CLAIMS

1. A method for reducing the immunogenicity for mammalian cells of RNA, oligoribonucleotide, or polyribonucleotide molecules comprising pseudouridine (Ψ), 1-methylpseudouridine ($m^1\Psi$), 5-methyluridine (m^5U), and 2-thiouridine (s^2U) in place of uridine (U), the method comprising:

purifying RNA, oligoribonucleotide, or polyribonucleotide molecules comprising a modified nucleoside selected from Ψ, $m^1\Psi$, m^5U, mo^5U, and s^2U in place of U using a process that removes RNA contaminant molecules that are immunogenic and toxic to the cell by inducing an innate immune response, such that a purified RNA preparation comprising said RNA, oligoribonucleotide, or polyribonucleotide molecules lacks immunogenicity,

wherein said lack of immunogenicity is detectable using an *in vitro* MDDC immunogenicity assay by measuring no increase in the amount of IFN-α or TNF-α secreted by human or murine monocyte-derived dendritic cells (MDDCs) transfected with said purified RNA, oligoribonucleotide, or polyribonucleotide molecules that is greater than the mean + the standard error of the mean (SEM) amount of IFN-α or TNF-α secreted by MDDCs transfected with negative controls that do not contain said *in vitro*-synthesized RNA, oligoribonucleotide, or polyribonucleotide molecules; and

wherein said purification step enables repeated delivery of said RNA, oligoribonucleotide, or polyribonucleotide molecules into a mammalian cell without generation of inflammatory cytokines.

2. The method according to claim 1, wherein said RNA, oligoribonucleotide, or polyribonucleotide molecules further comprise or consist of at least one of the following:

- they further comprise a poly-A tail;
- a majority of said molecules further comprise a 5' cap;
- they are mRNA (messenger RNA) molecules;
- the molecules encode a recombinant protein;
- the molecules are anti-sense RNA molecules, small inhibitory RNA (siRNA) molecules, micro RNA (miRNA) molecules or ribozyme molecules; and/or
- they further comprise the modified nucleoside 5-methylcytidine (m^5C).

3. The method of any one of claims 1-2, wherein said reduced immunogenicity said purified RNA, oligoribonucleotide, or polyribonucleotide molecules is detectable using an *in vitro* assay comprising measuring decreased secretion of a cytokine selected from the group consisting of: IL-12, IFN-α, TNF-α, RANTES, MIP-1α, MIP-1β, IL-6, IFN-β and IL-8, wherein preferably said cytokine which is measured is selected from IL-12, IFN-α and TNF-α from mammalian cells contacted with said purified RNA, oligoribonucleotide, or polyribonucleotide molecules than from said mammalian cells transfected with the same amount of the unpurified RNA, oligoribonucleotide, or polyribonucleotide molecules.

4. The method of any one of claims 1-3, wherein reduced immunogenicity of said RNA, oligoribonucleotide, or polyribonucleotide molecules following said purifying can be detected using an *in vitro* dendritic cell assay by measuring decreased secretion of IFN-α or TNF-α cytokine from dendritic cells transfected with said RNA, oligoribonucleotide, or polyribonucleotide molecules following said purifying compared to secretion of said cytokine from dendritic cells transfected with the same amount of said RNA, oligoribonucleotide, or polyribonucleotide molecules not subjected to said purifying.

5. The method of any one of claims 1-4, wherein the recombinant protein encoded by said RNA, oligoribonucleotide, or polyribonucleotide molecule is selected from the group consisting of: erythropoietin (EPO); a detectable enzyme selected from firefly luciferase, Renilla luciferase, bacterial beta-galactosidase (lacZ), and green fluorescent protein (GFP); a transcription factor selected from MYC and SRY or MCOP; a growth factor or cytokine selected from the group consisting of platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), transforming growth factor-beta1 (TGF-beta1), insulin-like growth factor (IGF), alpha-melanocyte-stimulating hormone (alpha-MSH); insulin-like growth factor-I (IGF-I); IL-4; IL-13; and IL-10; inducible nitric oxide synthase (iNOS); a heat shock protein; Cystic Fibrosis Transmembrane Conductance Regulator (CFTR); an enzyme with antioxidant activity selected from among catalase, phospholipid hydroperoxide glutathione peroxidase, superoxide dismutase-1, and superoxide dismutase-2; Bruton's tyrosine kinase; adenosine deaminase; ecto-nucleoside triphosphate diphosphydrolase; ABCA4; ABCD3; ACADM; AGL; AGT; ALDH4A1; ALPL; AMPD1; APOA2; AVSD1; BRCD2; C1QA; C1QB; C1QG; C8A; C8B; CACNA1S; CCV;

CD3Z; CDC2L1; CHML; CHS1; CIAS1; CLCNKB; CMD1A; CMH2; CMM; COL11A1; COL8A2; COL9A2; CPT2; CRB1; CSE; CSF3R; CTPA; CTSK; DBT; DIO1; DISC1; DPYD; EKV; ENO1; ENO1P; EPB41; EPHX1; F13B; F5; FCGR2A; FCGR2B; FCGR3A; FCHL; FH; FMO3; FMO4; FUCA1; FY; GALE; GBA; GFND; GJA8; GJB3; GLC3B; HF1; HMGCL; HPC1; HRD; HRPT2; HSD3B2; HSPG2; KCNQ4; KCS; KIF1B; LAMB3; LAMC2; LGMD1B; LMNA; LOR; MCKD1; MCL1; MPZ; MTHFR; MTR; MUTYH; MYOC; NB; NCF2; NEM1; NPHS2; NPPA; NRAS; NTRK1; OPTA2; PBX1; PCHC; PGD; PHA2A; PHGDH; PKLR; PKP1; PLA2G2A; PLOD; PPOX; PPTO; PRCC; PRG4; PSEN2; PTOS1; REN; RFX5; RHD; RMD1; RPE65; SCCD; SERPINC1; SJS1; SLC19A2; SLC2A1; SPG23; SPTA1; TAL1; TNFSF6; TNNT2; TPM3; TSHB; UMPK; UOX; UROD; USH2A; VMGLOM; VWS; WS2B; ABCB11; ABCG5; ABCG8; ACADL; ACP1; AGXT; AHHR; ALMS1; ALPP; ALS2; APOB; BDE; BDMR; BJS; BMPR2; CHRNA1; CMCWTD; CNGA3; COL3A1; COLAA3; COL4A4; COL6A3; CPS1; CRYGA; CRYGEP1; CYP1B1; CYP27A1; DBI; DES; DYSF; EDAR; EFEMP1; EIF2AK3; ERCC3; FSHR; GINGF; GLC1B; GPD2; GYPC; HADHA; HADHB; HOXD13; HPE2; IGKC; IHH; IRS1; ITGA6; KHK; KYNU; LCT; LHCGR; LSFC; MSH2; MSH6; NEB; NMTC; NPHP1; PAFAH1P1; PAX3; PAX8; PMS1; PNKD; PPH1; PROC; REG1A; SAG; SFTPB; SLC11A1; SLC3A1; SOS1; SPG4; SRD5A2; TCL4; TGFA; TMD; TPO; UGT1A@; UV24; WSS; XDH; ZAP70; ZFHX1B; ACAA1; AGS1; AGTR1; AHSG; AMT; ARMET; BBS3; BCHE; BCPM; BTD; CASR; CCR2; CCR5; CDL1; CMT2B; COL7A1; CP; CPO; CRV; CTNNB1; DEM; ETM1; FANCD2; FIH; FOXL2; GBE1; GLB1; GLCLC; GNAI2; GNAT1; GP9; GPX1; HGD; HRG; ITIH1; KNG; LPP; LRS1; MCCC1; MDS1; MHS4; MITF; MLH1; MYL3; MYMY; OPA1; P2RY12; PBXP1; PCCB; POU1F1; PPARG; PROS1; PTHR1; RCA1; RHO; SCA7; SCLC1; SCN5A; SI; SLC25A20; SLC2A2; TF; TGFBR2; THPO; THRB; TKT; TM4SF1; TRH; UMPS; UQCRC1; USH3A; VHL; WS2A; XPC; ZNF35; ADH1B; ADH1C; AFP; AGA; AIH2; ALB; ASMD; BFHD; CNGA1; CRBM; DCK; DSPP; DTDP2; ELONG; ENAM; ETFDH; EVC; F11; FABP2; FGA; FGB; FGFR3; FGG; FSHMD1A; GC; GNPTA; GNRHR; GYPA; HCA; HCL2; HD; HTN3; HVBS6; IDUA; IF; JPD; KIT; KLKB1; LQT4; MANBA; MLLT2; MSX1; MTP; NR3C2; PBT; PDE6B; PEE1; PITX2; PKD2; QDPR; SGCB; SLC25A4; SNCA; SOD3; STATH; TAPVR1; TYS; WBS2; WFS1; WHCR; ADAMTS2; ADRB2; AMCN; AP3B1; APC; ARSB; B4GALT7; BHR1; C6; C7; CCAL2; CKN1; CMDJ; CRHBP; CSF1R; DHFR; DIAPH1; DTR; EOS; EPD; ERVR; F12; FBN2;

