CLAIMS

~~WHAT IS CLAIMED IS:~~

1. A nucleic acid construct comprising a nucleic acid sequence encoding a modified Chikungunya virus (CHIKV) genome or replicon RNA, wherein the modified CHIKV genome or replicon RNA is devoid of at least a portion of the nucleic acid sequence encoding one or more viral structural proteins.

2. A nucleic acid construct comprising a nucleic acid sequence encoding a modified Sindbis virus (SINV) genome or replicon RNA, wherein the modified SINV genome or replicon RNA is devoid of at least a portion of the nucleic acid sequence encoding one or more viral structural proteins.

3. The nucleic acid construct of any one of claims 1-2, wherein the modified viral genome or replicon RNA is devoid of a substantial portion of the nucleic acid sequence encoding one or more viral structural proteins.

4. The nucleic acid construct of any one of claims 1-3, wherein the modified viral genome or replicon RNA comprises no nucleic acid sequence encoding viral structural proteins.

5. The nucleic acid construct of any one of claims 1-4, further comprising one or more expression cassettes, wherein each of the expression cassettes comprises a promoter operably linked to a heterologous nucleic acid sequence.

6. The nucleic acid construct of claim 5, wherein at least one of the expression cassettes comprises a subgenomic (*sg*) promoter operably linked to the heterologous nucleic acid sequence.

7. The nucleic acid construct of claim 6, wherein the *sg* promoter is a 26S subgenomic promoter.

8. The nucleic acid construct of any one of claims 1-7, further comprising one or more untranslated regions (UTRs).

9. The nucleic acid construct of claim 8, wherein at least one of the UTRs is a heterologous UTR.

10. The nucleic acid construct of any one of claims 5-9, wherein at least one of the expression cassettes comprises a coding sequence for a gene of interest (GOI).

11. The nucleic acid construct of claim 10, wherein the GOI encodes a polypeptide selected from the group consisting of a therapeutic polypeptide, a prophylactic polypeptide, a diagnostic polypeptide, a nutraceutical polypeptide, an industrial enzyme, and a reporter polypeptide.

12. The nucleic acid construct of any one of claims 10-11, wherein the GOI encodes a polypeptide selected from the group consisting of an antibody, an antigen, an immune modulator, an enzyme, a signaling protein, and a cytokine.

13. The nucleic acid construct of any one of claims 10-12, wherein the coding sequence of the GOI is optimized for expression at a level higher than the expression level of a reference coding sequence.

14. The nucleic acid construct of any one of claims 1-13, wherein the nucleic acid sequence has at least 80%, at least 85%, at least 90%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100% sequence identity to a nucleic acid sequence selected from the group consisting of SEQ ID NOS: 1-4.

15. A recombinant cell comprising a nucleic acid construct according to any one of claims 1-14.

16. The recombinant cell of claim 15, wherein the recombinant cell is a eukaryotic cell.

17. The recombinant cell of claim 16, wherein the recombinant cell is an animal cell.

18. The recombinant cell of claim 17, wherein the animal cell is a vertebrate animal cell or an invertebrate animal cell.

19. The recombinant cell of claim 18, wherein the recombinant cell is an insect cell.

20. The recombinant cell of claim 19, wherein the insect cell is a mosquito cell.

21. The recombinant cell of claim 18, wherein the recombinant cell is a mammalian cell.

22. The recombinant cell of claim 18, wherein the recombinant cell is selected from the group consisting of a monkey kidney CV1 cell transformed by SV40 (COS-7), a human embryonic kidney cell (e.g., HEK 293 or HEK 293 cell), a baby hamster kidney cell (BHK), a mouse sertoli cell (e.g., TM4 cells), a monkey kidney cell (CV1), a human

cervical carcinoma cell (HeLa), canine kidney cell (MDCK), buffalo rat liver cell (BRL 3A), human lung cell (W138), human liver cell (Hep G2), mouse mammary tumor (MMT 060562), TRI cell, , FS4 cell, a Chinese hamster ovary cell (CHO cell), an African green monkey kidney cell (Vero cell), a human A549 cell, a human cervix cell, a human CHME5 cell, a human PER.C6 cell, a NS0 murine myeloma cell, a human epidermoid larynx cell, a human fibroblast cell, a human HUH-7 cell, a human MRC-5 cell, a human muscle cell, a human endothelial cell, a human astrocyte cell, a human macrophage cell, a human RAW 264.7 cell, a mouse 3T3 cell, a mouse L929 cell, a mouse connective tissue cell, a mouse muscle cell, and a rabbit kidney cell.

