

I/We claim:

1. A method for preparing a producer cell for producing a retroviral vector carrying a nucleic acid fragment of interest, comprising:

5 integrating one or more but not all of, sequences of gag and pol genes of a retrovirus, a coding sequence of a viral envelope protein, and a viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, into the genome of a host cell using a Sleeping Beauty (SB) transposon system, and further

10 integrating the remaining one or more of, the sequences of gag and pol genes of the retrovirus, the coding sequence of the viral envelope protein, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, into the genome of the host cell using a PiggyBac (PB) transposon system,

or

15 integrating one or more but not all of, sequences of gag and pol genes of a retrovirus, a coding sequence of a viral envelope protein, and a viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, into the genome of a host cell using a PB transposon system, and further

20 integrating the remaining one or more of, the sequences of gag and pol genes of the retrovirus, the coding sequence of the viral envelope protein, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, into the genome of the host cell using an SB transposon system.

25 2. A method for preparing a producer cell for producing a retroviral ~~lentiviral~~ vector carrying a nucleic acid fragment of interest, wherein the retroviral vector is a lentiviral vector, and the method comprises ~~comprising~~:

integrating one or more but not all of, sequences of gag, pol and rev genes of a lentivirus, a coding sequence of a viral envelope protein, and a viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, into the genome of a host cell using an SB transposon system, and further

integrating the remaining one or more of, the sequences of gag, pol and rev genes of the lentivirus, the coding sequence of the viral envelope protein, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, into the genome of the host cell using a PB transposon system,

5 or

integrating one or more but not all of, sequences of gag, pol and rev genes of a lentivirus, a coding sequence of a viral envelope protein, and a viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, into the genome of a host cell using a PB transposon system, and further

10 integrating the remaining one or more of, the sequences of gag, pol and rev genes of the lentivirus, the coding sequence of the viral envelope protein, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, into the genome of the host cell using a SB transposon system.

15 3. The method of claim 2, wherein the integrating of the sequences of gag, pol and rev genes of the lentivirus and the coding sequence of the viral envelope protein into the genome of the host cell is achieved using the SB transposon system, and the further integrating of the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest into the genome of the host cell is achieved using the PB
20 transposon system, or

the integrating of the sequences of gag, pol and rev genes of the lentivirus and the coding sequence of the viral envelope protein into the genome of the host cell is achieved using the PB transposon system, and the further integrating of the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest
25 into the genome of the host cell is achieved using the SB transposon system.

4. The method of claim 2, wherein the sequences of gag, pol and rev genes of the lentivirus, the coding sequence of the viral envelope protein, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest are
30 located in two or more constructs.

5. The method of claim 4, wherein the sequences of gag and pol genes are located in one construct, and the sequence of rev gene is located in another construct, and the coding sequence of the viral envelope protein is located in a third construct, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest is located in a fourth construct.

6. The method of claim 2, wherein the gag, pol, and rev genes of the lentivirus are gag, pol, and rev genes of HIV-1 virus.

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~~7. The method of claim 2, wherein the viral envelope protein is selected from the group consisting of feline leukemia virus (RD114) envelope protein, amphotropic retrovirus envelope protein, ecotropic retrovirus envelope protein, Baboon ape leukemia virus envelope protein, nipah virus envelope protein, Mokola virus envelope protein, Lymphocytic choriomeningitis virus envelope protein, chikungunya virus envelope protein, Ross river virus envelope protein, Semliki forest virus envelope protein, Sindbis virus envelope protein, Venezuelan equine encephalitis virus envelope protein, Western equine encephalitis virus envelope protein, influenza virus envelope protein, Fowl Plague Virus envelope protein, Chandipura virus and Piry virus envelope protein, simian immunodeficiency virus envelope protein, feline immunodeficiency virus envelope protein, equine infectious anemia virus envelope protein, Ebola virus envelope protein, rabies virus envelope protein, baculovirus envelope protein, hepatitis C virus envelope protein, feline endogenous retrovirus envelope protein, measles virus envelope protein, murine leukemia virus facultative 4070A and 10A1, Gibbon ape leukemia virus envelope protein, human immunodeficiency virus gp120 and a vesicular stomatitis virus glycoprotein (VSV-G).~~

87. The method of claim 2, wherein the viral envelope protein is a vesicular stomatitis virus glycoprotein (VSV-G).

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98. The method of claim 2, wherein SB100X is used as a transposase in the SB system, and/or ePiggyBac is used as a transposase in the PB system.