GDNF; GHR; GLRA1; GM2A; HEXB; HSD17B4; ITGA2; KFS; LGMDLA; LOX; LTC4S; MAN2A1; MCC; MCCC2; MSH3; MSX2; NR3C1; PCSK1; PDE6A; PFBI; RASA1; SCZD1; SDHA; SGCD; SLC22A5; SLC26A2; SLC6A3; SM1; SMA@; SMN1; SMN2; SPINK5; TCOF1; TELAB1; TGFBI; ALDH5A1; ARG1; AS; ASSP2; BCKDHB; BF; C2; C4A; CDKN1A; COL10A1; COL11A2; CYP21A2; DYX2; EJM1; ELOVL4; EPM2A; ESR1; EYA4; F13A1; FANCE; GCLC; GJA1; GLYS1; GMPR; GSE; HCR; HFE; HLA-A; HLA-DPB1; HLA-DRA; HPFH; ICS1; IDDM1; IFNGR1; IGAD1; IGF2R; ISCW; LAMA2; LAP; LCA5; LPA; MCDR1; MOCS1; MUT; MYB; NEU1; NKS1; NYS2; OA3; ODDD; OFC0; PARK2; PBCA; PBCRA1; PDB1; PEX3; PEX6; PEX7; PKHD1; PLA2G7; PLG; POLH; PPAC; PSORS1; PUJO; RCD1; RDS; RHAG; RP14; RUNX2; RWS; SCA1; SCZD3; SIASD; SOD2; ST8; TAP1; TAP2; TFAP2B; TNDM; TNF; TPBG; TPMT; TULP1; WISP3; AASS; ABCB1; ABCB4; ACHE; AQP1; ASL; ASNS; AUTS1; BPGM; BRAF; C7orf2; CACNA2D1; CCM1; CD36; CFTR; CHORDOMA; CLCN1; CMH6; CMT2D; COL1A2; CRS; CYMD; DFNA5; DLD; DYT11; EEC1; ELN; ETV1; FKBP6; GCK; GHRHR; GHS; GLI3; GPDS1; GUSB; HLXB9; HOXA13; HPFH2; HRX; IAB; IMMP2L; KCNH2; LAMBI; LEP; MET; NCF1; NM; OGDH; OPN1SW; PEX1; PGAM2; PMS2; PON1; PPP1R3A; PRSS1; PTC; PTPN12; RP10; RP9; SERPINE1; SGCE; SHFM1; SHH; SLC26A3; SLC26A4; SLOS; SMAD1; TBXAS1; TWIST; ZWS1; ACHM3; ADRB3; ANK1; CA1; CA2; CCAL1; CLN8; CMT4A; CNGB3; COH1; CPP; CRH; CYP11B1; CYP11B2; DECR1; DPYS; DURS1; EBS1; ECA1; EGI; EXT1; EYA1; FGFR1; GNRH1; GSR; GULOP; HR; KCNQ3; KFM; KWE; LGCR; LPL; MCPH1; MOS; MYC; NAT1; NAT2; NBS1; PLAT; PLEC1; PRKDC; PXMP3; RP1; SCZD6; SFTPC; SGM1; SPG5A; STAR; TG; TRPS1; TTPA; VMD1; WRN; ABCA1; ABL1; ABO; ADAMTS13; AK1; ALAD; ALDH1A1; ALDOB; AMBP; AMCD1; ASS; BDMF; BSCL; C5; CDKN2A; CHAC; CLA1; CMD1B; COL5A1; CRAT; DBH; DNAI1; DYS; DYT1; ENG; FANCC; FBP1; FCMD; FRDA; GALT; GLDC; GNE; GSM1; GSN; HSD17B3; HSN1; IBM2; INVS; JBTS1; LALL; LCCS1; LCCS; LGMD2H; LMX1B; MLLT3; MROS; MSSE; NOTCH1; ORM1; PAPPA; PIP5K1B; PTCH; PTGS1; RLN1; RLN2; RMRP; ROR2; RPD1; SARDH; SPTLC1; STOM; TDFA; TEK; TMC1; TRIM32; TSC1; TYRP1; XPA; CACNB2; COL17A1; CUBN; CXCL12; CYP17; CYP2C19; CYP2C9; EGR2; EMX2; ERCC6; FGFR2; HK1; HPS1; IL2RA; LGI1; LIPA; MAT1A; MBL2; MKI67; MXI1; NODAL; OAT; OATL3; PAX2; PCBD; PEO1; PHYH; PNLIP; PSAP; PTEN; RBP4; RDPA; RET; SFTPA1; SFTPD; SHFM3; SIAL;

