We claim :

1. A stable vaccine composition of inactivated Chikungunya virus strain with one or more mutations in the capsid, E1, E2, or E3 structural glycoproteins that enhance the adaptation of the virus to *Aedes aegypti* and capable of infecting *Aedes albopictus* ~~or purified virus antigens derived from the strains thereof~~, wherein the strains of the Chikungunya virus isolates are selected from TN01610, TN015110, TN06210, TN06310, TN06410, and AP0109 containing the nucleotide sequences disclosed in SEQ. ID NO.1 to SEQ ID NO.6 and SEQ ID NO.15 to SEQ ID NO.20.

2. The vaccine composition of claim 1, wherein the Chikungunya virus strain has a non-synonymous mutation K1020E in the structural polyprotein corresponding to E1-K211E in the E1 structural glycoprotein either singly or in combination with other mutations selected from A232V, D301N, K327N, G380R, K391E, V589A, P867L, G1004R, and A1035V of the structural polyprotein sequence of the Chikungunya virus.

3. The vaccine composition of claim 1, wherein the Chikungunya virus isolates have the structural polyprotein sequences as disclosed in SEQ. ID No.8 to SEQ. ID NO.13 corresponding to nucleotide SEQ ID. NO.1 to SEQ ID NO.6 respectively and any genotypes or mutants thereof.

4. The vaccine composition of claim 1, wherein the therapeutically active antigen is a combination of the capsid protein and the structural glycoproteins of the Chikungunya virus strains as disclosed, comprising of C-E3-E2-6K-E1, C-E2-E1 and E2-E1 proteins for expression as Virus Like Particles.

5. The vaccine composition of claim 1 wherein the Chikungunya virus is inactivated by any of the following methods:

    i) Heat inactivation at 45°C to 60°C for 30 min to 4 hrs;
    ii) Ultraviolet radiation at 254 nm for 30 min to 120 min;
    iii) Formalin treatment at ratios upto 1:3000 (formalin:virus) at 2°C-8°C for 7 days or at ambient temperatures ranging from 20°C-25°C for 2 days;

iv) Beta propiolactone (henceforth BPL) ratios upto 1:1000 to 1:2500 (BPL:virus) at 2°C-8°C for 7 days or at ambient temperatures ranging from 20°C-25°C for 2 days wherein the additive is selected from glycine, mannitol, sorbitol, sucrose and trehalose;

v) Gamma irradiation by exposing the virus samples to a dose of 10 kGy (Kilo Gray) to 25 kGy from a ^{60}Co source.

6. The vaccine composition of claim 1 further comprising an adjuvant selected from (a) aluminum hydroxide, (b) aluminum phosphate, (c) gamma inulin, (d) algammulin (a combination of aluminum hydroxide and gamma inulin), (e) cholecalciferol in oil, (f) an oil in water emulsion OWEM1, containing squalene, tween-80, Span-85 in 10 mM phosphate-citrate buffer, (f) oil in water emulsion OWEM2 containing squalene, tween-80, Span-85, alpha tocopherol in phosphate-citrate buffer, (g) an oil in water emulsion OWEM3 containing squalene, tween-80, Span-85, cholecalciferol in phosphate-citrate buffer.

7. The vaccine composition of claim 1, further comprising the viral antigen at doses ranging from 1 μg to 100 μg per human dose in 40 mM phosphate buffer and 150 mM NaCl.

8. Use of the vaccine composition of claim 1 for the expression of structural antigens in eukaryotic or prokaryotic expression vectors.

9. The use of claim 8, wherein *E. coli* is used as a prokaryotic expression system and *Pichia pastoris* is used as a eukaryotic system for expression of recombinant proteins of the Chikungunya virus strains ~~as disclosed~~of claim 1.

10. The vaccine composition of claim 1 as a therapeutically active ingredient for use in the prophylaxis, treatment and diagnosis of infections caused by Chikungunya virus.

11. The use of vaccine composition of claim 1 in the manufacture of a medicament for use in a method of eliciting a protective immune response in human individuals against Chikungunya virus infections, said method comprising administering the

vaccine composition to humans through any of the routes selected from intramuscular, intradermal, subcutaneous, intravenous, oral or intranasal.

12. The use of Chikungunya virus isolates whose structural polyprotein gene sequence is disclosed in SEQ. ID. NOs.1 to 6 and proteins translated ~~thereof~~therefrom, as disclosed in SEQ. ID. NOs.8 to 13, as an immunodiagnostic agent for detection of Chikungunya virus infections in humans.

13. A combined vaccine composition comprising inactivated Chikungunya virus antigen and inactivated Japanese Encephalitis whole virion antigen and an adjuvant selected from (a) aluminum hydroxide, (b) aluminum phosphate, (c) gamma inulin, (d) algammulin (a combination of aluminum hydroxide and gamma inulin), (e) cholecalciferol in oil, (f) an oil in water emulsion OWEM1, containing squalene, tween-80, Span-85 in 10 mM phosphate-citrate buffer, (f) oil in water emulsion OWEM2 containing squalene, tween-80, Span-85, alpha tocopherol in phosphate-citrate buffer, (g) an oil in water emulsion OWEM3 containing squalene, tween-80, Span-85, cholecalciferol in phosphate-citrate buffer for use in eliciting a protective immune response against Chikungunya virus and Japanese Encephalitis virus infections in humans.

