Claims

1. An artificial mRNA molecule comprising

   a. at least one open reading frame (ORF);

   b. at least one 3'-untranslated region element (3'-UTR element) comprising

      a nucleic acid sequence which is derived from the 3'-UTR of a ribosomal protein S9 (RPS9) gene or from a functional variant of the 3'-UTR of a ribosomal protein S9 (RPS9) gene, wherein said functional variant is at least 80% identical to said 3'-UTR of a ribosomal protein S9 (RPS9) gene; and

   c. a poly(A) sequence or a polyadenylation signal;

   wherein the 3'-UTR is heterologous to the ORF.

2. The artificial mRNA molecule according to claim 1, wherein the at least one 3'-UTR element enhances, stabilizes and/or prolongs protein production from said artificial mRNA molecule.

3. The artificial mRNA molecule according to any one of claims 1 to 2, wherein the at least one 3'-UTR element comprises a nucleic acid sequence which is derived from the 3'-UTR of a eukaryotic ribosomal protein S9 (RPS9) gene, preferably from the 3'-UTR of a vertebrate ribosomal protein S9 (RPS9) gene, more preferably from the 3'-UTR of a mammalian ribosomal protein S9 (RPS9) gene, even more preferably from the 3'-UTR of a primate ribosomal protein S9 (RPS9) gene, in particular of a human ribosomal protein S9 (RPS9) gene, or of a rodent ribosomal protein S9 (RPS9) gene, in particular of a murine ribosomal protein S9 (RPS9) gene.

4. The artificial mRNA molecule according to any one of claims 1 to 3, wherein the open reading frame (ORF) does not encode a reporter gene or is not derived from a reporter gene, wherein the reporter gene is preferably not selected from group consisting of globin proteins (particularly beta-globin), luciferase protein, beta-glucuronidase (GUS) and GFP proteins or variants thereof, preferably not EGFP, or variants exhibiting at least 70% sequence identity to a globin protein, a luciferase protein, or a GFP protein;

the open reading frame (ORF) does not encode a ribosomal protein, preferably not an eukaryotic ribosomal protein, wherein the ribosomal protein is preferably not selected from ribosomal protein S6 (RPS6), ribosomal protein L36a-like (RPL36AL) or ribosomal protein S16 (RPS16); or

wherein the 3'-UTR is not derived from a virus.

5. The artificial mRNA molecule according to any one of claims 1 to 4, wherein the poly(A) sequence or the polyadenylation signal is located 3'-terminal to the 3'-UTR element.

6. The artificial mRNA molecule according to any one of claims 1 to 5, wherein the nucleic acid comprises an additional 5'-terminal element, preferably a 5'-UTR, a promoter, or a 5'-UTR and a promoter containing-sequence, more preferably a 5'-UTR, even more preferably a 5'-UTR that does not comprise a 5' TOP motif.

7. The artificial mRNA molecule according to any one of claims 1 to 6, wherein the at least one 3'-UTR element comprises or consists of a nucleic acid sequence which has an identity of at least about 1, 2, 3, 4, 5, 10, 15, 20, 30 or 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about 99% to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1, 2, 58 and 161, or wherein the at least one 3'-UTR element comprises or consists of a fragment of a nucleic acid sequence which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about 99% to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1, 2, 58 and 161.

8. The artificial mRNA molecule according to any one of claims 1 to 7, further comprising a 5'-cap structure, a poly(C) sequence, a histone stem-loop, and/or an IRES-motif.

9. The artificial mRNA molecule according to any one of claims 1 to 8, wherein the artificial mRNA molecule, preferably the open reading frame, is at least partially G/C

modified, preferably wherein the G/C content of the open reading frame is increased compared to the wild type open reading frame, and/or wherein the open reading frame comprises a codon-optimized region, preferably, wherein the open reading frame is codon-optimized.

10. A vector comprising

a. an open reading frame and/or a cloning site; and

b. at least one 3'-untranslated region element (3'-UTR element) comprising a nucleic acid sequence which is derived from the 3'-UTR of a ribosomal protein S9 (RPS9) gene or from a functional variant of the 3'-UTR of a ribosomal protein S9 (RPS9) gene, wherein said functional variant is at least 80% identical to said 3'-UTR of a ribosomal protein S9 (RPS9) gene; and

c. a poly(A) sequence or a polyadenylation signal;

wherein the 3'-UTR is heterologous to the open reading frame.

11. The vector according to claim 10, wherein the open reading frame or the at least one 3'-UTR element is characterized by any one of the features as defined in any one of claims 1 to 10 with respect to the artificial mRNA molecule.

12. The vector according to claim 10 or 11, which is a plasmid vector or a viral vector, preferably a plasmid vector.

13. The vector according to any one of claims 11 to 12, which comprises an artificial mRNA molecule according to any one of claims 1-9.

14. A cell comprising the artificial mRNA molecule according to any one of claims 1-9 or the vector according to any one of claims 10 to 13.

15. A pharmaceutical composition comprising the artificial mRNA molecule according to any one of claims 1-9, the vector according to any one of claims 10 to 13, or the cell according to claim 14.

16. The artificial mRNA molecule according to any one of claims 1-9, the vector according to any one of claims 10 to 13, the cell according to claim 14, or the pharmaceutical composition according to claim 15 for use as a medicament.

17. The artificial mRNA molecule according to any one of claims 1-9, the vector according to any one of claims 10 to 13, the cell according to claim 14, or the pharmaceutical composition according to claim 15 for use as a vaccine or for use in gene therapy.

18. An *in vitro* method for enhancing, stabilizing and/or prolonging protein production from an artificial nucleic acid molecule, preferably from an mRNA molecule or a vector, the method comprising the step of associating the nucleic acid molecule, preferably the artificial mRNA molecule or the vector, with an 3'-UTR element, wherein the 3'-UTR element comprises or consists of a nucleic acid sequence which is derived from the 3'-UTR of a ribosomal protein S9 (RPS9) gene and wherein the artificial nucleic acid molecule is preferably characterized by any one of the features defined in any one of claims 1 to 9 with respect to the artificial mRNA molecule.

19. Use of a 3'-UTR element for enhancing, stabilizing and/or prolonging protein production from a nucleic acid molecule *in vitro*, preferably from an artificial mRNA molecule or a vector, wherein the 3'-UTR element comprises or consists of a nucleic acid sequence which is derived from the 3'-UTR of a ribosomal protein S9 (RPS9) gene and wherein the nucleic acid molecule is preferably characterized by any one of the features defined in any one of claims 1 to 9 with respect to the artificial mRNA molecule.

20. A kit or kit of parts comprising an artificial mRNA molecule according to any one of claims 1-9, a vector according to any one of claims 10 to 13, a cell according to claim 14, and/or a pharmaceutical composition according to claim 15.