THC2; TLX1; TNFRSF6; UFS; UROS; AA; ABCC8; ACAT1; ALX4; AMPD3; ANC; APOAL; APOA4; APOC3; ATM; BSCL2; BWS; CALCA; CAT; CCND1; CD3E; CD3G; CD59; CDKNLC; CLN2; CNTF; CPT1A; CTSC; DDB1; DDB2; DHCR7; DLAT; DRD4; ECB2; ED4; EVR1; EXT2; F2; FSHB; FTH1; G6PT1; G6PT2; GIF; HBB; HBBP1; HBD; HBE1; HBG1; HBG2; HMBS; HND; HOMG2; HRAS; HVBS1; IDDM2; IGER; INS; JBS; KCNJ11; KCNJ1; KCNQ1; LDHA; LRP5; MEN1; MLL; MYBPC3; MYO7A; NNO1; OPPG; OPTB1; PAX6; PC; PDX1; PGL2; PGR; PORC; PTH; PTS; PVRL1; PYGM; RAG1; RAG2; ROM1; RRAS2; SAA1; SCA5; SCZD2; SDHD; SERPING1; SMPD1; TCIRG1; TCL2; TECTA; TH; TREH; TSG101; TYR; USH1C; VMD2; VRNI; WT1; WT2; ZNF145; A2M; AAAS; ACADS; ACLS; ACVRL1; ALDH2; AMHR2; AOM; AQP2; ATD; ATP2A2; BDC; CIR; CD4; CDK4; CNA1; COL2A1; CYP27B1; DRPLA; ENUR2; FEOM1; FGF23; FPF; GNB3; GNS; HAL; HBP1; HMGA2; HMN2; HPD; IGF1; KCNA1; KERA; KRAS2; KRT1; KRT2A; KRT3; KRT4; KRT5; KRT6A; KRT6B; KRTHB6; LDHB; LYZ; MGCT; MPE; MVK; MYL2; OAP; PAH; PPKB; PRB3; PTPN11; PXR1; RLS; RSN; SAS; SAX1; SCA2; SCNN1A; SMAL; SPPM; SPSMA; TBX3; TBX5; TCF1; TPI1; TSC3; ULR; VDR; VWF; ATP7B; BRCA2; BRCD1; CLN5; CPB2; ED2; EDNRB; ENUR1; ERCC5; F10; F7; GJB2; GJB6; IPF1; MBS1; MCOR; NYS4; PCCA; RB1; RHOK; SCZD7; SGCG; SLC10A2; SLC25A15; STARP1; ZNF198; ACHM1; ARVD1; BCH; CTAA1; DAD1; DFNB5; EML1; GALC; GCH1; IBGC1; IGH@; IGHC group; IGHG1; IGHM; IGHR; IV; LTBP2; MJD; MNG1; MPD1; MPS3C; MYH6; MYH7; NP; NPC2; PABPN1; PSEN1; PYGL; RPGRIP1; SERPINA1; SERPINA3; SERPINA6; SLC7A7; SPG3A; SPTB; TCL1A; TGM1; TITF1; TMIP; TRA@; TSHR; USHLA; VP; ACCPN; AHO2; ANCR; B2M; BBS4; BLM; CAPN3; CDAN1; CDAN3; CLN6; CMH3; CYP19; CYP1A1; CYP1A2; DYX1; EPB42; ETFA; EYCL3; FAH; FBN1; FES; HCVS; HEXA; IVD; LCS1; LIPC; MYO5A; OCA2; OTSC1; PWCR; RLBP1; SLC12A1; SPG6; TPM1; UBE3A; WMS; ABCC6; ALDOA; APRT; ATP2A1; BBS2; CARD15; CATM; CDH1; CETP; CHST6; CLN3; CREBBP; CTH; CTM; CYBA; CYLD; DHS; DNASE1; DPEP1; ERCC4; FANCA; GALNS; GAN; HAGH; HBA1; HBA2; HBHR; HBQ1; HBZ; HBZP; HP; HSD11B2; IL4R; LIPB; MC1R; MEFV; MHC2TA; MLYCD; MMVP1; PHKB; PHKG2; PKD1; PKDTS; PMM2; PXE; SALL1; SCA4; SCNN1B; SCNN1G; SLC12A3; TAT; TSC2; VDI; WT3; ABR; ACACA; ACADVL; ACE; ALDH3A2; APOH; ASPA; AXIN2; BCL5; BHD; BLMH; BRCA1; CACD; CCA1; CCZS; CHRNB1; CHRNE; CMT1A; COL1A1; CORD5;

CTNS; EPX; ERBB2; G6PC; GAA; GALK1; GCGR; GFAP; GH1; GH2; GP1BA; GPSC; GUCY2D; ITGA2B; ITGB3; ITGB4; KRT10; KRT12; KRT13; KRT14; KRT14L1; KRT14L2; KRT14L3; KRT16; KRT16L1; KRT16L2; KRT17; KRT9; MAPT; MDB; MDCR; MGI; MHS2; MKS1; MPO; MYO15A; NAGLU; NAPB; NF1; NME1; P4HB; PAFAH1B1; PECAM1; PEX12; PHB; PMP22; PRKAR1A; PRKCA; PRKWNK4; PRP8; PRPF8; PTLAH; RARA; RCV1; RMSA1; RP17; RSS; SCN4A; SERPINF2; SGCA; SGSH; SHBG; SLC2A4; SLC4A1; SLC6A4; SMCR; SOST; SOX9; SSTR2; SYM1; SYNS1; TCF2; THRA; TIMP2; TOC; TOP2A; TP53; TRIM37; VBCH; ATP8B1; BCL2; CNSN; CORD1; CYB5; DCC; F5F8D; FECH; FEO; LAMA3; LCFS2; MADH4; MAFD1; MC2R; MCL; MYP2; NPC1; SPPK; TGFBRE; TGIF; TTR; AD2; AMH; APOC2; APOE; ATHS; BAX; BCKDHA; BCL3; BFIC; C3; CACNA1A; CCO; CEACAM5; COMP; CRX; DBA; DDU; DFNA4; DLL3; DM1; DMWD; E11S; ELA2; EPOR; ERCC2; ETFB; EXT3; EYCL1; FTL; FUT1; FUT2; FUT6; GAMT; GCDH; GPI; GUSM; HB1; HCL1; HHC2; HHC3; ICAM3; INSR; JAK3; KLK3; LDLR; LHB; LIG1; LOH19CR1; LYL1; MAN2B1; MCOLN1; MDRV; MLLT1; NOTCH3; NPHS1; OFC3; OPA3; PEPD; PRPF31; PRTN3; PRX; PSG1; PVR; RYR1; SLC5A5; SLC7A9; STK11; TBXA2R; TGFB1; TNNI3; TYROBP; ADA; AHCY; AVP; CDAN2; CDPD1; CHED1; CHED2; CHRNA4; CST3; EDN3; EEGV1; FTLL1; GDF5; GNAS; GSS; HNF4A; JAG1; KCNQ2; MKKS; NBIA1; PCK1; PI3; PPCD; PPGB; PRNP; THBD; TOP1; AIRE; APP; CBS; COL6A1; COL6A2; CSTB; DCR; DSCR1; FPDMM; HLCS; HPE1; ITGB2; KCNE1; KNO; PRSS7; RUNX1; SOD1; TAM; ADSL; ARSA; BCR; CECR; CHEK2; COMT; CRYBB2; CSF2RB; CTHM; CYP2D6; CYP2D7P1; DGCR; DIA1; EWSR1; GGT1; MGCR; MN1; NAGA; NE2; OGS2; PDGFB; PPARA; PRODH; SCO2; SCZD4; SERPIND1; SLC5A1; SOX10; TCN2; TIMP3; TST; VCF; ABCD1; ACTL1; ADFN; AGMX2; AHDS; AIC; AIED; AIH3; ALAS2; AMCD; AMELX; ANOP1; AR; ARAF1; ARSC2; ARSE; ARTS; ARX; ASAT; ASSP5; ATP7A; ATRX; AVPR2; BFLS; BGN; BTK; BZX; C1HR; CACNA1F; CALB3; CBBM; CCT; CDR1; CFNS; CGF1; CHM; CHR39c; CIDX; CLA2; CLCN5; CLS; CMTX2; CMTX3; CND; COD1; COD2; COL4A5; COL4A6; CPX; CVD1; CYBB; DCX; DFN2; DFN4; DFN6; DHOF; DIAPH2; DKC1; DMD; DSS; DYT3; EBM; EBP; ED1; ELK1; EMD; EVR2; F8; F9; FCP1; FDPSL5; FGD1; FGS1; FMR1; FMR2; G6PD; GABRA3; GATA1; GDI1; GDXY; GJB1; GK; GLA; GPC3; GRPR; GTD; GUST; HMS1; HPRT1; HPT; HTC2; HTR2c; HYR; IDS; IHG1; IL2RG; INDX; IP1; IP2; JMS; KAL1; KFSD; L1CAM; LAMP2; MAA;

