CLAIMS

1. A composition comprising:

   a first mRNA construct comprising a first open reading frame (ORF), wherein the first ORF encodes a first antigen, wherein the first antigen is selected from: a pathogenic microbial antigen or a tumor-associated antigen, or an epitope containing fragment thereof;

   wherein the first ORF is operatively linked to at least one untranslated region (UTR), wherein the UTR comprises at least a first organ protection sequence (OPS), wherein the first OPS comprises at least three miRNA target (miRNA) sequences which are all different from each other, and wherein each of the at least three miRNA target sequences are optimised to hybridise with a corresponding miRNA sequence.

2. The composition of claim 1, wherein the first mRNA construct is comprised within or adsorbed to an *in vivo* delivery composition.

3. The composition of claim 1, wherein the pathogenic microbial antigen is selected from: a viral protein; a bacterial protein; a fungal protein; a parasite protein; or a prion.

4. The composition of claim 1, further comprising a second mRNA construct comprising a second open reading frame (ORF), wherein the second ORF encodes a proinflammatory cytokine.

5. The composition of claim 4, wherein the proinflammatory cytokine is selected from the group consisting of: interleukin 1 (IL-1), interleukin 2 (IL-2), interleukin 3 (IL-3), interleukin 4 (IL-4), interleukin 5 (IL-5), interleukin 6 (IL- 6), interleukin 7 (IL- 7), interleukin 8 (IL-8), interleukin 9 (IL-9), interleukin 10 (IL-10), interleukin 11 (IL-11), interleukin 12 (IL-12), interleukin 13 (IL-13), interleukin 14 (IL-14), interleukin 15 (IL-15), interleukin 16 (IL-16), interleukin 17 (IL-17), interleukin 18 (IL-18), interleukin 19 (IL- 19), interleukin 20 (IL-20), interleukin 21 (IL-21), interleukin 22 (IL-22), interleukin 23 (IL-23), interleukin 24 (IL-24), interleukin 25 (IL-25), interleukin 26 (IL-26), interleukin 27 (IL-27), interleukin 28 (IL-28), interleukin 29 (IL-29), interleukin 30 (IL-30), interleukin 31 (IL-31), interleukin 32 (IL-32), interleukin 33 (IL-33), interleukin 35 (IL-35), interleukin 36 (IL-36); IFNγ; IFNα; IFNβ; TNFα; and GM-CSF.

6. The composition of claim 4, wherein the second mRNA construct is comprised within or adsorbed to a delivery composition.

7. The composition of claim 5, wherein the second ORF codes for an IL-12 protein, or a subunit, derivative, fragment, agonist or homologue thereof.

8. The composition of claim 7, wherein the second ORF comprises a sequence at least 90% identical to SEQ ID NO: 59.

9. The composition of claim 4 wherein the second ORF is operatively linked to a second untranslated region (UTR), wherein the UTR comprises a second organ protection sequence (OPS) and wherein the second OPS comprises at least three micro-RNA (miRNA) target sequences which are all different from each other.

10. The composition of claim 9, wherein the at least three miRNA target sequences are optimised to hybridise with a corresponding miRNA sequence.

11. The composition of claim 9, wherein the first OPS includes at least one different miRNA target sequence to the second OPS.

12. The composition of claim 9, wherein the first OPS and the second OPS include the same miRNA target sequences.

13. The composition of claim 1, wherein the composition includes a delivery composition that comprises a delivery vector selected from a particle, such as a polymeric particle; a lipid nanoparticle (LNP), a liposome; a lipidoid particle; or a viral vector.

14. The composition of claim 1, wherein the first OPS comprises at least four miRNA target sequences.

15. The composition of claim 1, wherein the first OPS comprises miRNA sequences selected to protect one or more organs or tissues selected from the group consisting of muscle, liver, brain, breast, endothelium, pancreas, colon, kidney, lungs, spleen and skin, heart, gastrointestinal organs, reproductive organs, and esophagus.

16. The composition of claim 1, wherein the first OPS comprises at least three miRNA target sequences selected from one or more sequences that bind to: miRNA-122; miRNA-125; miRNA-199; miRNA-124a; miRNA-126; miRNA-98; Let7 miRNA family; miRNA-375; miRNA-141; miRNA-142; miRNA-148a/b; miRNA-143; miRNA-145; miRNA-194; miRNA-200c; miRNA-203a; miRNA-205; miRNA-1; miRNA-133a; miRNA-206; miRNA-34a; miRNA-192; miRNA-194; miRNA-204; miRNA-215; miRNA-30 family; miRNA-877; miRNA-4300; miRNA-4720; and/or miRNA-6761.

17. The composition of claim 1, wherein the first OPS comprises sequences selected from one or more of SEQ ID NOs: 44-57.

18. The composition of claim 1, wherein the antigen comprises a viral protein or an epitope containing fragment thereof.

19. The composition of claim 18, wherein the antigen is selected from: a coronavirus spike protein, an influenza protein, a respiratory syncytial virus (RSV) protein or a Human Immunodeficiency Virus (HIV) protein, or a variant thereof, or an epitope containing fragment thereof.

20. The composition of claim 1, wherein the antigen comprises a protein from the *Mycobacterium tuberculosis* bacterium or an epitope containing fragment thereof.

21. The composition of claim 20, wherein the protein from the *Mycobacterium tuberculosis* bacterium is selected from ESAT-6, Ag85B, TB10.4, Rv2626 and/or RpfD-B.

22. The composition of claim 1, wherein the antigen is a tumor-associated antigen selected from: a colorectal tumour antigen; a breast tumour antigen; a lung tumour antigen; a liver tumour antigen; or a pancreas tumour antigen.

23. The composition of claim 1, wherein the antigen is a tumor-associated antigen which is MUC1.

24. The composition of claim 1, wherein the antigen is a tumor-associated antigen which is a neoantigen.

25. The composition of claim 1, wherein the first mRNA comprises a second ORF encoding a second antigen, wherein the second antigen is different to the first antigen.

26. The composition of claim 25, wherein the second antigen is selected from: a pathogenic microbial antigen or a tumor-associated antigen, or an epitope containing fragment thereof;

27. The composition of claim 1, further comprising a second mRNA construct comprising a second open reading frame (ORF), wherein the second ORF encodes a second antigen, wherein the second antigen is different to the first antigen.

28. The composition of claim 27, wherein the second antigen is selected from: a pathogenic microbial antigen or a tumor-associated antigen, or an epitope containing fragment thereof.