CLAIMS

1. A composition comprising:

(i) a nanoparticle comprising a non-ionic detergent core and a viral glycoprotein, wherein the viral glycoprotein consists of a trimeric influenza HA glycoprotein, wherein the influenza HA glycoprotein contains a head region that projects outward from the non-ionic detergent core and a transmembrane domain that is associated with the non-ionic detergent core, wherein the amino acid sequence of the influenza HA glycoprotein has 100% identity to the amino acid sequence of the native influenza HA protein; wherein the non-ionic detergent is PS80;

and

(ii) a pharmaceutically acceptable buffer.

2. The composition of claim 1, wherein the influenza HA protein sub-type is selected from the group consisting of H1, H3, H4, H5, and H7.

3. The composition of claim 1, wherein the pharmaceutically acceptable buffer comprises (i) sodium phosphate at 15 mM to 50 mM; (ii) NaCl at about 150 to about 250 mM; wherein the composition pH is between 7.0 and 7.5.

4. The composition of claim 1, wherein the pharmaceutically acceptable buffer comprises (i) sodium phosphate at about 25 mM; (ii) NaCl at about 150 mM; wherein the composition pH is about 7.5.

5. A vaccine composition comprising:

(i) a nanoparticle comprising a non-ionic detergent core and a viral glycoprotein, wherein the viral glycoprotein consists of a trimeric influenza HA glycoprotein, and wherein the non-ionic detergent is PS80, wherein the influenza HA glycoprotein contains a head region that projects outward from the non-ionic detergent core and a transmembrane domain that is associated with the non-ionic detergent core, wherein the amino acid sequence of the influenza

HA glycoprotein has 100% identity to the amino acid sequence of the native influenza HA protein;

(ii) a buffer comprising 25 mM sodium phosphate, pH 7.5, and 150 mM sodium chloride; and

(iii) an ISCOM matrix adjuvant.

6. The vaccine composition of claim 5, wherein the ISCOM matrix adjuvant comprises a first ISCOM matrix containing fraction A, and a second ISCOM matrix containing fraction C.

7. The vaccine composition of claim 6, wherein the first ISCOM matrix comprises 70% to 95% by weight of the total ISCOM matrix, and the second ISCOM matrix comprises the remainder.

8. The vaccine composition of claim 7, wherein the first ISCOM matrix comprises 85% by weight of the total ISCOM matrix, and the second ISCOM matrix comprises the remainder.

9. The vaccine composition of claim 5, wherein the influenza HA protein sub-type is selected from the group consisting of H1, H3, H4, H5, and H7.

10. A method of preparing a recombinant influenza nanoparticle comprising steps of:

(i) binding a protein extract comprising a first detergent and influenza HA glycoprotein to a protein purification column, wherein the column binds the influenza glycoprotein;

(ii) performing a detergent exchange by substantially replacing the first detergent with a second detergent; and

(iii) eluting the bound influenza glycoprotein from the column in the presence of the second detergent to provide the nanoparticle, wherein the second detergent is PS80;

wherein the transition midpoint (Tm) of the nanoparticle, as measured by differential scanning calorimetry is at least about 60, wherein no buffer used during preparation has a pH of below 7.0, and wherein the amino acid sequence of the influenza HA glycoprotein has 100%

identity to the amino acid sequence of the native influenza HA glycoprotein, and wherein the nanoparticle consists of a viral glycoprotein and a non-ionic detergent core, wherein the viral glycoprotein is a trimeric HA glycoprotein, and wherein the HA glycoprotein contains a head region that projects outward from the non-ionic detergent core and a transmembrane domain that is associated with the non-ionic detergent core, and wherein the non-ionic detergent is PS80.

11. The method of claim 10, wherein the first detergent is NP-9.

12. The composition of claim 1, wherein the nanoparticle has a transition midpoint (Tm) peak in a range of about 60°C to about 75°C and wherein the Tm is measured by Differential Scanning Calorimetry.

13. The vaccine composition of claim 5, wherein the nanoparticle has a transition midpoint (Tm) peak in a range of about 60°C to about 75°C and wherein the Tm is measured by Differential Scanning Calorimetry.

14. The composition of claim 1, further comprising a second nanoparticle comprising a second influenza HA glycoprotein, wherein the HA glycoprotein contains a head region, which projects outward from the non-ionic detergent core, and a transmembrane domain, which is associated with the non-ionic detergent core, wherein the second influenza HA glycoprotein comprises an HA1 polypeptide and an HA2 polypeptide connected by a disulfide bond, wherein the non-ionic detergent is PS80.

15. The vaccine composition of claim 5, further comprising a second nanoparticle comprising a second influenza HA glycoprotein, wherein the HA glycoprotein contains a head region, which projects outward from the non-ionic detergent core, and a transmembrane domain, which is associated with the non-ionic detergent core, wherein the second influenza HA glycoprotein comprises an HA1 polypeptide and an HA2 polypeptide connected by a disulfide bond, wherein the non-ionic detergent is PS80.

16. The composition of claim 1, comprising a second nanoparticle, wherein the HA glycoprotein in the first nanoparticle is from a different influenza strain than the second nanoparticle.

17. The composition of claim 1, comprising three nanoparticles, wherein the HA glycoprotein in each nanoparticle is from a different influenza strain than the other two nanoparticles.

18. The composition of claim 1, comprising four nanoparticles, wherein the HA glycoprotein in each nanoparticle is from a different influenza strain than the other three nanoparticles.

19. The vaccine composition of claim 5, comprising a second nanoparticle, wherein the HA glycoprotein in the first nanoparticle is from a different influenza strain than the second nanoparticle.

20. The vaccine composition of claim 5, comprising three nanoparticles, wherein the HA glycoprotein in each nanoparticle is from a different influenza strain than the other two nanoparticles.

21. The vaccine composition of claim 5, comprising four nanoparticles, wherein the HA glycoprotein in each nanoparticle is from a different influenza strain than the other three nanoparticles.

22. The composition of claim 1, wherein the HA glycoprotein is a HA0 glycoprotein.

23. The vaccine composition of claim 5, wherein the HA glycoprotein is a HA0 glycoprotein.

24. The method of claim 10, wherein the HA glycoprotein is a HA0 glycoprotein.