MAFD2; MAOA; MAOB; MCF2; MCS; MEAX; MECP2; MF4; MGC1; MIC5; MID1; MLLT7; MLS; MRSD; MRX14; MRX1; MRX20; MRX2; MRX3; MRX40; MRXA; MSD; MTM1; MYCL2; MYP1; NDP; NHS; NPHL1; NROB1; NSX; NYS1; NYX; OA1; OASD; OCRL; ODT1; OFD1; OPA2; OPD1; OPEM; OPN1LW; OPN1MW; OTC; P3; PDHA1; PDR; PFC; PFKFB1; PGK1; PGK1P1; PGS; PHEX; PHKA1; PHKA2; PHP; PIGA; PLP1; POF1; POLA; POU3F4; PPMX; PRD; PRPS1; PRPS2; PRS; RCCP2; RENBP; RENS1; RP2; RP6; RPGR; RPS4X; RPS6KA3; RS1; S11; SDYS; SEDL; SERPINA7; SH2D1A; SHFM2; SLC25A5; SMAX2; SRPX; SRS; STS; SYN1; SYP; TAF1; TAZ; TBX22; TDD; TFE3; THAS; THC; TIMM8A; TIM1; TKCR; TNFSF5; UBE1; UBE2A; WAS; WSN; WTS; WWS; XIC; XIST; XK; XM; XS; ZFX; ZIC3; ZNF261; ZNF41; ZNF6; AMELY; ASSP6; AZF1; AZF2; DAZ; GCY; RPS4Y; SMCY; ZFY; ABAT; AEZ; AFA; AFD1; ASAH1; ASD1; ASMT; CCAT; CECR9; CEPA; CLA3; CLN4; CSF2RA; CTS1; DF; DIH1; DWS; DYT2; DYT4; EBR3; ECT; EEF1A1L14; EYCL2; FANCB; GCSH; GCSL; GIP; GTS; HHG; HMI; HOAC; HOKPP2; HRPT1; HSD3B3; HTC1; HV1S; ICHQ; ICR1; ICR5; IL3RA; KAL2; KMS; KRT18; KSS; LCAT; LHON; LIMM; MANBB; MCPH2; MEB; MELAS; MIC2; MPFD; MS; MSS; MTATP6; MTCO1; MTC03; MTCYB; MTND1; MTND2; MTND4; MTND5; MTND6; MTRNR1; MTRNR2; MTTE; MTTG; MTTI; MTTK; MTTL1; MTTL2; MTTN; MTTP; MTTS1; NAMSD; OCD1; OPD2; PCK2; PCLD; PCOS1; PFKM; PKD3; PRCA1; PRO1; PROP1; RBS; RFXAP; RP; SHOX; SLC25A6; SPG5B; STO; SUOX; THM; and TTD.

6. The method of any one of claims 1-5, wherein said RNA, oligoribonucleotide, or polyribonucleotide molecules further comprise at least one of the following features:

- they encode an open reading frame for said recombinant protein;

- they can be repeatedly administered to a mammalian cell without eliciting an immune response sufficient to detectably reduce expression of a recombinant protein encoded by said RNA, oligoribonucleotide, or polyribonucleotide molecules; and/or

- they can be repeatedly introduced into mammalian cells without eliciting an immune response sufficient to eliminate detectable expression of a protein encoded by said RNA, oligoribonucleotide, or polyribonucleotide molecules.

7. The method of any one of claims 1-6, wherein said mammalian cell is an antigen-presenting cell, a dendritic cell, a neural cell, a brain cell, a spleen cell, a lung cell, a skin cell, a microglial cell, an alveolar cell, a surface alveolar cell, an alveolar pneumocyte, a vascular endothelial cell, a mesenchymal cell, an epithelial cell, a hematopoietic cell, a colonic epithelium cell, a lung epithelium cell, a bone marrow cell, a Claudius' cell, Hensen cell, Merkel cell, Müller cell, Paneth cell, Purkinje cell, Schwann cell, Sertoli cell, acidophil cell, acinar cell, adipoblast, adipocyte, brown or white alpha cell, amacrine cell, beta cell, capsular cell, cementocyte, chief cell, chondroblast, chondrocyte, chromaffin cell, chromophobic cell, corticotroph, delta cell, Langerhans cell, follicular dendritic cell, enterochromaffin cell, ependymocyte, basal cell, squamous cell, endothelial cell, transitional cell, erythroblast, erythrocyte, fibroblast, fibrocyte, follicular cell, germinal epithelium, giant cell, glial cell, astroblast, astrocyte, oligodendroblast, oligodendrocyte, glioblast, goblet cell, gonadotroph, granulosa cell, haemocytoblast, hair cell, hepatoblast, hepatocyte, hyalocyte, interstitial cell, juxtaglomerular cell, keratinocyte, keratocyte, lemmal cell, leukocyte, granulocyte, basophil, eosinophil, neutrophil, lymphoblast, B-lymphoblast, T-lymphoblast, lymphocyte, B-lymphocyte, T lymphocyte, helper induced T-lymphocyte, Th1 T-lymphocyte, Th2 T-lymphocyte, natural killer cell, thymocyte, macrophage, Kupffer cell, alveolar macrophage, foam cell, histiocyte, luteal cell, lymphocytic stem cell, lymphoid cell, lymphoid stem cell, macroglial cell, mammotroph, mast cell, medulloblast, megakaryoblast, megakaryocyte, melanoblast, melanocyte, mesangial cell, mesothelial cell, metamyelocyte, monoblast, monocyte, mucous neck cell, muscle cell, cardiac muscle cell, skeletal muscle cell, smooth muscle cell, myelocyte, myeloid cell, myeloid stem cell, myoblast, myoepithelial cell, myofibrobast, neuroblast, neuroepithelial cell, neuron, odontoblast, osteoblast, osteoclast, osteocyte, oxyntic cell, parafollicular cell, paraluteal cell, peptic cell, pericyte, peripheral blood mononuclear cell, phaeochromocyte, phalangeal cell, pinealocyte, pituicyte, plasma cell, platelet, podocyte, proerythroblast, promonocyte, promyeloblast, promyelocyte, pronormoblast, reticulocyte, retinal pigment epithelial cell, retinoblast, small cell, somatotroph, stem cell, sustentacular cell, teloglial cell, or zymogenic cell.

8. Use of an RNA, oligoribonucleotide, or polyribonucleotide molecule made using the method of any one of claims 1-7 in the preparation of a pharmaceutical composition for treatment of a disorder,

wherein said purified RNA, oligoribonucleotide, or polyribonucleotide molecule is to be administered to a subject,

wherein said disorder is selected from the group consisting of a monogenic disorder, an infectious disease, an acquired disorder and a cancer; and/or wherein said treatment is a therapeutic treatment or a prophylactic treatment.

9. The use of claim 8, wherein the pharmaceutical composition further comprises at least one of the following:

- a pharmaceutically acceptable carrier or diluent; and/or

- a transfection reagent, wherein said transfection reagent is preferably selected from the group consisting of a lipid-based transfection reagent such as a cationic lipid reagent, a protein-based transfection reagent, a polyethyleneimine-based transfection reagent and calcium phosphate.

10. The use of any one of claims 8-9, wherein said composition is to be administered to said subject parenterally, paracancerally, transmucosally, transdermally, intramuscularly, intravenously, intra-dermally, subcutaneously, intra-peritonealy, intra-ventricularly, intra-cranially, intra-vaginally or intra-tumorally, and/or, wherein said composition is to be administered at a dose selected from among a one-time dose, a daily dose, a weekly dose, a monthly dose and a series of a defined number of doses.

11. The use of any one of claims 8-10, wherein said disorder and said recombinant protein, respectively, are selected from the group consisting of: anemia in a subject and said recombinant protein is erythropoietin (EPO); vasospasm in a subject and said recombinant protein is inducible nitric oxide synthase (iNOS); restenosis of a blood vessel following a procedure that enlarges the blood vessel and said recombinant protein is a heat shock protein, thereby decreasing an incidence of a restenosis in a subject; cystic fibrosis in a subject and said recombinant protein is Cystic Fibrosis Transmembrane Conductance Regulator (CFTR), thereby treating cystic fibrosis

in a subject; X-linked agammaglobulinemia in a subject and said recombinant protein is Bruton's tyrosine kinase, thereby treating an X-linked agammaglobulinemia; adenosine deaminase severe combined immunodeficiency (ADA SCID) in a subject and said recombinant protein is adenosine deaminase (ADA), thereby treating an ADA SCID; immune responsiveness due to a skin pathology and said recombinant protein is ecto-nucleoside triphosphate diphosphohydrolase, thereby reducing immune responsiveness of the skin and improving skin pathology; Niemann-Pick disease and said recombinant protein is Sphingomyelinase, thereby treating Niemann-Pick disease; mucopolysaccharidosis and said recombinant protein is alpha-L-iduronidase, iduronate-2-sulfatase, thereby a treating mucopolysaccharide storage disorder; Gaucher's disease and said recombinant protein is acid beta-glucosidase, thereby treating a Gaucher's disease; and Fabry's disease and said recombinant protein is alpha-galactosidase A, thereby treating a Fabry's disease.