23. A cell culture comprising at least one recombinant cell according to any one of claims 15-22, and a culture medium.

24. A transgenic animal comprising a nucleic acid construct according to any one of claims 1-14.

25. The transgenic animal of claim 24, wherein the animal is a vertebrate animal or an invertebrate animal.

26. The transgenic animal of claim 25, wherein the animal is an insect.

27. The transgenic animal of claim 26, wherein the insect is a mosquito.

28. The transgenic animal of claim 25, wherein the animal is a mammalian.

29. The transgenic animal of claim 28, wherein the animal is a non-human mammalian.

30. A method for producing a polypeptide of interest, comprising (i) rearing a transgenic animal according to any one of claims 24-29, or (ii) culturing a recombinant cell comprising a nucleic acid construct according to any one of claims 11-14 under conditions wherein the transgenic animal or the recombinant cell produces the polypeptide encoded by the GOI.

31. A method for producing a polypeptide of interest in a subject, comprising administering to the subject a nucleic acid construct according to any one of claims 11-14.

32. The method of claim 31, wherein the subject is vertebrate animal or an invertebrate animal.

33. The method of any one of claims 31-32, wherein the subject is an insect.

34. The method of any one of claims 31-32, wherein the subject is a mammalian subject.

35. The method of claim 34, wherein the mammalian subject is a human subject.

36. A recombinant polypeptide produced by the method of any one of claims 30-35.

37. A pharmaceutical composition comprising a pharmaceutically acceptable excipient and:
(a) a nucleic acid construct of any one of claims 1-14;
(b) a recombinant cell of any one of claims 15-22; and/or
(c) a recombinant polypeptide of claim 36.

38. The pharmaceutical composition of claim 37, comprising the nucleic acid construct of any one of claims 1-14, and a pharmaceutically acceptable excipient.

39. The pharmaceutical composition of claim 37, comprising the recombinant cell of any one of claims 15-22, and a pharmaceutically acceptable excipient.

40. The pharmaceutical composition of claim 37, comprising the recombinant polypeptide of claim 36, and a pharmaceutically acceptable excipient.

41. The pharmaceutical composition of any one of claims 37-40, wherein the composition is formulated in a liposome, a lipid-based nanoparticle (LNP), or a polymer nanoparticle.

42. The pharmaceutical composition of any one of claims 37-41, wherein the composition is an immunogenic composition.

43. The pharmaceutical composition of claim 42, wherein the immunogenic composition is formulated as a vaccine.

44. The pharmaceutical composition of any one of claims 37-41, wherein the composition is substantially non-immunogenic to a subject.

45. The pharmaceutical composition of any one of claims 37-44, wherein the pharmaceutical composition is formulated as an adjuvant.

46. The pharmaceutical composition of any one of claims 37-45, wherein the pharmaceutical composition is formulated for one or more of intranasal administration, transdermal administration, intraperitoneal administration, intramuscular administration, intranodal administration, intratumoral administration, intraarticular administration, intravenous administration, subcutaneous administration, intravaginal, intraocular, rectal, and oral administration.

47. Use of~~A method for eliciting an immune response in a subject in need thereof, the method comprises administering to the subject a composition comprising~~:
    (a) a nucleic acid construct of any one of claims 1-14;
    (b) a recombinant cell of any one of claims 15-22;
    (c) a recombinant polypeptide of claim 36; and/or
    (d) a pharmaceutical composition of any one of claims 37-46,
    for the preparation of a medicament for eliciting an immune response in a subject.

48. Use of~~A method for preventing and/or treating a health condition in a subject in need thereof, the method comprises prophylactically or therapeutically administering to the subject a composition comprising~~:
    (a) a nucleic acid construct of any one of claims 1-14;
    (b) a recombinant cell of any one of claims 15-22;
    (c) a recombinant polypeptide of claim 36; and/or
    (d) a pharmaceutical composition of any one of claims 37-46,
    for the preparation of a medicament for preventing and/or treating a health condition in a subject.

49. The ~~method~~ use of claim 48, wherein the health condition is a proliferative disorder or a microbial infection.

50. The ~~method~~ use of any one of claims 47-49, wherein the subject has or is suspected of having a condition associated with proliferative disorder or a microbial infection.

51. The ~~method~~ use of any one of claims 47-50, wherein the medicament to be administered ~~composition~~ results in an increased production of interferon in the subject.

52. The ~~method~~ use of any one of claims 47-51, wherein the ~~composition~~ medicament is to be administered to the subject individually as a single therapy (monotherapy) or as a first therapy in combination with at least one additional therapy.

53. The ~~method~~ use of claim 52, wherein the at least one additional therapy is selected from the group consisting of chemotherapy, radiotherapy, immunotherapy, hormonal therapy, toxin therapy, targeted therapy, and surgery.

54. A kit for eliciting an immune response, for the prevention, and/or for the treatment of a health condition or a microbial infection, the kit comprising:
    (a) a nucleic acid construct of any one of claims 1-14;
    (b) a recombinant cell of any one of claims 15-22;
    (c) a recombinant polypeptide of claim 36; and/or
    (d) a pharmaceutical composition of any one of claims 37-46.