CLAIMS

1. A liposomal vaccine composition comprising:

(a) a β-amyloid (Aβ)-derived peptide antigen displayed on the surface of the liposome;

(b) a peptide comprising a universal T-cell epitope, in which the universal T-cell epitope is encapsulated within the liposome that stimulates a helper T-cell response that enhances antibody production by B-cells, in which the peptide comprises:

(i) the amino acid sequence of SEQ ID NO: 6 and the tetanus toxin domain of SEQ ID NO: 1;

(ii) the amino acid sequence of SEQ ID NO: 8, the tetanus toxin domain of SEQ ID NO: 2, and an immunogenic keyhole limpet hemocyanin (KLH) domain;

(iii) the amino acid sequence of SEQ ID NO: 8 and the tetanus toxin domain of SEQ ID NO: 3; or

(iv) an immunogenic influenza hemagglutinin domain, the diphtheria toxindomain of SEQ ID NO: 4, the tetanus toxin domain of SEQ ID NO: 4, and the Epstein Barr virus domain of SEQ ID NO: 4; and

(c) an adjuvant.

2. A liposomal vaccine composition according to Claim 1, in which the peptide comprising a universal T-cell epitope comprises at least 30% hydrophobic amino acids.

3. A liposomal vaccine composition according to Claim 1 or 2, in which the liposomal vaccine composition comprises at least two different universal T-cell epitopes encapsulated within the liposome.

4. A liposomal vaccine composition according to Claim 1, 2 or 3, in which each universal T-cell epitope is no more than 30 amino acids in length, no more than 20 amino acids in length, or no more than 10-20 amino acids in length.

5. A liposomal vaccine composition according to any preceding claim, in which the liposomal vaccine composition comprises two, three or four different universal T-cell epitopes encapsulated within the liposome.

6. A liposomal vaccine composition according to any preceding claim, in which the peptide comprising a universal T-cell epitope comprises at least two different universal T-cell epitopes.

7. A liposomal vaccine composition according to any preceding claim, in which the peptide comprising a universal T-cell epitope comprises two, three or four universal T-cell epitopes.

8. A liposomal vaccine composition according to any of Claims 3 to 7, in which the at least two, three or four universal T-cell epitopes are joined by a linker.

9. A liposomal vaccine composition according to Claim 8, in which the linker comprises at least two amino acids, optionally in which the linker comprises, consists essentially of or consists of the amino acids VVR or PMGAP.

10. A liposomal vaccine composition according to any preceding claim, in which the peptide comprising a universal T-cell epitope comprises, consists essentially of or consists of an amino acid sequence selected from SEQ ID NO: 1 (SAT42), SEQ ID NO: 2 (SAT43), SEQ ID NO: 3 (SAT44), SEQ ID NO: 4 (SAT47).

11. A liposomal vaccine composition comprising:

(a) a tetrapalmitolyated β-amyloid (Aβ)-derived peptide antigen displayed on the surface of the liposome that comprises, consists essentially of or consists of amino acids 1-15 of Aβ;

(b) a peptide comprising a universal T-cell epitope encapsulated within the liposome, in which the peptide comprising a universal T-cell epitope comprises, consists essentially of or consists of an amino acid sequence selected from SEQ ID NO: 3 (SAT44) and SEQ ID NO: 4 (SAT47); and

(c) an adjuvant.

12. A liposomal vaccine composition according to any preceding claim, in which the adjuvant forms part of the liposome.

13. A liposomal vaccine composition according to any preceding claim, in which the adjuvant is, at least in part, displayed on the surface of the liposome.

14. A liposomal vaccine composition according to any preceding claim, in which the adjuvant comprises monophosphoryl lipid A (MPLA), CpG, or both MPLA and CpG.

15. A liposomal vaccine composition according to any preceding claim, in which the peptide comprising a universal T-cell epitope is between 30 and 60 amino acids in length.

16. A vaccine composition as defined in any preceding claim for use in treating, preventing, or inducing a protective immune response against an amyloid-beta associated disease or condition in a subject, in which the amyloid-beta associated disease or condition is Alzheimer's Disease, mild cognitive impairment, Down('s) syndrome, cardiac amyloidosis, cerebral amyloid angiopathy, multiple sclerosis, Parkinson's disease, Lewy body dementia, amyotrophic lateral sclerosis, Adult Onset Diabetes, inclusion body myositis, ocular amyloidosis, glaucoma, macular degeneration, lattice dystrophy and/or optic neuritis.

17. A kit for treating, preventing, or inducing a protective immune response against an amyloid-beta associated disease or condition in a subject comprising a liposomal vaccine composition according to any of Claims 1 to 15, in which the amyloid-beta associated disease or condition is Alzheimer's Disease, mild cognitive impairment, Down('s) syndrome, cardiac amyloidosis, cerebral amyloid angiopathy, multiple sclerosis, Parkinson's disease, Lewy body dementia, amyotrophic lateral sclerosis, Adult Onset Diabetes, inclusion body myositis, ocular amyloidosis, glaucoma, macular degeneration, lattice dystrophy and/or optic neuritis.