12. Use of a recombinant protein in the preparation of a medicament for the treatment of a disorder,

wherein the recombinant protein is produced in a method of inducing a mammalian cell using the RNA, oligoribonucleotide, or polyribonucleotide molecule made according to the method of any one of claims 1-7,

wherein a single dose of said RNA, oligoribonucleotide, or polyribonucleotide molecule is to be administered to a subject,

wherein said disorder is selected from the group consisting of a monogenic disorder, an infectious disease, an acquired disorder and a cancer; and/or wherein said treatment is a therapeutic treatment or a prophylactic treatment.

13. An RNA, oligoribonucleotide, or polyribonucleotide molecule for use in the reduction of an immune response of a mammalian cell, wherein

- said RNA, oligoribonucleotide, or polyribonucleotide molecule comprises a modified nucleoside selected from pseudouridine (Ψ), 1-methylpseudouridine ($m^1\Psi$), 5-methyluridine (m^5U), 5-methoxyuridine (mo^5U), and 2-thiouridine (s^2U) in place of uridine (U), and said RNA, oligoribonucleotide, or polyribonucleotide molecule has been purified

i) using a process that removes RNA contaminant molecules that are immunogenic and toxic to the cell by inducing an innate immune response, such that said purified RNA, oligoribonucleotide, or polyribonucleotide molecules are free of RNA contaminant molecules, including double-stranded RNA molecules, which upon contacting with said cells, would activate an immune response in said cells sufficient to activate RNA cell sensors, directly or indirectly decrease mRNA translation in said cells or prevent survival of said cells; and/or

ii) wherein said purification comprises:

A. using an HPLC or gravity flow column purification process; and/or

B. treatment with an RNase III enzyme such that short RNase III digestion products are generated and separating said short RNase III digestion products from said preparation such that said preparation is free from said short RNase III digestion products.

14. A method for reducing immunogenicity of a preparation composed of RNA, oligoribonucleotide, or polyribonucleotide molecules comprising a modified nucleoside selected from pseudouridine (Ψ), 1-methylpseudouridine ($m^1\Psi$), 5-methyluridine (m^5U), and 2-thiouridine (s^2U) in place of uridine (U) to mammalian cells to which said RNA, oligoribonucleotide, or polyribonucleotide molecules are contacted, comprising:

purifying said RNA, oligoribonucleotide, or polyribonucleotide molecules comprising a modified nucleoside selected from Ψ, $m^1\Psi$, m^5U, and s^2U in place of U composing said preparation

i) using a process that removes RNA contaminant molecules that are immunogenic and toxic to the cell by inducing an innate immune response, such that said purified RNA, oligoribonucleotide, or polyribonucleotide preparation is free of RNA contaminant molecules, including double-stranded RNA molecules, which upon contacting with said cells, would activate an immune response in said cells sufficient to activate RNA cell sensors, directly or indirectly decrease mRNA translation in said cells or prevent survival of said cells; and/or

ii) wherein said purification comprises:

A. using an HPLC or gravity flow column purification process; and/or

B. treatment with an RNase III enzyme such that short RNase III digestion products are generated, and separating said short RNase III digestion products from said preparation such that said preparation is free from said short RNase III digestion products.

15. The method of claim 14, wherein said RNA, oligoribonucleotide, or polyribonucleotide molecules have been synthesized by *in vitro* transcription wherein at least a portion of the UTP has been replaced by the corresponding triphosphate-derivative of a modified nucleoside selected from Ψ, $m^1\Psi$, m^5U, and s^2U.

16. The method of claim 15, wherein said RNA, oligoribonucleotide, or polyribonucleotide molecules further comprise the modified nucleoside 5-methylcytidine (m^5C) and said RNA, oligoribonucleotide, or polyribonucleotide molecules have been synthesized by *in vitro* transcription wherein at least a portion of the CTP has also been replaced by the corresponding triphosphate-derivative of m^5C.

17. The method of any of claims 14-16, wherein said RNA, oligoribonucleotide, or polyribonucleotide molecules further comprise or consist of at least one of the following:

- they further comprise a poly-A tail;
- a majority of said molecules further comprise an m^7GpppG cap;
- they lack immunogenicity, enabling repeated delivery into a mammalian cell without generation of inflammatory cytokines;
- they are mRNA (messenger RNA) molecules;
- the molecules encode a recombinant protein;
- the molecules are anti-sense RNA molecules, small inhibitory RNA (siRNA) molecules, micro RNA (miRNA) molecules or ribozyme molecules.

18. The method of any of claims 14-17, wherein said reduced immunogenicity is detectable using an *in vitro* assay comprising measuring decreased secretion of a cytokine selected from the group consisting of: IL-12, IFN-α, TNF-α, RANTES, MIP-1α, MIP-1β, IL-6, IFN-β and IL-8, wherein preferably said cytokine which is measured is selected from IL-12, IFN-α and TNF-α from mammalian cells contacted with said purified RNA, oligoribonucleotide, or

polyribonucleotide molecules than from said mammalian cells transfected with the same amount of the unpurified RNA, oligoribonucleotide, or polyribonucleotide molecules.

19. The method of any of claims 14-18, wherein said reduced immunogenicity following said purifying can be detected using an *in vitro* dendritic cell assay by measuring decreased secretion of IFN-α or TNF-α cytokine from dendritic cells transfected with said RNA, oligoribonucleotide, or polyribonucleotide molecules following said purifying compared to secretion of said cytokine from dendritic cells transfected with the same amount of said RNA, oligoribonucleotide, or polyribonucleotide molecules not subjected to said purifying.

20. The method of any of claims 14-19, wherein said RNA, oligoribonucleotide, or polyribonucleotide molecules further comprise at least one of the following features:

- they encode an open reading frame for a recombinant protein;
- they can be repeatedly administered to a mammalian cell without eliciting an immune response sufficient to detectably reduce expression of a recombinant protein encoded by said RNA, oligoribonucleotide, or polyribonucleotide molecules;
- they can be repeatedly introduced into mammalian cells without eliciting an immune response sufficient to eliminate detectable expression of a protein encoded by said RNA, oligoribonucleotide, or polyribonucleotide molecules.

21. The method of claim 20, wherein the recombinant protein encoded by said RNA, oligoribonucleotide, or polyribonucleotide molecule is selected from the group consisting of: erythropoietin (EPO); a detectable enzyme selected from firefly luciferase, Renilla luciferase, bacterial beta-galactosidase (lacZ), and green fluorescent protein (GFP); a transcription factor selected from MYC and SRY or MCOP; a growth factor or cytokine selected from the group consisting of platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), transforming growth factor-beta1 (TGF-beta1), insulin-like growth factor (IGF), alpha-melanocyte-stimulating hormone (alpha-MSH); insulin-like growth factor-I (IGF-I); IL-4; IL-13; and IL-10; inducible nitric oxide synthase (iNOS); a heat shock protein; Cystic Fibrosis Transmembrane Conductance Regulator (CFTR); an enzyme with antioxidant activity selected from among catalase, phospholipid hydroperoxide glutathione peroxidase, superoxide dismutase-

