Claims

1. A recombinant lentiviral vector genome comprising a polynucleotide encoding a fusion polypeptide, wherein said fusion polypeptide comprises, arranged from N-terminal to C-terminal ends:

- a first polypeptide comprising (i) an MHC-II-associated light invariant chain (Ii), preferably of SEQ ID No. 11, or (ii) the transmembrane domain of the transferrin receptor (TfR), preferably of SEQ ID No. 13, and

- at least one antigenic polypeptide of a pathogen.

2. The recombinant lentiviral vector genome according to claim 1, wherein said antigenic polypeptide is a mono-antigenic polypeptide comprising one antigen of a pathogen or immunogenic fragment thereof, or is a poly-antigenic polypeptide comprising at least two antigens of one or more pathogens or immunogenic fragments thereof.

3. The recombinant lentiviral vector genome according to claim 1 or 2, wherein the pathogen is a bacterial, parasite or viral pathogen, in particular a pathogen associated with an acute or chronic respiratory infectious disease in a mammal, more particularly is *Mycobacterium tuberculosis*, an influenza virus or a coronavirus such as SARS-CoV-2.

4. The recombinant lentiviral vector genome according to claim 3, wherein said antigenic polypeptide comprises one or more *Mycobacterium tuberculosis* (Mtb) antigens selected from EsxA, EspC, EsxH, PE19 or Ag85A, or an immunogenic fragment thereof, in particular one of the following Mtb antigenic combinations:

(a) EsxH;
(b) EsxH and EsxA;
(c) EsxH, EsxA and PE19;
(d) EsxH, EsxA, EspC and PE19;
(e) EsxH, EsxA, EspC, PE19 and Ag85A;

or immunogenic fragments thereof.

5. The recombinant lentiviral vector genome according to any one of claims 1 to 4, wherein said genome is obtained from a pFLAP vector plasmid, in particular the vector plasmid of nucleotide sequence SEQ ID No. 20, wherein the polynucleotide encoding the fusion polypeptide has been cloned under control of a promoter functional in mammalian cells, in particular the CMV promoter, the human beta-2 microglobulin promoter, the SP1-human beta-2 microglobulin promoter of SEQ ID No. 21 or the composite BCUAG promoter of SEQ ID No. 22 and wherein the vector optionally comprises post-transcriptional regulatory element of the woodchuck hepatitis virus (WPRE), in particular a mutant WPRE as set forth in SEQ ID No. 23.

6. A DNA plasmid comprising the recombinant lentiviral vector genome according to any one of claims 1 to 5, in particular wherein said genome is inserted within a pFLAP vector plasmid, preferably the vector plasmid of nucleotide sequence SEQ ID No. 20, wherein the fusion polypeptide encoded by the polynucleotide comprised within the recombinant lentiviral vector genome is inserted between restriction sites BamHI and XhoI in replacement of the GFP sequence.

7. A recombinant lentiviral vector particle which comprises the recombinant lentiviral vector genome according to any one of claims 1 to 5.

8. The recombinant lentiviral vector particle according to claim 7, which is a recombinant integration-deficient lentiviral vector particle, in particular wherein the recombinant integration-deficient lentiviral vector particle is a HIV-1 based vector particle and is integrase deficient as a result of a mutation of the integrase gene encoded in the genome of the lentivirus in such a way that the integrase is not expressed or not functionally expressed, in particular the mutation in the integrase gene leads to the expression of an integrase substituted on its amino acid residue 64, in particular the substitution is D64V in the catalytic domain of the HIV-1 integrase encoded by Pol.

9. The recombinant lentiviral vector particle according to any one of claim 7 or 8, wherein said recombinant lentiviral vector particle is a recombinant replication-incompetent pseudotyped lentiviral vector particle, in particular a replication-incompetent pseudotyped HIV-1 lentiviral vector particle, in particular wherein the lentiviral vector particle is pseudotyped with the glycoprotein G from a Vesicular Stomatitis Virus (V-SVG) of Indiana or of New-Jersey serotype.

10. A host cell, preferably a mammalian host cell, transfected with a DNA plasmid according to claim 6, in particular wherein said host cell is a HEK-293T cell line or a K562 cell line.

11. A pharmaceutical composition, in particular a vaccine composition, suitable for administration to a mammalian host, comprising a recombinant lentiviral vector particle of any one of claims 7 to 9 together with one or more pharmaceutically acceptable excipient(s) suitable for administration to a host in need thereof, in particular a human host.

12. The pharmaceutical composition of claim 11, further comprising an adjuvant, in particular a pro-Th1 and/or pro-Th17 adjuvant such as polyinosinic-polycytidylic acid (polyI:C) or a derivative thereof, or a cyclic dinucleotide adjuvant, in particular cyclic Guanine-Adenine dinucleotide (cGAMP).

13. Use of the pharmaceutical composition of claim 11 or 12, in the manufacture of a medicament for eliciting a protective, preferentially prophylactic, immune response by the elicitation of antibodies directed against the antigenic polypeptide or immunogenic fragments thereof in a host in need thereof, in particular a human host.

14. The use of pharmaceutical composition of claim 13, wherein the immune response involves the induction of MHC-I restricted presentation and MHC-II restricted

presentation of the antigenic polypeptide or immunogenic fragments thereof, by an antigen-presenting cell, in particular a dendritic cell, and the induction of a CD4- and CD8-mediated cellular immune response.

15. Use of the pharmaceutical composition of any one of claims 11 to 14, in the manufacture of a medicament for preventing and/or treating an infection by a pathogen in a mammalian host in need thereof, in particular a human host in particular an infection by a pathogen associated with an acute or chronic respiratory infectious disease in a mammal.

16. A method for the preparation of recombinant lentiviral vector particles suitable for the preparation of a pharmaceutical composition, in particular a vaccine composition, comprising the following steps:

a) transfecting the recombinant lentiviral transfer vector carrying the lentiviral vector genome comprising a polynucleotide encoding a fusion polypeptide, according to any one of claims 1 to 5, or the DNA plasmid according to claim 6 in a host cell, for example a HEK-293T cell line or a K562 cell line;

b) co-transfecting the cell of step a) with: (i) a plasmid vector encoding envelope proteins and with a plasmid vector encoding the lentiviral GAG and POL or mutated POL protein as packaging construct; and (ii) a plasmid encoding VSV-G Indiana or New Jersey envelope,

c) culturing the host cell under conditions suitable for the production of recombinant lentiviral vector particles expressing the fusion polypeptide;

d) recovering the recombinant lentiviral particles expressing the fusion polypeptide.