CLAIMS

1. A pseudotyped retrovirus-like particle or retroviral vector comprising:

a) at least one cell targeting fusion protein comprising (i) a protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family or a transmembrane domain and (ii) at least one cell targeting domain to a surface receptor expressed by a target cell, wherein the at least one cell targeting domain is linked to the ectodomain of the protein derived from the envelope glycoprotein G or H,

b) at least one modulating fusion protein comprising (i) a protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family or a transmembrane domain and (ii) at least one functional domain chosen from a cytokine, growth factor, hormone, neurotransmitter, apoptosis ligand, or a combination thereof, wherein the at least one functional domain is linked to the ectodomain of the protein derived from the envelope glycoprotein G or H and wherein the at least one functional domain modulates an activity of the target cell, and

c) at least one glycoprotein derived from an envelope glycoprotein F of a virus of the Paramyxoviridae family,

wherein at least one of said cell targeting fusion protein or said modulating fusion protein comprises a protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family,

wherein said protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family lacks at least one part of the cytoplasmic region of said envelope glycoprotein G or H.

2. The pseudotyped retrovirus-like particle or retroviral vector according to claim 1, wherein said virus of the Paramyxoviridae family is a virus of the *Morbillivirus* genus or of the *Henipavirus* genus.

3. The pseudotyped retrovirus-like particle or retroviral vector according to claim 1 or 2, wherein said protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family is at least partially unable to bind at least one natural receptor of said envelope glycoprotein G or H.

4. The pseudotyped retrovirus-like particle or retroviral vector of any one of claims 1-3, wherein said virus of the Paramyxoviridae family is a Henipavirus.

5. The pseudotyped retrovirus-like particle or retroviral vector of any of claims 1-4, wherein said cell targeting fusion protein comprises a protein derived from an envelope glycoprotein G or H of a virus of the Henipavirus family.

6. The pseudotyped retrovirus-like particle or retroviral vector of any of claims 1-5, wherein said modulating fusion protein comprises a protein derived from an envelope glycoprotein G or H of a virus of the Henipavirus family.

7. The pseudotyped retrovirus-like particle or retroviral vector of any one of claims 1 to 6, which comprises a gene of interest encoding a therapeutic protein, apoptotic protein, chimeric antigen receptor, cell surface receptor, antibody, antibody fragment, shRNA, antigen, cytokine, microRNA, CRISPR ((clustered, regularly interspaced, short palindromic repeat))/CAS element(s), a Zinc Finger Nucleases, or a S/MAR (Scaffold / Matrix Attachment Region) episomes, ligand and/or receptor.

8. The pseudotyped retrovirus-like particle or retroviral vector of any one of claims 1-7, which comprises a gene encoding a chimeric antigen receptor.

9. The pseudotyped retrovirus-like particle or retroviral vector of any one of claims 4 to 8, wherein the virus of the Henipavirus genus is Nipah virus, Cedar virus, or Hendra virus.

10. The pseudotyped retrovirus-like particle or retroviral vector according to any of claims 1-9, wherein the protein derived from an envelope glycoprotein comprises at least one modification by comparison to a Nipah virus envelope glycoprotein G and comprises a protein having at least 80% sequence identity to SEQ ID NO: 9.

11. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 10, wherein the protein derived from an envelope glycoprotein G has a truncation in the cytoplasmic region.

12. The pseudotyped retrovirus-like particle or retroviral vector of any one of claims 1 to 11, wherein the glycoprotein G is of the Henipavirus and has a cytoplasmic truncation of 34 amino acids at the N-terminus of SEQ ID NO: 9.

13. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 12, wherein the protein is derived from an envelope glycoprotein G

of a virus of the Henipavirus genus wherein the protein comprises E501A, W504A, Q530A and E533A point mutations by comparison to sequence SEQ ID NO:9.

14. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1-13, wherein the glycoprotein derived from an envelope F comprises at least one modification by comparison to a Nipah virus envelope glycoprotein F and comprises a protein having at least 80% sequence identity to SEQ ID NO: 11.

15. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 14, wherein said glycoprotein derived from an envelope glycoprotein F has a truncation of at least one part of the cytoplasmic region of said envelope glycoprotein F.

16. The pseudotyped retrovirus-like particle or retroviral vector of any of claims 1 to 15, wherein the glycoprotein F that has a cytoplasmic truncation of 22 amino acids at the C-terminus of SEQ ID NO: 11.

17. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 16, wherein said cell targeting domain is selected in the group consisting of a DARPin, ScFv, targeting peptide and their combinations

18. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 17, wherein the at least one cell targeting domain binds a target cell selected from a hematopoietic cell, stromal cell, liver cell, muscle cell, or cell of the nervous system.

19. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 18, wherein the at least one cell targeting domain is specific for CD3, CD8, CD4, a cancer cell marker, CD11b, CD19, CD62L, CD56, Glut-1 (glucose transporter), CD22, CD20, CCR5 or CXCR4.

20. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 19, wherein the at least one cell targeting domain is specific for CD3 or CD8.

21. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 20, wherein the at least one cell targeting domain comprises an

anti-CD8 scFv and the anti-CD8 scFv targeting domain comprises the variable heavy (VH) and variable light (VL) chain of the scFv set forth in the sequence of SEQ ID NO:4.

22. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 21, wherein the at least one cell targeting domain comprises an anti-CD8 scFv and the anti-CD8 scFv targeting domain comprises the scFv set forth in the sequence of SEQ ID NO:4

23. The pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 22, wherein the cytokine is selected from the group consisting of interleukin (IL), a tumor necrosis factor (TNF) or an interferon.

24. The pseudotyped retrovirus-like particle or retroviral vector of claim 23, wherein the interleukin is IL-2, IL-7, IL-15 or IL-21.

25. The pseudotyped retrovirus-like particle or retroviral vector of any of claims 1 to 24, wherein the modulating fusion protein comprises IL-7.

26. A nucleic acid comprising a sequence encoding a cell targeting fusion protein and a sequence encoding a modulating fusion protein, wherein:

- said cell targeting fusion protein comprises a protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family or a transmembrane domain and (ii) at least one cell targeting domain to a surface receptor expressed by a target cell, wherein the at least one cell targeting domain is linked to the ectodomain of the protein derived from the envelope glycoprotein G or H, and

said modulating fusion protein comprises (i) a protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family or a transmembrane domain and (ii) at least one functional domain chosen from a cytokine, growth factor, hormone, neurotransmitter, apoptosis ligand, or a combination thereof, wherein the at least one functional domain is linked to the ectodomain of the protein derived from the envelope glycoprotein G or H and wherein the at least one functional domain modulates an activity of the target cell,

wherein at least one of said cell targeting fusion protein or said modulating fusion protein comprises a protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family,

wherein said protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family lacks at least one part of the cytoplasmic region of said envelope glycoprotein G or H.

27. The nucleic acid according to claim 26, wherein said cell targeting fusion protein comprises the protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family.

28. The nucleic acid according to claim 26 or claim 27, wherein said virus of the Paramyxoviridae family is a henipavirus.

29. The nucleic acid according to claim 28, wherein the virus of the Henipavirus genus is Nipah virus, Cedar virus, or Hendra virus.

30. The nucleic acid according to any one of claims 26 to 29, wherein said nucleic acid comprises a sequence selected from the group consisting of SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7 and SEQ ID NO: 13 and/or comprises a sequence encoding a sequence selected in the group consisting of sequences SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8 and SEQ ID NO: 14.

31. A vector comprising a nucleic acid according to any of claims 26 to 30.

32. A method for producing a pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 25, wherein said method comprises co-transfecting a packaging cell line with:

(i) at least one nucleic acid encoding a cell targeting fusion protein, said cell targeting fusion protein comprising (i) a protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family or a transmembrane domain and (ii) at least one cell targeting domain,

(ii) at least one nucleic acid encoding a modulating fusion protein, said modulating fusion protein comprising (i) a protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family or a transmembrane domain and (ii) at least one functional domain chosen from a cytokine, growth factor, hormone, neurotransmitter, apoptosis ligand, or a combination thereof,

(iii) at least one nucleic acid encoding a glycoprotein derived from an envelope glycoprotein F of a virus of the Paramyxoviridae family, and

(iv) at least one vector comprising a nucleic acid encoding core proteins from said retrovirus,

wherein at least one of said cell targeting fusion protein and/or said modulating fusion protein comprises a protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family, and

wherein said protein derived from an envelope glycoprotein G or H of a virus of the Paramyxoviridae family lacks at least one part of the cytoplasmic region of said envelope glycoprotein G or H.

33. An in vitro or ex vivo use of a pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 25 to selectively modulate the activity of target cells and optionally selectively transduce said target cells.

34. An in vitro or ex vivo method for selectively modulating the activity of target cells and/or selectively transducing target cells, wherein said method comprises contacting a pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 1 to 25 with cells comprising said target cells.

35. A pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 7 to 25 for use in immune therapy, gene therapy and/or vaccination.

36. Use of a pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 7 to 25 in the manufacture of a medicament, for use in immune therapy, gene therapy and/or vaccination

37. A pseudotyped retrovirus-like particle or retroviral vector or a fusion protein according to any one of claims 7 to 25 for use in the prevention and/or treatment of an immune disease, cancer, genetic disease, allergic disease, inflammatory disease, infectious disease, metabolic disease, neurological disease, muscular disease and their combinations.

38. Use of a pseudotyped retrovirus-like particle or retroviral vector according to any one of claims 7 to 25 in the manufacture of a medicament, for the prevention and/or treatment of an immune disease, cancer, genetic disease, allergic disease, inflammatory disease, infectious disease, metabolic disease, neurological disease, muscular disease and their combinations.