1, and superoxide dismutase-2; Bruton's tyrosine kinase; adenosine deaminase; ecto-nucleoside triphosphate diphosphydrolase; ABCA4; ABCD3; ACADM; AGL; AGT; ALDH4A1; ALPL; AMPD1; APOA2; AVSD1; BRCD2; C1QA; C1QB; C1QG; C8A; C8B; CACNA1S; CCV; CD3Z; CDC2L1; CHML; CHS1; CIAS1; CLCNKB; CMD1A; CMH2; CMM; COL11A1; COL8A2; COL9A2; CPT2; CRB1; CSE; CSF3R; CTPA; CTSK; DBT; DIO1; DISC1; DPYD; EKV; ENO1; ENO1P; EPB41; EPHX1; F13B; F5; FCGR2A; FCGR2B; FCGR3A; FCHL; FH; FMO3; FMO4; FUCA1; FY; GALE; GBA; GFND; GJA8; GJB3; GLC3B; HF1; HMGCL; HPC1; HRD; HRPT2; HSD3B2; HSPG2; KCNQ4; KCS; KIF1B; LAMB3; LAMC2; LGMD1B; LMNA; LOR; MCKD1; MCL1; MPZ; MTHFR; MTR; MUTYH; MYOC; NB; NCF2; NEM1; NPHS2; NPPA; NRAS; NTRK1; OPTA2; PBX1; PCHC; PGD; PHA2A; PHGDH; PKLR; PKP1; PLA2G2A; PLOD; PPOX; PPTO; PRCC; PRG4; PSEN2; PTOS1; REN; RFX5; RHD; RMD1; RPE65; SCCD; SERPINC1; SJS1; SLC19A2; SLC2A1; SPG23; SPTA1; TAL1; TNFSF6; TNNT2; TPM3; TSHB; UMPK; UOX; UROD; USH2A; VMGLOM; VWS; WS2B; ABCB11; ABCG5; ABCG8; ACADL; ACP1; AGXT; AHHR; ALMS1; ALPP; ALS2; APOB; BDE; BDMR; BJS; BMPR2; CHRNA1; CMCWTD; CNGA3; COL3A1; COLAA3; COL4A4; COL6A3; CPS1; CRYGA; CRYGEP1; CYP1B1; CYP27A1; DBI; DES; DYSF; EDAR; EFEMP1; EIF2AK3; ERCC3; FSHR; GINGF; GLC1B; GPD2; GYPC; HADHA; HADHB; HOXD13; HPE2; IGKC; IHH; IRS1; ITGA6; KHK; KYNU; LCT; LHCGR; LSFC; MSH2; MSH6; NEB; NMTC; NPHP1; PAFAH1P1; PAX3; PAX8; PMS1; PNKD; PPH1; PROC; REG1A; SAG; SFTPB; SLC11A1; SLC3A1; SOS1; SPG4; SRD5A2; TCL4; TGFA; TMD; TPO; UGT1A@; UV24; WSS; XDH; ZAP70; ZFHX1B; ACAA1; AGS1; AGTR1; AHSG; AMT; ARMET; BBS3; BCHE; BCPM; BTD; CASR; CCR2; CCR5; CDL1; CMT2B; COL7A1; CP; CPO; CRV; CTNNB1; DEM; ETM1; FANCD2; FIH; FOXL2; GBE1; GLB1; GLCLC; GNAI2; GNAT1; GP9; GPX1; HGD; HRG; ITIH1; KNG; LPP; LRS1; MCCC1; MDS1; MHS4; MITF; MLH1; MYL3; MYMY; OPA1; P2RY12; PBXP1; PCCB; POU1F1; PPARG; PROS1; PTHR1; RCA1; RHO; SCA7; SCLC1; SCN5A; SI; SLC25A20; SLC2A2; TF; TGFBR2; THPO; THRB; TKT; TM4SF1; TRH; UMPS; UQCRC1; USH3A; VHL; WS2A; XPC; ZNF35; ADH1B; ADH1C; AFP; AGA; AIH2; ALB; ASMD; BFHD; CNGA1; CRBM; DCK; DSPP; DTDP2; ELONG; ENAM; ETFDH; EVC; F11; FABP2; FGA; FGB; FGFR3; FGG; FSHMD1A; GC; GNPTA; GNRHR; GYPA; HCA; HCL2; HD; HTN3; HVBS6; IDUA; IF; JPD; KIT; KLKB1; LQT4; MANBA; MLLT2; MSX1; MTP; NR3C2; PBT; PDE6B; PEE1; PITX2; PKD2;

QDPR; SGCB; SLC25A4; SNCA; SOD3; STATH; TAPVR1; TYS; WBS2; WFS1; WHCR; ADAMTS2; ADRB2; AMCN; AP3B1; APC; ARSB; B4GALT7; BHR1; C6; C7; CCAL2; CKN1; CMDJ; CRHBP; CSF1R; DHFR; DIAPH1; DTR; EOS; EPD; ERVR; F12; FBN2; GDNF; GHR; GLRA1; GM2A; HEXB; HSD17B4; ITGA2; KFS; LGMDLA; LOX; LTC4S; MAN2A1; MCC; MCCC2; MSH3; MSX2; NR3C1; PCSK1; PDE6A; PFBI; RASA1; SCZD1; SDHA; SGCD; SLC22A5; SLC26A2; SLC6A3; SM1; SMA@; SMN1; SMN2; SPINK5; TCOF1; TELAB1; TGFBI; ALDH5A1; ARG1; AS; ASSP2; BCKDHB; BF; C2; C4A; CDKN1A; COL10A1; COL11A2; CYP21A2; DYX2; EJM1; ELOVL4; EPM2A; ESR1; EYA4; F13A1; FANCE; GCLC; GJA1; GLYS1; GMPR; GSE; HCR; HFE; HLA-A; HLA-DPB1; HLA-DRA; HPFH; ICS1; IDDM1; IFNGR1; IGAD1; IGF2R; ISCW; LAMA2; LAP; LCA5; LPA; MCDR1; MOCS1; MUT; MYB; NEU1; NKS1; NYS2; OA3; ODDD; OFC0; PARK2; PBCA; PBCRA1; PDB1; PEX3; PEX6; PEX7; PKHD1; PLA2G7; PLG; POLH; PPAC; PSORS1; PUJO; RCD1; RDS; RHAG; RP14; RUNX2; RWS; SCA1; SCZD3; SIASD; SOD2; ST8; TAP1; TAP2; TFAP2B; TNDM; TNF; TPBG; TPMT; TULP1; WISP3; AASS; ABCB1; ABCB4; ACHE; AQP1; ASL; ASNS; AUTS1; BPGM; BRAF; C7orf2; CACNA2D1; CCM1; CD36; CFTR; CHORDOMA; CLCN1; CMH6; CMT2D; COL1A2; CRS; CYMD; DFNA5; DLD; DYT11; EEC1; ELN; ETV1; FKBP6; GCK; GHRHR; GHS; GLI3; GPDS1; GUSB; HLXB9; HOXA13; HPFH2; HRX; IAB; IMMP2L; KCNH2; LAMB1; LEP; MET; NCF1; NM; OGDH; OPN1SW; PEX1; PGAM2; PMS2; PON1; PPP1R3A; PRSS1; PTC; PTPN12; RP10; RP9; SERPINE1; SGCE; SHFM1; SHH; SLC26A3; SLC26A4; SLOS; SMAD1; TBXAS1; TWIST; ZWS1; ACHM3; ADRB3; ANK1; CA1; CA2; CCAL1; CLN8; CMT4A; CNGB3; COH1; CPP; CRH; CYP11B1; CYP11B2; DECR1; DPYS; DURS1; EBS1; ECA1; EGI; EXT1; EYA1; FGFR1; GNRH1; GSR; GULOP; HR; KCNQ3; KFM; KWE; LGCR; LPL; MCPH1; MOS; MYC; NAT1; NAT2; NBS1; PLAT; PLEC1; PRKDC; PXMP3; RP1; SCZD6; SFTPC; SGM1; SPG5A; STAR; TG; TRPS1; TTPA; VMD1; WRN; ABCA1; ABL1; ABO; ADAMTS13; AK1; ALAD; ALDH1A1; ALDOB; AMBP; AMCD1; ASS; BDMF; BSCL; C5; CDKN2A; CHAC; CLA1; CMD1B; COL5A1; CRAT; DBH; DNAI1; DYS; DYT1; ENG; FANCC; FBP1; FCMD; FRDA; GALT; GLDC; GNE; GSM1; GSN; HSD17B3; HSN1; IBM2; INVS; JBTS1; LALL; LCCS1; LCCS; LGMD2H; LMX1B; MLLT3; MROS; MSSE; NOTCH1; ORM1; PAPPA; PIP5K1B; PTCH; PTGS1; RLN1; RLN2; RMRP; ROR2; RPD1; SARDH; SPTLC1; STOM; TDFA; TEK; TMC1; TRIM32; TSC1; TYRP1; XPA; CACNB2; COL17A1;