We claim :

1. A stable vaccine composition of inactivated Chikungunya virus strain with one or more mutations in the capsid, E1, E2, or E3 structural glycoproteins that enhance the adaptation of the virus to *Aedes aegypti* and capable of infecting *Aedes albopictus*, wherein the strains of the Chikungunya virus isolates are selected from TN01610, TN015110, TN06210, TN06310, TN06410, and AP0109 containing the nucleotide sequences disclosed in SEQ. ID NO.1 to SEQ ID NO.6 and SEQ ID NO.15 to SEQ ID NO.20.

2. The vaccine composition of claim 1, wherein the Chikungunya virus strain has a non-synonymous mutation K1020E in the structural polyprotein corresponding to E1-K211E in the E1 structural glycoprotein either singly or in combination with other mutations selected from A232V, D301N, K327N, G380R, K391E, V589A, P867L, G1004R, and A1035V of the structural polyprotein sequence of the Chikungunya virus.

3. The vaccine composition of claim 1, wherein the Chikungunya virus isolates have the structural polyprotein sequences as disclosed in SEQ. ID No.8 to SEQ. ID NO.13 corresponding to nucleotide SEQ ID. NO.1 to SEQ ID NO.6 respectively and any genotypes or mutants thereof.

4. The vaccine composition of claim 1, wherein the therapeutically active antigen is a combination of the capsid protein and the structural glycoproteins of the Chikungunya virus strains as disclosed, comprising of C-E3-E2-6K-E1, C-E2-E1 and E2-E1 proteins for expression as Virus Like Particles.

5. The vaccine composition of claim 1 wherein the Chikungunya virus is inactivated by any of the following methods:

    i) Heat inactivation at 45°C to 60°C for 30 min to 4 hrs;
    ii) Ultraviolet radiation at 254 nm for 30 min to 120 min;
    iii) Formalin treatment at ratios upto 1:3000 (formalin:virus) at 2°C-8°C for 7 days or at ambient temperatures ranging from 20°C-25°C for 2 days;

iv) Beta propiolactone (henceforth BPL) ratios upto 1:1000 to 1:2500 (BPL:virus) at 2°C-8°C for 7 days or at ambient temperatures ranging from 20°C-25°C for 2 days wherein the additive is selected from glycine, mannitol, sorbitol, sucrose and trehalose;

v) Gamma irradiation by exposing the virus samples to a dose of 10 kGy (Kilo Gray) to 25 kGy from a ^{60}Co source.

6. The vaccine composition of claim 1 further comprising an adjuvant selected from (a) aluminum hydroxide, (b) aluminum phosphate, (c) gamma inulin, (d) algammulin (a combination of aluminum hydroxide and gamma inulin), (e) cholecalciferol in oil, (f) an oil in water emulsion OWEM1, containing squalene, tween-80, Span-85 in 10 mM phosphate-citrate buffer, (f) oil in water emulsion OWEM2 containing squalene, tween-80, Span-85, alpha tocopherol in phosphate-citrate buffer, (g) an oil in water emulsion OWEM3 containing squalene, tween-80, Span-85, cholecalciferol in phosphate-citrate buffer.

7. The vaccine composition of claim 1, further comprising the viral antigen at doses ranging from 1 μg to 100 μg per human dose in 40 mM phosphate buffer and 150 mM NaCl.

8. Use of the vaccine composition of claim 1 for the expression of structural antigens in eukaryotic or prokaryotic expression vectors.

9. The use of claim 8, wherein *E. coli* is used as a prokaryotic expression system and *Pichia pastoris* is used as a eukaryotic system for expression of recombinant proteins of the Chikungunya virus strains of claim 1.

10. The vaccine composition of claim 1 as a therapeutically active ingredient for use in the prophylaxis, treatment and diagnosis of infections caused by Chikungunya virus.

11. The use of vaccine composition of claim 1 in the manufacture of a medicament for use in a method of eliciting a protective immune response in human individuals against Chikungunya virus infections, said method comprising administering the

vaccine composition to humans through any of the routes selected from intramuscular, intradermal, subcutaneous, intravenous, oral or intranasal.

12. The use of Chikungunya virus isolates whose structural polyprotein gene sequence is disclosed in SEQ. ID. NOs.1 to 6 and proteins translated therefrom, as disclosed in SEQ. ID. NOs.8 to 13, as an immunodiagnostic agent for detection of Chikungunya virus infections in humans.

13. A combined vaccine composition comprising inactivated Chikungunya virus antigen and inactivated Japanese Encephalitis whole virion antigen and an adjuvant selected from (a) aluminum hydroxide, (b) aluminum phosphate, (c) gamma inulin, (d) algammulin (a combination of aluminum hydroxide and gamma inulin), (e) cholecalciferol in oil, (f) an oil in water emulsion OWEM1, containing squalene, tween-80, Span-85 in 10 mM phosphate-citrate buffer, (f) oil in water emulsion OWEM2 containing squalene, tween-80, Span-85, alpha tocopherol in phosphate-citrate buffer, (g) an oil in water emulsion OWEM3 containing squalene, tween-80, Span-85, cholecalciferol in phosphate-citrate buffer for use in eliciting a protective immune response against Chikungunya virus and Japanese Encephalitis virus infections in humans.