409. The method of claim 2, wherein the transcription of one or more of the gag, pol and rev genes, the coding sequence of the viral envelope protein, and the viral genome transcriptional cassette carrying the nucleic acid fragment of interest is controllable.

410. The method of claim 409, wherein the viral envelope protein is VSV-G and the transcription of the rev gene and the coding sequence of VSV-G is controllable.

~~12. The method of claim 10, wherein the viral envelope protein is VSV-G and the transcription of the gag, pol and rev genes and the coding sequence of VSV-G is controllable.~~

~~13. The method of claim 10, wherein the controllable transcription is achieved by placing the gene or sequence under the control of an inducible expression system.~~

~~14. The method of claim 13, wherein the inducible expression system is selected from the group consisting of a tetracycline inducible expression system and a Cumate inducible expression system.~~

4511. The method of claim 449, wherein the genes or sequences are placed under a single control of a Tet-On inducible expression system or under a dual control of a Tet-On inducible expression system and a Cumate inducible expression system.

4612. The method of claim 4511, wherein the viral envelope protein is a VSV-G, and

when under the single control of the Tet-On inducible expression system, the transcription of rev is under the control of a TRE_{3G} sequence, and/or the transcription of

the coding sequence of VSV-G is under the control of a TRE_{3G}-intron sequence, and/or the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence or a TRE_{3G}-intron sequence;

when under the dual control of the Tet-On inducible expression system and the
5 Cumate inducible expression system, the transcription of rev is under the control of a TRE_{adv}CuO sequence, a TRE_{adv}CuO-intron sequence, a TRE_{3G} sequence, a TRE_{3G}CuO sequence or a TRE_{3G}CuO-intron sequence, and/or the transcription of VSV-G is under the control of a TRE_{adv}CuO sequence, a TRE_{adv}CuO-intron sequence, a TRE_{3G}-intron sequence or a TRE_{3G}CuO-intron sequence, and/or the transcription of gag and pol is
10 under the control of a eukaryotic promoter-intron sequence, a TRE_{adv}-intron sequence, a TRE_{adv}CuO-intron sequence, a TRE_{3G}-intron sequence or a TRE_{3G}CuO-intron sequence.

~~17. The method of claim 16, wherein,~~

~~when under the single control of the Tet-On inducible expression system, the
15 transcription of rev is under the control of a TRE_{3G} sequence, and the transcription of the coding sequence of VSV-G is under the control of a TRE_{3G}-intron sequence, and the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence or a TRE_{3G}-intron sequence;~~

~~when under the dual control of the Tet-On inducible expression system and the
20 Cumate inducible expression system, the transcription of rev is under the control of a TRE_{3G} sequence or a TRE_{3G}CuO sequence, and the transcription of VSV-G is under the control of a TRE_{3G}CuO-intron sequence, and the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence or a TRE_{3G}CuO-intron sequence.~~

~~25 18. The method of claim 17, wherein, when under the dual control of the Tet-On inducible expression system and the Cumate inducible expression system, the transcription of rev is under the control of a TRE_{3G} sequence, and the transcription of VSV-G is under the control of a TRE_{3G}CuO-intron sequence, and the transcription of gag and pol is under the control of a TRE_{3G}CuO-intron sequence; and the copy number
30 of gag/pol gene inserted into the genome of the host cell is 2-8 copies/cell, and the ratio~~

of the copy number of gag/pol to VSV-G inserted into the genome of the host cell is 1:1 to 4:1.

~~19. The method of claim 18, wherein the copy number of gag/pol gene inserted into the genome of the host cell is 4-6 copies/cell, and the ratio of the copy number of gag/pol to VSV-G inserted into the genome of the host cell is 2:1 to 3:1.~~

~~20~~13. The method of claim ~~15~~11, wherein a coding sequence of a Tet-On transactivator protein, or a coding sequence of a Tet-On transactivator protein and a coding sequence of a repressor CymR protein of Cumate operon, is/are integrated into the genome of the host cell using an SB transposon system or a PB transposon system.