CUBN; CXCL12; CYP17; CYP2C19; CYP2C9; EGR2; EMX2; ERCC6; FGFR2; HK1; HPS1; IL2RA; LGI1; LIPA; MAT1A; MBL2; MKI67; MXI1; NODAL; OAT; OATL3; PAX2; PCBD; PEO1; PHYH; PNLIP; PSAP; PTEN; RBP4; RDPA; RET; SFTPA1; SFTPD; SHFM3; SIAL; THC2; TLX1; TNFRSF6; UFS; UROS; AA; ABCC8; ACAT1; ALX4; AMPD3; ANC; APOAL; APOA4; APOC3; ATM; BSCL2; BWS; CALCA; CAT; CCND1; CD3E; CD3G; CD59; CDKNLC; CLN2; CNTF; CPT1A; CTSC; DDB1; DDB2; DHCR7; DLAT; DRD4; ECB2; ED4; EVR1; EXT2; F2; FSHB; FTH1; G6PT1; G6PT2; GIF; HBB; HBBP1; HBD; HBE1; HBG1; HBG2; HMBS; HND; HOMG2; HRAS; HVBS1; IDDM2; IGER; INS; JBS; KCNJ11; KCNJ1; KCNQ1; LDHA; LRP5; MEN1; MLL; MYBPC3; MYO7A; NNO1; OPPG; OPTB1; PAX6; PC; PDX1; PGL2; PGR; PORC; PTH; PTS; PVRL1; PYGM; RAG1; RAG2; ROM1; RRAS2; SAA1; SCA5; SCZD2; SDHD; SERPING1; SMPD1; TCIRG1; TCL2; TECTA; TH; TREH; TSG101; TYR; USH1C; VMD2; VRNI; WT1; WT2; ZNF145; A2M; AAAS; ACADS; ACLS; ACVRL1; ALDH2; AMHR2; AOM; AQP2; ATD; ATP2A2; BDC; CIR; CD4; CDK4; CNA1; COL2A1; CYP27B1; DRPLA; ENUR2; FEOM1; FGF23; FPF; GNB3; GNS; HAL; HBP1; HMGA2; HMN2; HPD; IGF1; KCNA1; KERA; KRAS2; KRT1; KRT2A; KRT3; KRT4; KRT5; KRT6A; KRT6B; KRTHB6; LDHB; LYZ; MGCT; MPE; MVK; MYL2; OAP; PAH; PPKB; PRB3; PTPN11; PXR1; RLS; RSN; SAS; SAX1; SCA2; SCNN1A; SMAL; SPPM; SPSMA; TBX3; TBX5; TCF1; TPI1; TSC3; ULR; VDR; VWF; ATP7B; BRCA2; BRCD1; CLN5; CPB2; ED2; EDNRB; ENUR1; ERCC5; F10; F7; GJB2; GJB6; IPF1; MBS1; MCOR; NYS4; PCCA; RB1; RHOK; SCZD7; SGCG; SLC10A2; SLC25A15; STARP1; ZNF198; ACHM1; ARVD1; BCH; CTAA1; DAD1; DFNB5; EML1; GALC; GCH1; IBGC1; IGH@; IGHC group; IGHG1; IGHM; IGHR; IV; LTBP2; MJD; MNG1; MPD1; MPS3C; MYH6; MYH7; NP; NPC2; PABPN1; PSEN1; PYGL; RPGRIP1; SERPINA1; SERPINA3; SERPINA6; SLC7A7; SPG3A; SPTB; TCL1A; TGM1; TITF1; TMIP; TRA@; TSHR; USHLA; VP; ACCPN; AHO2; ANCR; B2M; BBS4; BLM; CAPN3; CDAN1; CDAN3; CLN6; CMH3; CYP19; CYP1A1; CYP1A2; DYX1; EPB42; ETFA; EYCL3; FAH; FBN1; FES; HCVS; HEXA; IVD; LCS1; LIPC; MYO5A; OCA2; OTSC1; PWCR; RLBP1; SLC12A1; SPG6; TPM1; UBE3A; WMS; ABCC6; ALDOA; APRT; ATP2A1; BBS2; CARD15; CATM; CDH1; CETP; CHST6; CLN3; CREBBP; CTH; CTM; CYBA; CYLD; DHS; DNASE1; DPEP1; ERCC4; FANCA; GALNS; GAN; HAGH; HBA1; HBA2; HBHR; HBQ1; HBZ; HBZP; HP; HSD11B2; IL4R; LIPB; MC1R; MEFV; MHC2TA; MLYCD; MMVP1; PHKB; PHKG2;

PKD1; PKDTS; PMM2; PXE; SALL1; SCA4; SCNN1B; SCNN1G; SLC12A3; TAT; TSC2; VDI; WT3; ABR; ACACA;

ACADVL; ACE; ALDH3A2; APOH; ASPA; AXIN2; BCL5; BHD; BLMH; BRCA1; CACD; CCA1; CCZS; CHRNB1; CHRNE; CMT1A; COL1A1; CORD5; CTNS; EPX; ERBB2; G6PC; GAA; GALK1; GCGR; GFAP; GH1; GH2; GP1BA; GPSC; GUCY2D; ITGA2B; ITGB3; ITGB4; KRT10; KRT12; KRT13; KRT14; KRT14L1; KRT14L2; KRT14L3; KRT16; KRT16L1; KRT16L2; KRT17; KRT9; MAPT; MDB; MDCR; MGI; MHS2; MKS1; MPO; MYO15A; NAGLU; NAPB; NF1; NME1; P4HB; PAFAH1B1; PECAM1; PEX12; PHB; PMP22; PRKAR1A; PRKCA; PRKWNK4; PRP8; PRPF8; PTLAH; RARA; RCV1; RMSA1; RP17; RSS; SCN4A; SERPINF2; SGCA; SGSH; SHBG; SLC2A4; SLC4A1; SLC6A4; SMCR; SOST; SOX9; SSTR2; SYM1; SYNS1; TCF2; THRA; TIMP2; TOC; TOP2A; TP53; TRIM37; VBCH; ATP8B1; BCL2; CNSN; CORD1; CYB5; DCC; F5F8D; FECH; FEO; LAMA3; LCFS2; MADH4; MAFD1; MC2R; MCL; MYP2; NPC1; SPPK; TGFBRE; TGIF; TTR; AD2; AMH; APOC2; APOE; ATHS; BAX; BCKDHA; BCL3; BFIC; C3; CACNA1A; CCO; CEACAM5; COMP; CRX; DBA; DDU; DFNA4; DLL3; DM1; DMWD; E11S; ELA2; EPOR; ERCC2; ETFB; EXT3; EYCL1; FTL; FUT1; FUT2; FUT6; GAMT; GCDH; GPI; GUSM; HB1; HCL1; HHC2; HHC3; ICAM3; INSR; JAK3; KLK3; LDLR; LHB; LIG1; LOH19CR1; LYL1; MAN2B1; MCOLN1; MDRV; MLLT1; NOTCH3; NPHS1; OFC3; OPA3; PEPD; PRPF31; PRTN3; PRX; PSG1; PVR; RYR1; SLC5A5; SLC7A9; STK11; TBXA2R; TGFB1; TNNI3; TYROBP; ADA; AHCY; AVP; CDAN2; CDPD1; CHED1; CHED2; CHRNA4; CST3; EDN3; EEGV1; FTLL1; GDF5; GNAS; GSS; HNF4A; JAG1; KCNQ2; MKKS; NBIA1; PCK1; PI3; PPCD; PPGB; PRNP; THBD; TOP1; AIRE; APP; CBS; COL6A1; COL6A2; CSTB; DCR; DSCR1; FPDMM; HLCS; HPE1; ITGB2; KCNE1; KNO; PRSS7; RUNX1; SOD1; TAM; ADSL; ARSA; BCR; CECR; CHEK2; COMT; CRYBB2; CSF2RB; CTHM; CYP2D6; CYP2D7P1; DGCR; DIA1; EWSR1; GGT1; MGCR; MN1; NAGA; NE2; OGS2; PDGFB; PPARA; PRODH; SCO2; SCZD4; SERPIND1; SLC5A1; SOX10; TCN2; TIMP3; TST; VCF; ABCD1; ACTL1; ADFN; AGMX2; AHDS; AIC; AIED; AIH3; ALAS2; AMCD; AMELX; ANOP1; AR; ARAF1; ARSC2; ARSE; ARTS; ARX; ASAT; ASSP5; ATP7A; ATRX; AVPR2; BFLS; BGN; BTK; BZX; C1HR; CACNA1F; CALB3; CBBM; CCT; CDR1; CFNS; CGF1; CHM; CHR39c; CIDX; CLA2; CLCN5; CLS; CMTX2; CMTX3; CND; COD1; COD2; COL4A5; COL4A6; CPX; CVD1; CYBB; DCX; DFN2; DFN4; DFN6; DHOF; DIAPH2;

