CLAIMS

WHAT IS CLAIMED:

1. An immunogenic composition for use in increasing cell-mediated immunity against varicella zoster virus (VZV) in a human subject in need thereof, the immunogenic composition comprising: i) an unmethylated cytidine-phospho-guanosine (CpG)-containing oligonucleotide comprising the sequence of 5'-TGACTGTGAA CGTTCGAGAT GA-3'(SEQ ID NO:1); and ii) a truncated VZV glycoprotein E (gE) antigen, which are present in the immunogenic composition in amounts effective to increase cell-mediated immunity against VZV relative to cell-mediated immunity against VZV in the subject prior to administration of the immunogenic composition, wherein a first dose and a second dose of the immunogenic composition is to be administered to the human subject, with the second dose to be administered from 2 months to 6 months after the first dose.

2. Use of an immunogenic composition in the manufacture of a medicament for increasing cell-mediated immunity against varicella zoster virus (VZV) in a human subject in need thereof, wherein:

the immunogenic composition comprises: i) an unmethylated cytidine-phospho-guanosine (CpG)-containing oligonucleotide comprising the sequence of 5'-TGACTGTGAA CGTTCGAGAT GA-3'(SEQ ID NO:1); and ii) a truncated VZV glycoprotein E (gE) antigen, which are present in the immunogenic composition in amounts effective to increase cell-mediated immunity against VZV relative to cell-mediated immunity against VZV in the subject prior to administration of the immunogenic composition, and wherein a first dose and a second dose of the immunogenic composition is to be administered to the human subject, with the second dose to be administered from 2 months to 6 months after the first dose.

3. The composition or use of claim 1 or claim 2, wherein the immunogenic composition comprises: from about 25 μg to about 150 μg of the gE antigen, and from about 750 μg to about 6000 μg of the oligonucleotide or

the immunogenic composition comprises from about 50 μg to about 100 μg of the gE antigen, and from about 1500 μg to about 6000 μg of the oligonucleotide.

4. The composition or use of claim 1 or claim 2, wherein the immunogenic composition comprises about 25 µg, about 50 µg, about 75 µg, about 100 µg, about 125 µg, or about 150 µg of the gE antigen, and about 750 µg, about 1500 µg, about 3000 µg, or about 6000 µg of the oligonucleotide or

the immunogenic composition comprises about 100 µg of the gE antigen, and about 3000 µg or 6000 µg of the oligonucleotide.

5. An immunogenic composition for use in increasing an immune response against varicella zoster virus (VZV) in a human subject in need thereof, the immunogenic composition comprising:

i) an unmethylated cytidine-phospho-guanosine (CpG)-containing oligonucleotide comprising the sequence of 5'-TGACTGTGAA CGTTCGAGAT GA-3'(SEQ ID NO:1); and ii) a truncated VZV glycoprotein E (gE) antigen, wherein the immunogenic composition comprises about 100 µg of the gE antigen and about 3000 µg or about 6000 µg of the oligonucleotide.

6. Use of an immunogenic composition in the manufacture of a medicament for increasing an immune response against varicella zoster virus (VZV) in a human subject in need thereof, wherein:

the immunogenic composition comprises: i) an unmethylated cytidine-phospho-guanosine (CpG)-containing oligonucleotide comprising the sequence of 5'-TGACTGTGAA CGTTCGAGAT GA-3'(SEQ ID NO:1); and ii) a truncated VZV glycoprotein E (gE) antigen, wherein the immunogenic composition comprises about 100 µg of the gE antigen and about 3000 µg or about 6000 µg of the oligonucleotide.

7. The composition or use of any one of claims 1-6, wherein the immunogenic composition comprises about 100 µg of the gE antigen, and about 3000 µg of the oligonucleotide or

the immunogenic composition comprises about 100 µg of the gE antigen, and about 6000 µg of the oligonucleotide.

8. The composition or use of any one of claims 1-7, wherein the oligonucleotide comprises at least one phosphorothioate linkage, or wherein all nucleotide linkages are phosphorothioate linkages and/or the oligonucleotide is a single-stranded oligodeoxynucleotide.

