CLAIMS

WHAT IS CLAIMED IS:

1. A system for treating hearing loss, comprising:

a cochlear implant; and

a gene therapeutic construct, wherein the gene therapeutic construct comprises an expression vector for h-TMPRSS3.

2. The system of claim 1, wherein the expression vector further comprises an initial vector, an enhancer, a promoter, a bGH poly(A) signal, and a closing vector.

3. The system of claim 1, wherein the expression vector is an adeno-associated viral vector or a synthetic version of an adeno associated viral vector serotype.

4. The system of claim 3, wherein the expression vector of claim 2, wherein the adeno-associated viral vector is selected from the group consisting of AAV2, AAV2/Anc80, AAV5, AAV6, AAV6.2, AAV7, AAV8, AAV9, AAVrh8, AAVrh10, AAVrh39, AAVrh43, AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, Anc80, or a synthetic version of an adeno associated viral vector serotype

5. The system of claim 1, wherein the promoter is selected from the group consisting of: TMPRSS3 promoters, Myo7a promoters, human cytomegalovirus

(HCMV) promoters, cytomegalovirus/chicken beta-actin (CBA) promoters and Pou4f3 promoters.

6. The system of claim 1, wherein the enhancer is selected from the group consisting of: TMPRSS3 enhancers and human cytomegalovirus (HCMV) enhancers.

7. The system of claim 1, wherein the cochlear implant comprises:

a microphone, the microphone configured to receive sound;

a speech processor, the speech processor configured to select and/or arrange sounds received up by the microphone;

a transmitter and a receiver/stimulator, wherein the transmitter and the receiver/stimulator are configured to receive signals from the speech processor and convert them into electric impulses; and

an electrode.

8. Use of a pharmaceutical composition in the manufacture of a medicament for treating or preventing hearing loss, said composition comprising an expression vector comprising an initial vector, an enhancer, a promoter, a bGH poly(A) signal, and a closing vector.

9. The use of claim 8, wherein the expression vector is an adeno-associated viral vector or a synthetic version of an adeno associated viral vector serotype.

10. The use of claim 9, wherein the adeno-associated viral vector is selected from the group consisting of AAV2, AAV2/Anc80, AAV5, AAV6, AAV6.2, AAV7, AAV8, AAV9, AAVrh8, AAVrh10, AAVrh39, AAVrh43, AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, Anc80, or a synthetic version of an adeno associated viral vector serotype

11. The use of claim 8, wherein the promoter is selected from the group consisting of: TMPRSS3 promoters, Myo7a promoters, human cytomegalovirus (HCMV) promoters, cytomegalovirus/chicken beta-actin (CBA) promoters and Pou4f3 promoters.

12. The use of claim 8, wherein the enhancer is selected from the group consisting of: TMPRSS3 enhancers and human cytomegalovirus (HCMV) enhancers.

13. Use of a cell transfected with an expression vector in the manufacture of a medicament for treating or preventing hearing loss, said expression vector comprising an initial vector, an enhancer, a promoter, a bGH poly(A) signal, and a closing vector.

14. The use of claim 13, wherein the expression vector is an adeno-associated viral vector or a synthetic version of an adeno associated viral vector serotype

15. The use of claim 14, wherein the adeno-associated viral vector is selected from the group consisting of AAV2, AAV2/Anc80, AAV5, AAV6, AAV6.2, AAV7, AAV8, AAV9, AAVrh8, AAVrh10, AAVrh39, AAVrh43, AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, Anc80, or a synthetic version of an adeno associated viral vector serotype

16. The use of claim 13, wherein the promoter is selected from the group consisting of: TMPRSS3 promoters, Myo7a promoters, human cytomegalovirus (HCMV) promoters, cytomegalovirus/chicken beta-actin (CBA) promoters and Pou4f3 promoters.

17. The use of claim 13, wherein the cell is a stem cell.

18. The use of claim 17, wherein the stem cell is an induced pluripotent stem cell.

19. Use of an expression vector comprising an initial vector, an enhancer, a promoter, a bGH poly(A) signal, and a closing vector in the manufacture of a medicament for use in combination therapy for treating or preventing hearing loss in a subject in need thereof, wherein the medicament is to be administered in combination with a cochlear implant.

20. The use of claim 19, wherein the expression vector is to be administered prior to the implantation of the cochlear implant.

21. The use of claim 19, wherein the expression vector is to be administered subsequent to the implantation of the cochlear implant.

22. The use of claim 19, wherein the expression vector is to be administered concurrently with the cochlear implant.

23. The use of claim 19, wherein the expression vector is an adeno-associated viral vector or a synthetic version of an adeno associated viral vector serotype

24. The use of claim 23, wherein the adeno-associated viral vector is selected from the group consisting of AAV2, AAV2/Anc80, AAV5, AAV6, AAV6.2, AAV7, AAV8, AAV9, AAVrh8, AAVrh10, AAVrh39, AAVrh43, AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, Anc80 or a synthetic version of an adeno associated viral vector serotype

25. The use of claim 19, wherein the promoter is selected from the group consisting of: TMPRSS3 promoters, Myo7a promoters, human cytomegalovirus (HCMV) promoters, cytomegalovirus/chicken beta-actin (CBA) promoters and Pou4f3 promoters.

26. The use of claim 19, wherein the expression vector is to be administered by injection into the inner ear of the subject.

27. The use of claim 26, wherein the injection method is selected from the group consisting of cochleostomy, round window membrane, endolymphatic sac, scala media, canalostomy, scala media via the endolymphatic sac, or any combination thereof.

28. The use of claim 19, wherein the subject has one or more genetic risk factors associated with hearing loss.

29. The use of claim 28, wherein one of the genetic risk factors is selected from the group consisting of a mutation in the TMPRSS3 gene or a mutation in the LOXHD1 gene.

30. The use of claim 28, wherein the subject does not exhibit any clinical indicators of hearing loss.