DKC1; DMD; DSS; DYT3; EBM; EBP; ED1; ELK1; EMD; EVR2; F8; F9; FCP1; FDPSL5; FGD1; FGS1; FMR1; FMR2; G6PD; GABRA3; GATA1; GDI1; GDXY; GJB1; GK; GLA; GPC3; GRPR; GTD; GUST; HMS1; HPRT1; HPT; HTC2; HTR2c; HYR; IDS; IHG1; IL2RG; INDX; IP1; IP2; JMS; KAL1; KFSD; L1CAM; LAMP2; MAA; MAFD2; MAOA; MAOB; MCF2; MCS; MEAX; MECP2; MF4; MGC1; MIC5; MID1; MLLT7; MLS; MRSD; MRX14; MRX1; MRX20; MRX2; MRX3; MRX40; MRXA; MSD; MTM1; MYCL2; MYP1; NDP; NHS; NPHL1; NROB1; NSX; NYS1; NYX; OA1; OASD; OCRL; ODT1; OFD1; OPA2; OPD1; OPEM; OPN1LW; OPN1MW; OTC; P3; PDHA1; PDR; PFC; PFKFB1; PGK1; PGK1P1; PGS; PHEX; PHKA1; PHKA2; PHP; PIGA; PLP1; POF1; POLA; POU3F4; PPMX; PRD; PRPS1; PRPS2; PRS; RCCP2; RENBP; RENS1; RP2; RP6; RPGR; RPS4X; RPS6KA3; RS1; S11; SDYS; SEDL; SERPINA7; SH2D1A; SHFM2; SLC25A5; SMAX2; SRPX; SRS; STS; SYN1; SYP; TAF1; TAZ; TBX22; TDD; TFE3; THAS; THC; TIMM8A; TIM1; TKCR; TNFSF5; UBE1; UBE2A; WAS; WSN; WTS; WWS; XIC; XIST; XK; XM; XS; ZFX; ZIC3; ZNF261; ZNF41; ZNF6; AMELY; ASSP6; AZF1; AZF2; DAZ; GCY; RPS4Y; SMCY; ZFY; ABAT; AEZ; AFA; AFD1; ASAH1; ASD1; ASMT; CCAT; CECR9; CEPA; CLA3; CLN4; CSF2RA; CTS1; DF; DIH1; DWS; DYT2; DYT4; EBR3; ECT; EEF1A1L14; EYCL2; FANCB; GCSH; GCSL; GIP; GTS; HHG; HMI; HOAC; HOKPP2; HRPT1; HSD3B3; HTC1; HV1S; ICHQ; ICR1; ICR5; IL3RA; KAL2; KMS; KRT18; KSS; LCAT; LHON; LIMM; MANBB; MCPH2; MEB; MELAS; MIC2; MPFD; MS; MSS; MTATP6; MTCO1; MTC03; MTCYB; MTND1; MTND2; MTND4; MTND5; MTND6; MTRNR1; MTRNR2; MTTE; MTTG; MTTI; MTTK; MTTL1; MTTL2; MTTN; MTTP; MTTS1; NAMSD; OCD1; OPD2; PCK2; PCLD; PCOS1; PFKM; PKD3; PRCA1; PRO1; PROP1; RBS; RFXAP; RP; SHOX; SLC25A6; SPG5B; STO; SUOX; THM; and TTD.

22. The method of any of claims 14-21, wherein said mammalian cell is an antigen-presenting cell, a dendritic cell, a neural cell, a brain cell, a spleen cell, a lung cell, a skin cell, a microglial cell, an alveolar cell, a surface alveolar cell, an alveolar pneumocyte, a vascular endothelial cell, a mesenchymal cell, an epithelial cell, a hematopoietic cell, a colonic epithelium cell, a lung epithelium cell, a bone marrow cell, a Claudius' cell, Hensen cell, Merkel cell, Müller cell, Paneth cell, Purkinje cell, Schwann cell, Sertoli cell, acidophil cell, acinar cell, adipoblast, adipocyte, brown or white alpha cell, amacrine cell, beta cell, capsular cell,

cementocyte, chief cell, chondroblast, chondrocyte, chromaffin cell, chromophobic cell, corticotroph, delta cell, Langerhans cell, follicular dendritic cell, enterochromaffin cell, ependymocyte, basal cell, squamous cell, endothelial cell, transitional cell, erythroblast, erythrocyte, fibroblast, fibrocyte, follicular cell, germinal epithelium, giant cell, glial cell, astroblast, astrocyte, oligodendroblast, oligodendrocyte, glioblast, goblet cell, gonadotroph, granulosa cell, haemocytoblast, hair cell, hepatoblast, hepatocyte, hyalocyte, interstitial cell, juxtaglomerular cell, keratinocyte, keratocyte, lemmal cell, leukocyte, granulocyte, basophil, eosinophil, neutrophil, lymphoblast, B-lymphoblast, T-lymphoblast, lymphocyte, B-lymphocyte, T lymphocyte, helper induced T-lymphocyte, Th1 T-lymphocyte, Th2 T-lymphocyte, natural killer cell, thymocyte, macrophage, Kupffer cell, alveolar macrophage, foam cell, histiocyte, luteal cell, lymphocytic stem cell, lymphoid cell, lymphoid stem cell, macroglial cell, mammotroph, mast cell, medulloblast, megakaryoblast, megakaryocyte, melanoblast, melanocyte, mesangial cell, mesothelial cell, metamyelocyte, monoblast, monocyte, mucous neck cell, muscle cell, cardiac muscle cell, skeletal muscle cell, smooth muscle cell, myelocyte, myeloid cell, myeloid stem cell, myoblast, myoepithelial cell, myofibrobast, neuroblast, neuroepithelial cell, neuron, odontoblast, osteoblast, osteoclast, osteocyte, oxyntic cell, parafollicular cell, paraluteal cell, peptic cell, pericyte, peripheral blood mononuclear cell, phaeochromocyte, phalangeal cell, pinealocyte, pituicyte, plasma cell, platelet, podocyte, proerythroblast, promonocyte, promyeloblast, promyelocyte, pronormoblast, reticulocyte, retinal pigment epithelial cell, retinoblast, small cell, somatotroph, stem cell, sustentacular cell, teloglial cell, or zymogenic cell.