~~21. The method of claim 20, wherein the Tet-On transactivator protein is rtTA_{3G}.~~

~~22~~14. The method of claim ~~15~~11, wherein the sequences of gag, pol and rev genes of the lentivirus, the coding sequence of the viral envelope protein, and the coding sequence of the Tet-On transactivator protein, or the coding sequence of the Tet-On transactivator protein and the coding sequence of the repressor CymR protein of Cumate operon are integrated into the genome of the host cell using an SB transposon system, and then the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest is further integrated into the genome of the host cell using a PB transposon system; or

the sequences of gag, pol and rev genes of the lentivirus, the coding sequence of the viral envelope protein, and the coding sequence of the Tet-On transactivator protein, or the coding sequence of the Tet-On transactivator protein and the coding sequence of the repressor CymR protein of Cumate operon are integrated into the genome of the host cell using a PB transposon system, and then the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest is further integrated into the genome of the host cell using an SB transposon system.

~~23. A producer cell prepared by the method of any one of claims 1-22.~~

~~24. The producer cell of claim 23, wherein the producer cell was deposited at the China General Microbiological Culture Collection Center (CGMCC) on April 13, 2020 with CGMCC No. 19675.~~

~~25~~15. A producer cell for producing a retroviral vector carrying a nucleic acid fragment of interest, wherein the producer cell is integrated in the genome thereof with a sequence of gag and pol genes of a retrovirus, a coding sequence of a viral envelope protein, and a viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest; and

wherein each of, the sequence of the gag and pol genes, the coding sequence of the viral envelope protein, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, has IR/DR sequences for recognition by an SB transposase or ITR sequences for recognition by a PB transposase at both ends thereof, and both the IR/DR sequences and the ITR sequences are present in the producer cell.

~~26~~16. The producer cell of claim ~~25~~15, wherein

each of, the sequence of the gag and pol genes and the coding sequence of the viral envelope protein, has IR/DR sequences for recognition by an SB transposase at both ends thereof, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest has ITR sequences for recognition by a PB transposase at both ends thereof, or

each of, the sequence of the gag and pol genes and the coding sequence of the viral envelope protein, has ITR sequences for recognition by a PB transposase at both ends thereof, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest has IR/DR sequences for recognition by an SB transposase at both ends thereof.

17. A producer cell for producing a lentiviral vector carrying a nucleic acid

fragment of interest, wherein the producer cell is integrated in the genome thereof with a sequence of gag and pol genes of a lentivirus, a sequence of rev gene of a lentivirus, a coding sequence of a viral envelope protein, and a viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest; and

5 wherein each of, the sequence of gag and pol genes, the sequence of rev gene, the coding sequence of the viral envelope protein, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest, has IR/DR sequences for recognition by an SB transposase or ITR sequences for recognition by a PB transposase at both ends thereof, and both the IR/DR sequences and the ITR sequences
10 are present in the producer cell.

~~27. The producer cell of claim 25, wherein the retrovirus is a lentivirus, and the producer cell is further integrated in the genome thereof with a sequence of rev gene of a lentivirus, and the sequence of the rev gene has IR/DR sequences for recognition by~~
15 ~~an SB transposase or ITR sequences for recognition by a PB transposase at both ends thereof.~~

~~28. The producer cell of claim 27, wherein the retrovirus is an HIV-1 virus.~~

20 ~~29~~18. The producer cell of claim ~~27~~17, wherein

each of, the sequence of the gag and pol genes, the sequence of the rev gene and the coding sequence of the viral envelope protein, has IR/DR sequences for recognition by an SB transposase at both ends thereof, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest has ITR sequences for
25 recognition by a PB transposase at both ends thereof; or

each of, the sequence of the gag and pol genes, the sequence of the rev gene and the coding sequence of the viral envelope protein, has ITR sequences for recognition by a PB transposase at both ends thereof, and the viral genome transcriptional cassette sequence carrying the nucleic acid fragment of interest has IR/DR sequences for
30 recognition by an SB transposase at both ends thereof.

