

CLAIMS

1. A liposomal construct comprising:
a liposome,
at least one adjuvant; and
- 5 a peptide containing at least one T-cell epitope which comprises, consists essentially of, or consists of the amino acid sequence of SEQ ID NO: 4 or an analogue thereof that retains alanine at position 2 and does not contain any methionine residues.
2. A liposomal construct according to Claim 1, in which the peptide containing at least one T-cell epitope comprises at least one additional T-cell epitope, in which the at least one
- 10 additional T-cell epitope comprises, consists of, or consists essentially of an amino acid sequence selected from SEQ ID NO: 1 and/or SEQ ID NO: 3, or an analogue thereof.
3. A liposomal construct according to Claim 1 or 2, in which the peptide contains at least three T-cell epitopes which comprise, consist essentially of, or consist of the amino acid sequences SEQ ID NO:1, SEQ ID NO:3, and SEQ ID NO:4, or analogues thereof.
- 15 4. A liposomal construct according to Claim 2 or 3, in which the peptide further comprises at least one linker between at least two T-cell epitopes.
5. A liposomal construct according to Claim 4, in which the at least one linker comprises, consists essentially of, or consists of the amino acid sequence: VVR; TVGLR; KVSVR; PMGAP or PMGLP.
- 20 6. A liposomal construct according to Claim 4 or 5, in which the at least one linker comprises, consists of or consists essentially of the amino acid sequence VVR.
7. A liposomal construct according to any preceding claim, in which the peptide containing at least one T-cell epitope comprises, consists essentially of, or consists of the amino acid sequence of SEQ ID NO: 6, or an analogue thereof.
- 25 8. A liposomal construct according to any preceding claim, in which the peptide containing at least one T-cell epitope is at least partially encapsulated within the liposome.
9. A liposomal construct according to any preceding claim, in which the at least one adjuvant is at least in part displayed on the surface of the liposome.

10. A liposomal construct according to any preceding claim, in which the at least one adjuvant is at least in part integrated within a lipid bilayer of the liposome.
11. A liposomal construct according to any preceding claim, in which the at least one adjuvant is selected from the group consisting of: monophosphoryl lipid A (MPLA);
5 diphosphoryl lipid A (DPLA); alum; Pam2CSK4; Pam3CSK4; Pam3CAG; saponins; CpG; lipidated CpG, preferably CpG-Cholesterol; cationic lipids; phosphorothioated PS-CpG-ODNs; CpG oligodeoxynucleotides (CpG-ODN); CpG-A; CpG-B or CpG-C.
12. A liposomal construct of any preceding claim, in which the at least one adjuvant is a TLR4 agonist, preferably monophosphoryl lipid A (MPLA).
- 10 13. A liposomal construct according to any of Claims 1 to 11, in which the at least one adjuvant is a TLR9 agonist, preferably a CpG oligonucleotide.
14. A liposomal construct according to any preceding claim for use in the preparation of a liposomal vaccine composition.
15. A liposomal vaccine composition comprising:
15 a liposomal construct according to any of Claims 1 to 13; and
at least one antigenic peptide, and optionally two different antigenic peptides, displayed on the surface of the liposome, optionally in which the composition additionally comprises at least one pharmaceutically acceptable carrier.
16. A liposomal vaccine composition according to Claim 15, in which the at least one
20 antigenic peptide is modified with one or more lipophilic or hydrophobic moieties, optionally in which the one or more lipophilic or hydrophobic moieties is selected from: a fatty acid, a triglyceride, diglyceride, steroid, sphingolipid, glycolipid, or a phospholipid.
17. A liposomal vaccine composition according to Claim 16, in which the one or more lipophilic or hydrophobic moieties comprises a palmitoyl residue (palmitic acid).
- 25 18. A liposomal vaccine composition according to Claim 17, in which the at least one antigenic peptide is tetrapalmitoylated.
19. A liposomal vaccine composition according to any of Claims 15 to 18, in which the at least one antigenic peptide is a self-antigen.

