Claims

1. A pharmaceutical composition comprising:

(a) an mRNA construct for expressing alphavirus replicase which is not capable of self-replication, and

(b) an RNA replicon that can be replicated by the replicase *in trans*,

wherein the mRNA construct of (a) for expressing alphavirus replicase comprises a 5'-cap for driving translation of the replicase; and

wherein the RNA replicon of (b) comprises (1) an alphavirus 5' replication recognition sequence, (2) an open reading frame encoding a pharmaceutically active protein or peptide and (3) an alphavirus 3' replication recognition sequence and wherein the alphavirus 5' replication recognition sequence and the alphavirus 3' replication recognition sequence direct replication of the RNA replicon in the presence of the replicase.

2. The pharmaceutical composition according to claim 1, wherein the 5'-cap is a natural 5'-cap or a 5'-cap analog.

3. The pharmaceutical composition according to claim 1 or 2, wherein the mRNA construct for expressing alphavirus replicase comprises:

(1) a 5' UTR,

(2) an open reading frame encoding the replicase, and

(3) a 3' UTR.

4. The pharmaceutical composition according to any one of claims 1 to 3, wherein the mRNA construct for expressing alphavirus replicase comprises a 3' poly(A) sequence.

5. The pharmaceutical composition according to any one of claims 1 to 4, wherein the RNA replicon comprises a heterologous nucleic acid.

6. The pharmaceutical composition according to any one of claims 1 to 5, wherein the protein or peptide comprises an epitope suitable for vaccination, preferably an

epitope that elicits an immune response against a bacterium, a virus, a fungus, a parasite, an allergen, or a tumor.

7. The pharmaceutical composition according to claim 6, wherein expression of the open reading frame encoding a protein of interest is under the control of a subgenomic promoter which is preferably native to the alphavirus from which the replicase is derived.

8. The pharmaceutical composition according to any one of claims 1 to 7, wherein the RNA replicon comprises a 3' poly(A) sequence and/or a 5’-cap.

9. The pharmaceutical composition according to any one of claims 1 to 8, wherein the alphavirus is Semliki Forest virus, Venezuelan equine encephalitis virus, Sindbis virus, or Chikungunya Virus.

10. A kit comprising the mRNA construct and the RNA replicon according to any one of claims 1 to 9, wherein the RNA is for inoculation with a cell and/or for administration to a human or animal subject.

11. The pharmaceutical composition according to any one of claims 1 to 9 for use in therapy.

12. An *in vitro* method for producing a pharmaceutically active protein or peptide in a cell comprising the steps of:

(a) obtaining an mRNA construct for expressing alphavirus replicase,

(b) obtaining an RNA replicon that can be replicated by the replicase *in trans* and comprises an open reading frame encoding the protein or peptide, and

(c) co-inoculating the mRNA construct for expressing alphavirus replicase and the RNA replicon into the cell,

wherein the mRNA construct of (a) comprises a 5’-cap for driving translation of the replicase, and wherein said mRNA is not capable of self-replication; and

wherein the RNA replicon of (b) comprises (1) an alphavirus 5' replication recognition sequence and (2) an alphavirus 3' replication recognition sequence and wherein the

alphavirus 5' replication recognition sequence and the alphavirus 3' replication recognition sequence direct replication of the RNA replicon in the presence of the replicase.