical to SEQ ID NO: 110 or 111.
45. A vector comprising the isolated nucleic acid of any one of claims 1-44.
46. The vector of claim 45, wherein the vector is a plasmid or a viral vector.
47. The vector of claim 46, wherein the viral vector is an AAV vector.
48. A vector comprising from 5' to 3':
 (a) a 5' ITR;
 (b) a GJB2 promoter, or a basal GJB2 promoter sequence thereof;

- (c) a GJB2 5' UTR;
 - (d) a nucleotide sequence encoding a GJB2 protein;
 - (e) a GJB2 3' UTR;
 - (f) a bovine growth hormone poly A signal; and
 - (g) a 3' ITR.
49. A vector comprising from 5' to 3':
- (a) a 5' ITR;
 - (b) a GJB2 enhancer;
 - (c) a GJB2 promoter, or a basal GJB2 promoter sequence thereof;
 - (d) a GJB2 5' UTR;
 - (e) a nucleotide sequence encoding a GJB2 protein;
 - (f) a GJB2 3' UTR;
 - (g) a bovine growth hormone poly A signal; and
 - (h) a 3' ITR.
50. A recombinant adeno-associated virus (rAAV) comprising:
- (i) a capsid protein; and
 - (ii) the isolated nucleic acid of any one of claims 1-44.
51. A recombinant adeno-associated virus (rAAV) comprising:
- (i) a capsid protein; and
 - (ii) an isolated nucleic acid comprising:
 - (a) a 5' ITR;
 - (b) a GJB2 promoter, or a basal GJB2 promoter sequence thereof;
 - (c) a GJB2 5' UTR;
 - (d) a nucleotide sequence encoding a GJB2 protein;
 - (e) a GJB2 3' UTR;
 - (f) a bovine growth hormone poly A signal; and
 - (g) a 3' ITR.
52. A recombinant adeno-associated virus (rAAV) comprising:
- (i) a capsid protein; and
 - (ii) an isolated nucleic acid comprising:

- (a) a 5' ITR;
- (b) a GJB2 enhancer;
- (c) a GJB2 promoter, or a basal GJB2 promoter sequence thereof;
- (d) a GJB2 5' UTR;
- (e) a nucleotide sequence encoding a GJB2 protein;
- (f) a GJB2 3' UTR;
- (g) a bovine growth hormone poly A signal; and
- (h) a 3' ITR.

53. The rAAV of any one of claims claim 50-52, wherein the rAAV has tropism for a subset of cochlear cells that normally express the *GJB2* gene.

54. The rAAV of any one of claims 50-53, wherein the rAAV has tropism for cells of the inner ear.

55. The rAAV of any one of claims 50-54, wherein the capsid protein is an AAV1 capsid protein, an AAV2 capsid protein, an AAV5 capsid protein, an AAV7 capsid protein, an AAV8 capsid protein, an AAV9 capsid protein, an AAV-S capsid protein, or a variant thereof.

56. The rAAV of any one of claims 50-55, wherein the AAV capsid is AAV9.PHP.B, AAV9.PHP.eB, or AAV-S.

57. The rAAV of claim 56, wherein the AAV capsid protein is AAV-S.

58. A cell comprising the isolated nucleic acid of any one of claims 1-44, the vector of any one of claims 45-49, or the rAAV of any one of claims 50-57.

59. A pharmaceutical composition comprising the isolated nucleic acid of any one of claims 1-44, the vector of any one of claims 45-49, the rAAV of any one of claims 50-57, or the cell of claim 58.

60. The pharmaceutical composition of claim 59 further comprising a pharmaceutically acceptable carrier.

61. A method for specifically expressing GJB2 in cells that normally expresses the *GJB2* gene in a subject, the method comprising administering to the subject an effective amount of the isolated nucleic acid of any one of claims 1-44, the vector of any one of claims 45-49, the rAAV of any one of claims 50-57, the cell of claim 58, or the pharmaceutical composition of claim 59 or 60.
62. A method for treating Non-syndromic Hearing Loss and Deafness (DFNB1) in a subject in need thereof, the method comprising administering to the subject an effective amount of the isolated nucleic acid of any one of claims 1-44, the vector of any one of claims 45-49, the rAAV of any one of claims 50-57, the cell of claim 58, or the pharmaceutical composition of claims 59 or 60.
63. A method for treating a GJB2-associated disease in a subject in need thereof, the method comprising administering to the subject an effective amount of the isolated nucleic acid of any one of claims 1-44, the vector of any one of claims 45-49, the rAAV of any one of claims 50-57, the cell of claim 58, or the pharmaceutical composition of claims 59 or 60.
64. The method of any one of claims 61-63, wherein the subject is a mammal.
65. The method of claim 64, wherein the mammal is a human.
66. The method of claim 64, wherein the mammal is a non-human mammal.
67. The method of claim 66, wherein the non-human mammal is mouse, rat, or non-human primate.
68. The method of any one of claims 61-67, wherein the hearing loss is associated with a mutation in the *GJB2* gene.
69. The method of claim 68, wherein the mutation in the *GJB2* gene is a point mutation, a missense mutation, a nonsense mutation, a deletion, an insertion, or a combination thereof.

70. The method of claim 69, wherein the subject is human; and the mutation is a mutation listed in Table 2 or a combination thereof.

71. The method of claims 69 or 70, wherein the mutation is c 101.T>C or Del35G.

72. The method of any one of claims 61-71, wherein the step of administering results in expression of GJB2 protein in cochlear connective tissue cells and supporting cells of the organ of Corti.

73. The method of claim 72, wherein the supporting cells of the organ of Corti are pillar cells, Deiters' cells, Hensen's cells, Claudius cells, inner phalangeal cells, and border cells.

74. The method of claim 72, wherein the cochlear connective tissue cells are stria intermediate cells, fibrocytes of the lateral wall and suprastrial zone, basal cells of the stria vascularis, fibrocytes in the spiral ligament, fibrocytes in the spiral limbus, mesenchymal cells lining the bony otic capsule facing the scala vestibuli, and supralimbal dark cells.

75. The method of any one of claims 61-74, wherein the administration is via injection.

76. The method of claim 75, wherein the injection is through the round window membrane of the cochlea, into the scala media of the cochlea, into the scala vestibuli of the cochlea, into a semicircular canal of the inner ear, or into the saccule or the utricle of the inner ear.