

Claims

1. A peptide comprising any one of SEQ ID NOs: 9, 1 to 8, 10 to 34 or a variant thereof.
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2. A complex comprising a peptide according to claim 1 bound to a MHC molecule.
3. A complex according to claim 2, wherein the complex comprises two or more peptides according to claim 1 and two or more MHC molecules.
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4. A complex according to claim 3, wherein each peptide is bound to one of the two or more MHC molecules.
5. A complex according to claim 3 or 4, wherein each of the two or more MHC
15 molecules is attached to a dextran backbone.
6. A complex according to claim 5, wherein the complex further comprise a fluorophore, optionally wherein the fluorophore is attached to the dextran backbone.
- 20 7. A complex according to any one of claims 3 to 7, wherein the complex comprises two or more of SEQ ID NOs 21, 1, 19, 28, 2, 27, 16 and 14 or a variant thereof, optionally wherein the complex comprises SEQ ID NOs 21, 1, 19, 28, 2, 27, 16 and 14 or a variant thereof.
- 25 8. Use of a peptide according to claim 1 or a complex according to any one of claims 2 to 7 in a method of determining the presence or absence of current or previous coronavirus infection in an individual.
9. A use according to claim 8, wherein the method comprises contacting the peptide
30 or complex with a sample obtained from the individual and determining the presence or absence of binding between the peptide or complex and a molecule comprised in the sample.

10. A use according to claim 9, wherein the molecule is an antibody or a T cell receptor.
- 5 11. A use according to claim 9 or 10, wherein the presence of binding indicates the presence of current or previous coronavirus infection, and/or the absence of binding indicates the absence of current or previous coronavirus infection.
- 10 12. Use of a peptide according to claim 1 or a complex according to any one of claims 2 to 7 in a method of identifying coronavirus-specific T cells.
- 15 13. A use according to claim 12, wherein the method comprises contacting the peptide or complex with a sample obtained from an individual and determining the presence or absence of binding between the peptide or complex and a T cell receptor comprised in the sample.
14. A use according to claim 13, wherein the individual is currently infected with the coronavirus.
- 20 15. A use according to claim 14, wherein the individual was previously, but is not currently, infected with the coronavirus.
- 25 16. Use of a peptide of claim 1 or complex of any one of claims 2 to 7 in a method of identifying a coronavirus-specific T cell receptor.
17. A use according to claim 16, wherein the method comprises contacting the peptide or complex with a T cell receptor and determining the presence or absence of binding between the peptide or complex and the T cell receptor.
- 30 18. A use according to claim 17, wherein the presence of binding indicates that the T cell receptor is a coronavirus-specific T cell receptor, and/or the absence of binding indicates that the T cell receptor is not coronavirus-specific T cell receptor.

19. A T cell comprising a T cell receptor that is capable of binding to a peptide comprising any one of SEQ ID NOs: 9, 1 to 8, 10 to 34 or a variant thereof.
- 5 20. A vaccine composition comprising a peptide according to claim 1, or a peptide that is capable of binding to a T cell receptor as defined in claim 19.
21. A vaccine composition according to claim 20, which comprises:
- 10 (a) two or more peptides according to claim 1, each comprising a different sequence selected from SEQ ID NOs: 9, 1 to 8, 10 to 34 or a variant thereof; or
- (b) two or more peptides that each are capable of binding to a different T cell receptor as defined in claim 19, wherein each different T cell receptor is capable of binding to a
- 15 different sequence selected from SEQ ID NOs: 9, 1 to 8, 10 to 34 or a variant thereof.
22. A vaccine composition according to claim 21, wherein the vaccine composition comprises two or more peptides each comprising a different sequence selected from SEQ ID NOs 21, 1, 19, 28, 2, 27, 16 and 14 or a variant thereof.
- 20 23. A vaccine composition according to claim 21, wherein each of the two or more peptides interacts with a different HLA supertype.
24. A vaccine composition according to any one of claims 20 to 23, which comprises at
- 25 least one peptide according to claim 20, wherein the peptide interacts with at least two different HLA supertypes.
25. A vaccine composition according to claim 23 or 24, wherein the at least two different HLA supertypes are:

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- (i) selected from A2, A203/A2, A23, A24, A2403/A2, A2403/A24, A39, A3, A11, A30, A31, A32, A68, A69, B7, B8, B35, B37, B44, B48, B53, B60, B61, B62, B63, B72, B75, Cw1 and Cw6;
- 5 (ii) A3, A11 and A31;
- (iii) B7 and B35;
- (iv) B72, A2 and A203/A2;
- 10 (v) B72, B62 and B75;
- (vi) A68, A11 and A31;
- 15 (vii) A203/A2 and A2;
- (viii) A2403/A2 and A23;
- (ix) A11, A30, A3, A68 and A31;
- 20 (x) A11, A30, A3 and A68;
- (xi) B60, B48 and B44;
- 25 (xii) A68, B63 and A203/A2
- (xiii) A2, A203/A2, A69 and A32
- (xiv) A2, A203/A2 and A68;
- 30 (xv) B35, B53, A29;

(xvi) B37, B60, B61, B44 and B48;

(xvii) Cw6 and Cw1; and

5 (xviii) A30, B7, B8, B62 and B72.

26. A vaccine composition according to any one of claims 20 to 25, wherein the peptide is attached to a nanoparticle.

10 27. A vaccine composition according to any one of claims 21 to 26, wherein each of the two or more peptides is attached to a nanoparticle.

28. A vaccine composition according to claim 26 or 27, wherein the nanoparticle is a gold nanoparticle, a calcium phosphate nanoparticle, or a silicon nanoparticle, optionally
15 wherein the gold nanoparticle is coated with alpha-galactose and/or beta-GlcNAc.

29. A vaccine composition according to any one of claims 26 to 28, wherein the peptide is attached to the nanoparticle via a linker.

20 30. A vaccine composition comprising a polynucleotide encoding a peptide according to claim 1, or a peptide that is capable of binding to a T cell receptor as defined in claim 19.

31. A vaccine composition according to claim 30, which comprises a polynucleotide
25 encoding:

(a) two or more peptides according to claim 1, each comprising a different sequence selected from SEQ ID NOs: 9, 1 to 8, 10 to 34 or a variant thereof; or

30 (b) two or more peptides that each are capable of binding to a different T cell receptor as defined in claim 19, wherein each different T cell receptor is capable of binding to a different sequence selected from SEQ ID NOs: 1 to 34 or a variant thereof.

32. A vaccine composition according to claim 30, which comprises:

- (a) two or more polynucleotides each encoding a peptide according to claim 1, wherein
5 each peptide comprises a different sequence selected from SEQ ID NOs: 1 to 34 or a
variant thereof; or
- (b) two or more polynucleotides each encoding a peptide that is capable of binding to a T
cell receptor as defined in claim 18, wherein each peptide is capable of binding to a
10 different T cell receptor as defined in claim 18 and each different T cell receptor is capable
of binding to a different sequence selected from SEQ ID NOs: 1 to 34 or a variant thereof.

33. A method of preventing or treating a coronavirus infection, comprising
administering a vaccine composition according to any one of claims 20 to 32 to an
15 individual infected with, or at risk of being infected with, a coronavirus.

34. A vaccine composition according to any one of claims 20 to 32 for use in a method
of preventing or treating a coronavirus infection in an individual.

20 35. A use according to any one of claims 8 to 18, a T cell receptor as defined in claim
19, a vaccine composition according to any one of claims 20 to 32, a method of preventing
or treating a coronavirus infection according to claim 33, or a vaccine composition for use
according to claim 34, wherein the coronavirus is SARS coronavirus or SARS coronavirus
2.
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