~~30. The producer cell of claim 25, wherein the viral envelope protein is a vesicular stomatitis virus glycoprotein (VSV-G).~~

5 ~~31~~19. The producer cell of claim ~~23~~ or claim ~~25~~15 or 17, wherein the nucleic acid fragment of interest has recognition sequences for a site-specific recombinase system at both ends thereof and/or the coding sequence of the envelope protein has recognition sequences for a site-specific recombinase system at both ends thereof.

10 ~~32. A system for replacing a nucleic acid fragment of interest and/or an envelope protein in a retroviral vector, comprising: the producer cell of claim 31, a site-specific recombinase system, and a nucleic acid fragment of interest and/or a coding sequence of an envelope protein for replacement.~~

15 ~~33. The system of claim 32, wherein the site-specific recombinase system is FLP-FRT or Cre-lox recombinase system.~~

20 ~~34. The system of claim 32, wherein the original nucleic acid fragment of interest in the producer cell comprises or is linked to a marker gene and/or the coding sequence of the original envelope protein in the producer cell is linked to a marker gene, and the marker gene linked to the nucleic acid fragment of interest for replacement and/or to the coding sequence of the envelope protein for replacement is different from the original marker gene in the producer cell.~~

25 ~~35. The system of claim 34, wherein the maker gene is a resistance gene sequence for a eukaryotic cell, a metabolic pathway screening gene, a fluorescent protein marker gene, a protease gene used for reporter gene detection, or any combination thereof.~~

36. The system of claim 35, wherein the resistance gene sequence is selected from a ~~hygromycin resistance gene, a puromycin resistance gene, a neomycin resistance gene, a blasticidin resistance gene, a bleomycin resistance gene.~~

5 37. The system of claim 35, wherein the metabolic pathway screening gene is selected from a gene encoding ~~dihydrofolate reductase, glutamine synthetase or thymidine kinase.~~

10 38. The system of claim 35, wherein the fluorescent protein marker gene is selected from a gene sequence encoding ~~Green Fluorescent Protein (EGFP), red fluorescent protein (dsRed), cherry fluorescent protein (mcherry), cyan fluorescent protein (ECFP), yellow fluorescent protein (EYFP), and the derivatives thereof.~~

15 39. The system of claim 35, wherein the protease gene used for reporter gene detection is selected from a gene sequence encoding ~~luciferase, β -galactosidase or chloramphenicol acetyltransferase.~~

20 40. A method for replacing a nucleic acid fragment of interest and/or an envelope protein in a retrovirus producer cell, comprising: providing the producer cell of claim 31, and replacing the original nucleic acid fragment of interest and/or a coding sequence of the original envelope protein in the producer cell with a nucleic acid fragment of interest for replacement and/or a coding sequence of an envelope protein for replacement using a site specific recombinase system.

25 41. The method of claim 40, wherein the site specific recombinase system is a FLP-FRT or Cre lox recombinase system.

30 42. The method of claim 40, wherein the original nucleic acid fragment of interest in the producer cell comprises or is linked to a marker gene and/or the coding sequence of the original envelope protein in the producer cell is linked to a marker gene, and the

marker gene linked to the nucleic acid fragment of interest for replacement and/or the coding sequence of the envelope protein for replacement is different from the original marker gene in the producer cell.

5 43. The method of claim 42, wherein the maker gene is a resistance gene sequence for a eukaryotic cell, a metabolic pathway screening gene, a fluorescent protein marker gene, a protease gene used for reporter gene detection, or any combination thereof.

10 44. The method of claim 43, wherein the resistance gene sequence is selected from hygromycin resistance gene, puromycin resistance gene, neomycin resistance gene, blasticidin resistance gene, bleomycin resistance gene.

15 45. The method of claim 43, wherein the metabolic pathway screening gene is selected from a gene encoding dihydrofolate reductase, glutamine synthetase or thymidine kinase.

20 46. The method of claim 43, wherein the fluorescent protein marker gene is selected from a gene sequence encoding Green Fluorescent Protein (EGFP), red fluorescent protein (dsRed), cherry fluorescent protein (mcherry), cyan fluorescent protein (ECFP), yellow fluorescent protein (EYFP), and the derivatives thereof.

25 47. The method of claim 43, wherein the protease gene used for reporter gene detection is selected from a gene sequence encoding luciferase, β galactosidase or chloramphenical acetyltransferase.