9. The composition or use of any one of claims 1-8, wherein the gE antigen is a recombinant protein devoid of transmembrane and intravirion domains of a full-length VZV gE antigen.

10. The composition or use of claim 9, wherein the gE antigen comprises the amino acid sequence of SEQ ID NO:4, or an amino acid sequence that is at least 90%, 95%, 96%, 97%, 98% or 99% identical to SEQ ID NO:4,

the gE antigen comprises the amino acid sequence of SEQ ID NO:5, or an amino acid sequence that is at least 90%, 95%, 96%, 97%, 98% or 99% identical to SEQ ID NO:5,

and/or the recombinant protein is produced in mammalian cells.

11. The composition or use of any one of claims 1-10, wherein the immunogenic composition further comprises an aluminum salt adjuvant.

12. The composition or use of claim 11, wherein the aluminum salt adjuvant comprises one or more of the group consisting of amorphous aluminum hydroxyphosphate sulfate, aluminum hydroxide, aluminum phosphate, and potassium aluminum sulfate.

13. The composition or use of claim 11, wherein the aluminum salt adjuvant comprises aluminum hydroxide.

14. The composition or use of any one of claims 11-13, wherein the immunogenic composition comprises from about 0.25 mg to about 1.25 mg Al3+, the immunogenic composition comprises about 0.50 mg, about 0.75 mg, or about 1.00 mg Al3+, or the immunogenic composition comprises about 0.75 mg Al3+.

15. The composition or use of any one of claims 11-14, wherein the immunogenic composition further comprises a pharmaceutically acceptable buffer.

16. The composition or use of claim 15, wherein the buffer is not a phosphate-containing buffer or the buffer is a Tris buffer.

17. The composition or use of any one of claims 1-16, wherein the immunogenic composition does not comprise one or more of a saponin, a TLR4 agonist, and a liposome or does not comprise one or more of QS21, 3-O-deacylated monophosphoryl lipid A (3D-MPL1), dioleoyl phosphatidylcholine, and cholesterol.

18. The composition or use of any one of claims 1-17, wherein the gE antigen and the oligonucleotide are present in the immunogenic composition at a ratio of from 1:15 to 1:120 (wt/wt) or at a ratio of about 1:15, about 1:20, about 1:30, about 1:40, about 1:60, about 1:80, or about 1:120 (wt/wt).

19. The composition or use of any one of claims 15-18, wherein the oligonucleotide and the Al3+ are present in the immunogenic composition at a ratio of from 8:1 to 2:1 (wt/wt).

20. The composition or use of any one of claims 1-19, wherein the human subject is 18 years of age or older, 50 years of age or older, or 50-69 years of age.

21. The composition or use of any one of claims 1-20, wherein the human subject is suspected to have a latent VZV infection and/or was not previously vaccinated against varicella or herpes zoster.

22. The composition or use of any one of claims 5-21, wherein the human subject is to receive a first dose and a second dose of the immunogenic composition with the second dose to be administered from 1 month to 1 year after the first dose, the second dose is to be administered from 2 months to 6 months after the first dose.

23. The composition or use of any one of claims 1-4 and 22, wherein the second dose is to be administered about 2 months after the first dose.

24. The composition or use of any one of claims 1-23, wherein the immunogenic composition is to be administered by intramuscular injection.

25. The composition or use of any one of claims 1-24, wherein the increase in cell-mediated immunity against VZV or the increase in immune response against VZV comprises an increase in frequency of gE antigen-reactive, activated CD4+ T cells, wherein the activated

CD4+ T cells express two or more activation markers selected from interleukin-2, interferon-gamma, tumor necrosis factor-alpha, and CD40L (CD154),

wherein administration of the immunogenic composition results in an increase in humoral immunity against VZV in the subject relative to humoral immunity against VZV in the subject prior to administration of the immunogenic composition,

wherein the increase in humoral immunity against VZV comprises an increased concentration of gE antigen-reactive IgG, or

wherein the increase in humoral immunity against VZV comprises an increase in concentration of gE- and/or VZV-neutralizing antibodies.