20. A liposomal vaccine composition according to Claim 19, in which the self-antigen is derived from IL-17, IL-27, Tau, α -synuclein, huntingtin, prion, or amylin protein.
21. A liposomal vaccine composition comprising:
- a liposome
 - 5 an MPLA adjuvant
 - CpG-Cholesterol
 - a peptide which comprises, consists essentially of, or consists of the amino acid sequence of SEQ ID NO: 4 or SEQ ID NO: 6; and
 - 10 an α -synuclein derived antigenic peptide displayed on the surface of the liposome comprising, consisting essentially of or consisting of the amino acid sequence of SEQ ID NO: 9 or SEQ ID NO: 10.
22. A liposomal vaccine composition according to any of Claims 15 to 21, in which the peptide which comprises, consists essentially of, or consists of the amino acid sequence of SEQ ID NO: 6 is, at least partially, encapsulated within the liposome.
- 15 23. A liposomal vaccine composition according to any of Claims 15 to 22, in which the liposome comprises phospholipids and cholesterol.
24. A liposomal vaccine composition according to Claim 23, in which the phospholipids comprise dimyristoylphosphatidyl-choline (DMPC) and dimyristoylphosphatidyl-glycerol (DMPG), optionally in which the molar ratio of DPMC:DPMG:cholesterol is 9:1:7.
- 20 25. A liposomal vaccine composition according to Claim 24, in which the molar ratio of DPMC:DPMG:cholesterol:MPLA in the liposome is 9:1:7:0.05.
26. A liposomal vaccine composition according to any of Claims 15 to 18, in which the at least one antigenic peptide is a foreign antigen.
- 25 27. A liposomal vaccine composition according to Claim 26, in which the foreign antigen is a viral antigen or an allergen.
28. A liposomal vaccine composition according to Claim 27, in which the viral antigen is derived from a virus selected from rhinoviruses, coronaviruses, enteroviruses, adenoviruses, parainfluenza viruses and respiratory syncytial viruses.

29. A liposomal vaccine composition according to any of Claims 15 to 28 for use in therapy.

30. A liposomal vaccine composition according to any of Claims 15 to 28, for use in a method of prevention or treatment, of symptoms of, or associated with, a neurodegenerative disease or disorder.

5 31. A method of manufacturing a liposomal construct as defined in any of Claims 1 to 13 comprising the steps of:

- 10 (a) providing a peptide containing at least one T-cell epitope which comprises, consists essentially of, or consists of the amino acid sequence of SEQ ID NO: 4 or an analogue thereof that retains alanine at position 2 and does not contain any methionine residues,
- (b) providing a liposome comprising at least one adjuvant; and
- (c) combining the peptide containing at least one T-cell epitope with the liposome to generate the liposomal construct.

15 32. A method according to Claim 31, in which the peptide containing at least one T-cell epitope comprises, consists of, or consists essentially of:

- (a) the amino acid sequences SEQ ID NO: 1, SEQ ID NO: 3 and SEQ ID NO: 4 in combination; or
- (b) the amino acid sequence of SEQ ID NO: 6, or an analogue thereof.

20 33. A method of manufacturing a liposomal vaccine composition as defined in any of Claims 15 to 28, in which the method comprises the steps of:

- (a) providing a peptide containing at least one T-cell epitope which comprises, consists essentially of, or consists of the amino acid sequence of SEQ ID NO: 4 or an analogue thereof that retains alanine at position 2 and does not contain any methionine residues,
- 25 (b) providing a liposome comprising at least one adjuvant,
- (c) combining the peptide containing at least one T-cell epitope with the liposome; and

(d) incorporating at least one peptide antigen into the liposome such that the at least one peptide antigen is displayed on the surface of the liposome.

34. A method according to Claim 33, in which the peptide containing at least one T-cell epitope comprises, consists of, or consists essentially of:

5 (a) the amino acid sequences SEQ ID NO: 1, SEQ ID NO: 3 and SEQ ID NO: 4 in combination; or

(b) the amino acid sequence of SEQ ID NO: 6, or an analogue thereof.

35. A method according to Claim 33 or 34, in which the at least one adjuvant comprises MPLA.

10 36. A method according to Claim 35, in which the at least one adjuvant further comprises a CpG adjuvant.

37. A method according to any of Claims 33 to 36, in which the peptide antigen is palmitoylated and the palmitic acid residues are integrated in the outer layer of the liposome.

15 38. A method according to any of Claims 33 to 37, in which the peptide antigen is an α -synuclein derived peptide, preferably an α -synuclein derived antigenic peptide displayed on the surface of the liposome comprising, consisting essentially of or consisting of the amino acid sequence of SEQ ID NO: 9 or SEQ ID NO: 10.