48. A retrovirus producer cell obtained by the method for replacing a nucleic acid fragment of interest and/or an envelope protein in a retrovirus producer cell of claim 40.

30 49. A method for producing a retroviral vector carrying a nucleic acid fragment of interest, comprising the following steps:

adding an inducer(s) of the inducible expression system(s) to the producer cell of any one of claims 23-31 or the producer cell of claim 48, and

collecting and purifying the retroviral vector carrying the nucleic acid fragment of interest.

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50. The method of claim 49, wherein the inducer(s) is(are) tetracycline or a derivative thereof and/or Cumate or a functional analogue thereof.

51. The method of claim 50, wherein the tetracycline derivative is doxycycline.

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52. A retroviral vector carrying a nucleic acid fragment of interest prepared by the method of claim 49.

53. Use of the producer cell of any one of claims 23-31, the producer cell of claim 48 or the retroviral vector carrying a nucleic acid fragment of interest of claim 52 in the preparation of a reagent for delivering a nucleic acid fragment of interest into a cell.

54. A method for preparing a lentiviral vector packaging/producer cell, comprising: introducing sequences of gag, pol and rev genes of a lentivirus and a coding sequence of a vesicular stomatitis virus glycoprotein (VSV-G) into a host cell, wherein the transcription of one or more of the gag, pol and rev genes and the coding sequence of VSV-G is under a single control of a Tet-On inducible expression system or under a dual control of a Tet-On inducible expression system and a Cumate inducible expression system, when under the single control of the Tet-On inducible expression system, the transcription of rev is under the control of a TRE_{3G} sequence, and/or the transcription of the coding sequence of VSV-G is under the control of a TRE_{3G} intron sequence, and/or the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence or a TRE_{3G} intron sequence; when under the dual control of the Tet-On inducible expression system and the Cumate inducible expression system, the transcription of rev is under the control of a TRE_{adv}CuO sequence, a TRE_{adv}CuO-

intron sequence, a TRE_{3G} sequence, a TRE_{3G}CuO sequence or a TRE_{3G}CuO-intron sequence, and/or the transcription of VSV-G is under the control of a TRE_{adv}CuO sequence, a TRE_{adv}CuO-intron sequence, a TRE_{3G}-intron sequence or a TRE_{3G}CuO-intron sequence, and/or the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence, a TRE_{adv}-intron sequence, a TRE_{adv}CuO-intron sequence, a TRE_{3G}-intron sequence or a TRE_{3G}CuO-intron sequence.

55. The method of claim 54, wherein, when under the single control of the Tet-On inducible expression system, the transcription of rev is under the control of a TRE_{3G} sequence, and the transcription of the coding sequence of VSV-G is under the control of a TRE_{3G}-intron sequence, and the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence or a TRE_{3G}-intron sequence; when under the dual control of the Tet-On inducible expression system and the Cumate inducible expression system, the transcription of rev is under the control of a TRE_{3G} sequence or a TRE_{3G}CuO sequence, and the transcription of VSV-G is under the control of a TRE_{3G}CuO-intron sequence, and the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence or a TRE_{3G}CuO-intron sequence.

56. The method of claim 54, wherein the sequences of the gag, pol and rev genes of the lentivirus and the coding sequence of VSV-G are integrated into the genome of the host cell.

57. The method of claim 56, wherein the sequences of the gag, pol and rev genes of the lentivirus and the coding sequence of VSV-G are integrated into the genome of the host cell by an SB or PB transposon system.

58. The method of claim 56, wherein, when under the dual control of the Tet-On inducible expression system and the Cumate inducible expression system, the transcription of rev is under the control of a TRE_{3G} sequence, and the transcription of VSV-G is under the control of a TRE_{3G}CuO-intron sequence, and the transcription of

~~gag and pol is under the control of a TRE_{3G}CuO-intron sequence; and the copy number of gag/pol gene inserted into the genome of the host cell is 2-8 copies/cell, and the ratio of the copy number of gag/pol to VSV-G inserted into the genome of the host cell is 1:1 to 4:1.~~

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~~59. The method of claim 58, wherein the copy number of gag/pol gene inserted into the genome of the host cell is 4-6 copies/cell, and the ratio of the copy number of gag/pol to VSV-G inserted into the genome of the host cell is 2:1 to 3:1.~~

