

Claims:

1. A virus-specific immune cell comprising a chimeric antigen receptor (CAR) or nucleic acid encoding a CAR for use in a method of treating or preventing a cancer, wherein the CAR comprises: (i) an antigen-binding domain which binds specifically to CD30, (ii) a transmembrane domain, and (iii) a signalling domain, wherein the signalling domain comprises: (a) an amino acid sequence derived from the intracellular domain of CD28, and (b) an amino acid sequence comprising an immunoreceptor tyrosine-based activation motif (ITAM).
2. Use of a virus-specific immune cell comprising a chimeric antigen receptor (CAR) or nucleic acid encoding a CAR in the manufacture of a medicament for use in treating or preventing a cancer, wherein the CAR comprises: (i) an antigen-binding domain which binds specifically to CD30, (ii) a transmembrane domain, and (iii) a signalling domain, wherein the signalling domain comprises: (a) an amino acid sequence derived from the intracellular domain of CD28, and (b) an amino acid sequence comprising an immunoreceptor tyrosine-based activation motif (ITAM).
3. A method of treating or preventing a cancer, comprising administering to a subject a therapeutically or prophylactically effective quantity of virus-specific immune cells comprising a chimeric antigen receptor (CAR) or nucleic acid encoding a CAR, wherein the CAR comprises: (i) an antigen-binding domain which binds specifically to CD30, (ii) a transmembrane domain, and (iii) a signalling domain, wherein the signalling domain comprises: (a) an amino acid sequence derived from the intracellular domain of CD28, and (b) an amino acid sequence comprising an immunoreceptor tyrosine-based activation motif (ITAM).
4. The virus-specific immune cell for use according to claim 1, the use according to claim 2, or the method according to claim 3, wherein the signalling domain comprises an amino acid sequence having at least 80% amino acid sequence identity to SEQ ID NO:26.
5. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 4, wherein the transmembrane domain is derived from the transmembrane domain of CD28.
6. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 5, wherein the transmembrane domain comprises an amino acid sequence having at least 80% amino acid sequence identity to SEQ ID NO:20.
7. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 6, wherein the antigen-binding domain comprises an amino acid sequence having at least 80% amino acid sequence identity to SEQ ID NO:14, and an amino acid sequence having at least 80% amino acid sequence identity to SEQ ID NO:15.

8. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 7, wherein the antigen-binding domain comprises an amino acid sequence having at least 80% amino acid sequence identity to SEQ ID NO:18.
- 5 9. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 8, wherein the signalling domain comprises: (a) an amino acid sequence derived from the intracellular domain of CD3 ζ .
- 10 10. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 9, wherein the signalling domain comprises an amino acid sequence having at least 80% amino acid sequence identity to SEQ ID NO:25.
- 15 11. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 10, wherein the CAR additionally comprises a hinge region provided between the antigen-binding domain and the transmembrane domain.
- 20 12. The virus-specific immune cell for use, the use, or the method according to claim 11, wherein the hinge region comprises an amino acid sequence having at least 80% amino acid sequence identity to SEQ ID NO:33.
- 25 13. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 12, wherein the CAR comprises an amino acid sequence having at least 80% amino acid sequence identity to SEQ ID NO:35 or 36.
- 30 14. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 13, wherein the virus-specific immune cell comprises a CAR comprising an antigen-binding domain which binds specifically to a target antigen other than CD30, or nucleic acid encoding a CAR comprising an antigen-binding domain which binds specifically to a target antigen other than CD30.
- 35 15. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 14, wherein:
the CAR comprises: (i) an antigen-binding domain which binds specifically to CD30, (ii) a transmembrane domain, and (iii) a signalling domain comprising an immunoreceptor tyrosine-based activation motif (ITAM); and
wherein the virus-specific immune cell comprises a CAR comprising an antigen-binding domain which binds specifically to a target antigen other than CD30, or nucleic acid encoding a CAR comprising an antigen-binding domain which binds specifically to a target antigen other than CD30.
- 40 16. The virus-specific immune cell for use, the use, or the method according to claim 14 or claim 15, wherein the virus-specific immune cell comprises more than one non-identical CAR, or nucleic acid encoding more than one non-identical CAR.

17. The virus-specific immune cell for use, the use, or the method according to any one of claims 14 to 16, wherein the target antigen other than CD30 is a cancer cell antigen.
- 5 18. The virus-specific immune cell for use, the use, or the method according to any one of claims 14 to 17, wherein the target antigen other than CD30 is selected from CD19, CD20, CD22, ROR1R, CD4, CD7, CD38, BCMA, Mesothelin, EGFR, GPC3, MUC1, HER2, GD2, CEA, EpCAM, LeY and PSCA.
19. The virus-specific immune cell for use, the use, or the method according to any one of claims 14 to 10 18, wherein the target antigen other than CD30 is CD19.
20. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 19, wherein the virus-specific immune cell is a virus-specific T cell.
- 15 21. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 20, wherein the virus-specific immune cell is specific for Epstein-Barr virus (EBV).
22. The virus-specific immune cell for use, the use, or the method according to any one of claims 1 to 21, wherein the cancer is selected from the group consisting of: a CD30-positive cancer, an EBV-associated 20 cancer, a hematological cancer, a myeloid hematologic malignancy, a hematopoietic malignancy a lymphoblastic hematologic malignancy, myelodysplastic syndrome, leukemia, T cell leukemia, acute myeloid leukemia, chronic myeloid leukemia, acute lymphoblastic leukemia, lymphoma, non-Hodgkin's lymphoma, B cell non-Hodgkin's lymphoma, diffuse large B cell lymphoma, EBV-associated lymphoma, EBV-positive B cell lymphoma, EBV-positive diffuse large B cell lymphoma, EBV-positive lymphoma 25 associated with X-linked lymphoproliferative disorder, EBV-positive lymphoma associated with HIV infection/AIDS, oral hairy leukoplakia, Burkitt's lymphoma, post-transplant lymphoproliferative disease, central nervous system lymphoma, anaplastic large cell lymphoma, T cell lymphoma, peripheral T cell lymphoma, cutaneous T cell lymphoma, NK-T cell lymphoma, extra-nodal NK-T cell lymphoma, thymoma, multiple myeloma, a solid cancer, epithelial cell cancer, gastric cancer, gastric carcinoma, gastric 30 adenocarcinoma, gastrointestinal adenocarcinoma, liver cancer, hepatocellular carcinoma, cholangiocarcinoma, head and neck cancer, head and neck squamous cell carcinoma, oral cavity cancer, oropharyngeal cancer, oropharyngeal carcinoma, oral cancer, laryngeal cancer, nasopharyngeal carcinoma, oesophageal cancer, colorectal cancer, colorectal carcinoma, colon cancer, colon carcinoma, cervical carcinoma, prostate cancer, lung cancer, non-small cell lung cancer, small cell lung cancer, lung 35 adenocarcinoma, squamous lung cell carcinoma, bladder cancer, urothelial carcinoma, skin cancer, melanoma, advanced melanoma, renal cell cancer, renal cell carcinoma, ovarian cancer, ovarian carcinoma, mesothelioma, breast cancer, brain cancer, glioblastoma, prostate cancer, pancreatic cancer, mastocytosis, advanced systemic mastocytosis, germ cell tumor or testicular embryonal carcinoma.