26. The composition or use of claim 25, wherein the increase in cell-mediated immunity and the increase in humoral immunity are elicited in the subject by about two months after administration of the first dose of the immunogenic composition, by about one month after administration of the second dose of the immunogenic composition, and/or for at least three months after administration of the second dose of the immunogenic composition.

27. The composition or use of claim 25 or claim 26, wherein administration of the immunogenic composition reduces risk of the subject developing herpes zoster relative to risk of a control subject who did not receive an immunogenic composition comprising the gE antigen, prevents the subject from developing herpes zoster, or prevents the subject from developing postherpetic neuralgia.

28. The composition or use of any one of claims 25-27, wherein the immunogenic composition is associated with a reduced risk of development of one or more solicited local reactions or solicited systemic reactions within 7 days following administration of the first dose and/or the second dose (day of vaccination and subsequent 6 days) relative to a comparator composition comprising the gE antigen and an AS01B adjuvant, or

is associated with a reduced risk of development of Guillain-Barre syndrome within 42 days following administration of the first dose and/or the second dose (day of vaccination and subsequent 41 days) relative to a comparator composition comprising the gE antigen and an AS01B adjuvant.

29. The composition or use of claim 28, wherein the solicited local reactions comprise pain that prevents normal every day activities or the solicited systemic reactions comprise fatigue, headache, and/or myalgia that prevents normal every day activities, and/or fever above 39oC.

30. An immunogenic composition comprising: i) an unmethylated cytidine-phospho-guanosine (CpG)-containing oligonucleotide comprising the sequence of 5'-TGACTGTGAA CGTTCGAGAT GA-3'(SEQ ID NO:1); ii) a truncated VZV glycoprotein E (gE) antigen; and iii) at least one excipient,

wherein the gE antigen is a recombinant protein produced in mammalian cells and is present in the immunogenic composition in an amount of from about 25 µg to about 150 µg, the oligonucleotide is present in the immunogenic composition in an amount of from about 750 µg to about 6000 µg, and the at least one excipient comprises a pharmaceutically acceptable buffer.

31. An immunogenic composition comprising i) an unmethylated cytidine-phospho-guanosine (CpG)-containing oligonucleotide comprising the sequence of 5'-TGACTGTGAA CGTTCGAGAT GA-3'(SEQ ID NO:1); ii) a truncated VZV glycoprotein E (gE) antigen; and iii) at least one excipient,

wherein the gE antigen is a recombinant protein produced in mammalian cells and is present in the immunogenic composition in an amount of about 100 µg, the oligonucleotide is present in the immunogenic composition in an amount of about 3000 µg or about 6000 µg, and the at least one excipient comprises a pharmaceutically acceptable buffer.

32. The immunogenic composition of claim 30 or claim 31, wherein the immunogenic composition comprises about 100 µg of the gE antigen, and about 3000 µg of the oligonucleotide or

the immunogenic composition comprises about 100 µg of the gE antigen, and about 6000 µg of the oligonucleotide.

33. The immunogenic composition of any one of claims 30-32, wherein the gE antigen comprises the amino acid sequence of SEQ ID NO:4, or an amino acid sequence that is at least 90%, 95%, 96%, 97%, 98% or 99% identical to SEQ ID NO:4, or

the gE antigen comprises the amino acid sequence of SEQ ID NO:5, or an amino acid sequence that is at least 90%, 95%, 96%, 97%, 98% or 99% identical to SEQ ID NO:5.

34. The immunogenic composition of any one of claims 30-33, further comprising an aluminum hydroxide adjuvant, wherein the immunogenic composition comprises from about 0.25 mg to about 1.25 mg Al3+ or comprises about 0.75 mg Al3+.

35. The immunogenic composition of any one of claims 30-34, wherein the buffer is not a phosphate-containing buffer or is a Tris buffer.