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~~60. The method of claim 56, wherein after the sequences of gag, pol and rev genes of the lentivirus and the coding sequence of VSV-G being integrated into the genome of the host cell by the SB or PB transposon system, a viral genome transcriptional cassette sequence carrying a nucleic acid fragment of interest is further integrated into the genome of the host cell by the same transposon system or is further introduced into the host cell using a transient transfection method.~~

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~~61~~20. A lentiviral vector packaging/producer cell, comprising sequences of gag, pol and rev genes of a lentivirus and a coding sequence of a vesicular stomatitis virus glycoprotein (VSV-G), wherein the transcription of one or more of the gag, pol and rev genes and the coding sequence of VSV-G is under a single control of a Tet-On inducible expression system or under a dual control of a Tet-On inducible expression system and a Cumate inducible expression system,

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when under the single control of the Tet-On inducible expression system, the transcription of rev is under the control of a TRE_{3G} sequence, and/or the transcription of the coding sequence of VSV-G is under the control of a TRE_{3G}-intron sequence, and/or the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence or a TRE_{3G}-intron sequence;

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when under the dual control of the Tet-On inducible expression system and the Cumate inducible expression system, the transcription of rev is under the control of a TRE_{adv}CuO sequence, a TRE_{adv}CuO-intron sequence, a TRE_{3G} sequence, a TRE_{3G}CuO

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sequence or a TRE_{3G}CuO-intron sequence, and/or the transcription of VSV-G is under the control of a TRE_{adv}CuO sequence, a TRE_{adv}CuO-intron sequence, a TRE_{3G}-intron sequence or a TRE_{3G}CuO-intron sequence, and/or the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence, a TRE_{adv}-intron sequence, a
5 TRE_{adv}CuO-intron sequence, a TRE_{3G}-intron sequence or a TRE_{3G}CuO-intron sequence.

~~62. The lentiviral vector packaging/producer cell of claim 61, wherein the sequence of the gag gene and/or the sequence of the pol gene and/or the sequence of the rev gene of the lentivirus and/or the coding sequence of the vesicular stomatitis virus glycoprotein (VSV-G) are integrated into the genome of the packaging/producer cell.~~
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~~63. The lentiviral vector packaging/producer cell of claim 61, wherein, when under the single control of the Tet On inducible expression system, the transcription of rev is under the control of a TRE_{3G}-sequence, and the transcription of the coding sequence of VSV-G is under the control of a TRE_{3G}-intron sequence, and the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence or a TRE_{3G}-intron sequence; when under the dual control of the Tet On inducible expression system and the Cumate inducible expression system, the transcription of rev is under the control of a TRE_{3G}-sequence or a TRE_{3G}CuO sequence, and the transcription of VSV-G is under the control of a TRE_{3G}CuO-intron sequence, and the transcription of gag and pol is under the control of a eukaryotic promoter-intron sequence or a TRE_{3G}CuO-intron sequence.~~
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~~64. The lentiviral vector packaging/producer cell of claim 61, wherein, when under the dual control of the Tet On inducible expression system and the Cumate inducible expression system, the transcription of rev is under the control of a TRE_{3G}-sequence, and the transcription of VSV-G is under the control of a TRE_{3G}CuO-intron sequence, and the transcription of gag and pol is under the control of a TRE_{3G}CuO-intron sequence, and the copy number of gag/pol gene inserted into the genome of the~~
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packaging/producer cell is 2-8 copies/cell, and the ratio of the copy number of gag/pol to VSV-G inserted into the genome of the packaging/producer cell is 1:1 to 4:1.

5 65. The lentiviral vector packaging/producer cell of claim 64, wherein the copy number of gag/pol gene inserted into the genome of the packaging/producer cell is 4-6 copies/cell, and the ratio of the copy number of gag/pol to VSV-G inserted into the genome of the host cell is 2:1 to 3:1.

10 66. The lentiviral vector packaging/producer cell of claim 61, wherein the packaging/producer cell was deposited at the China General Microbiological Culture Collection Center (CGMCC) on April 13, 2020 with CGMCC No. 19674.

15 67. A method for producing a lentiviral vector, comprising culturing the packaging/producer cell of any one of claims 61 to 66 under conditions suitable for producing a lentiviral vector.