CLAIMS

1. A ~~vaccine combination comprising~~

   ~~(a) a first composition comprising an immunologically effective amount of a~~ recombinant MVA vector comprising a first nucleic acid encoding at least one immunogenic protein of a MARV envelope glycoprotein (GP); a second nucleic acid encoding an immunogenic protein of Zaire Ebola virus (ZEBOV) envelope glycoprotein; a third nucleic acid encoding an immunogenic protein of Sudan Ebola virus (SEBOV) envelope glycoprotein; and a fourth nucleic acid encoding an immunogenic protein of Ebola virus Ivory Coast nucleoprotein~~an antigenic protein of at least one filovirus subtype, together with a pharmaceutically acceptable carrier; and~~

   ~~(b) a second composition comprising an immunologically effective amount of a fowlpox vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;~~

   ~~wherein one of the compositions is a priming composition and the other composition is a boosting composition~~.

2. The recombinant~~A vaccine combination comprising~~

   ~~(a) a first composition comprising an immunologically effective amount of a~~ MVA vector of claim 1,~~comprising a nucleic acid encoding antigenic proteins of at least two filovirus subtypes, together with a pharmaceutically acceptable carrier; and~~

   ~~(b) a second composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;~~

   wherein the MARV envelope glycoprotein is full-length MARV-Musoke envelope glycoprotein~~one of the compositions is a priming composition and the other composition is a boosting composition~~.

3. The recombinant ~~vaccine combination according to claim 1, wherein the first composition comprises a~~ MVA vector of claim 1, wherein the first nucleic acid encodes an immunogenic protein comprising the sequence set forth in SEQ ID NO:6~~comprising a nucleic acid encoding an antigenic protein of a second filovirus subtype~~.

4. The recombinant ~~vaccine combination according to claims 2-3, wherein the first composition comprises a~~ MVA vector of claim 3, wherein the first ~~comprising a~~

nucleic acid comprises the sequence set forth in SEQ ID NO:5~~encoding an antigenic protein of a third filovirus subtype or a fourth filovirus subtype~~.

~~5. The vaccine combination of claims 1-4, wherein the filovirus subtype is selected from an Ebola virus (EBOV) or a Marburg virus (MARV).~~

~~6. The vaccine combination according to claims 1-5, wherein the antigenic determinant of the EBOV protein is from one or more EBOV subtypes selected from the group consisting of Zaire Ebola virus (ZEBOV), Sudan Ebola virus (SEBOV), Cote d'Ivoire Ebola virus (EBOV-CdI), Reston Ebola virus (EBOV-Reston) and Bundibugyo Ebola virus (BEBOV).~~

~~7. The vaccine combination according to claims 1-6, wherein the antigenic determinant of the filovirus protein is selected from the group consisting of: an envelope glycoprotein (GP), nucleoprotein (NP), virion protein 35 (VP35), virion protein 40 (VP40), virion protein 30 (VP30), virion protein 24 (VP24), and RNA-directed RNA polymerase protein (L).~~

~~8.~~5. The recombinant~~vaccine combination according to claims 1-7, wherein the~~ MVA vector of claim 1 that ~~in the first composition~~ comprises a nucleic acid encoding an immunogenic~~antigenic~~ protein having a sequence selected from the group consisting of: SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:20, SEQ ID NO:29, SEQ ID NO:31, ~~SEQ ID NO:34~~ and SEQ ID NO:37.

~~9. The vaccine combination according to claims 1-8, wherein the MVA vector in the first composition comprises a nucleic acid encoding antigenic proteins from four different filovirus subtypes selected from the group having: SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:20, SEQ ID NO:29 and SEQ ID NO:31.~~

~~10.~~6. The recombinant~~vaccine combination according to claims 1-9, wherein the~~ MVA vector of claim 1 that~~in the first composition~~ comprises a nucleic acid encoding an immunogenic~~antigenic~~ protein~~s~~ comprising the sequence set forth in~~from four different filovirus subtypes selected from the group having:~~ SEQ ID NO:6, SEQ ID NO:20, SEQ ID NO:29, or ~~and~~ SEQ ID NO:31.

~~11. The vaccine combination according to claims 1-10 for use in generating a protective immune response against at least one filovirus subtype, wherein the first composition is used for priming said immune response and the second composition is used for boosting said immune response.~~

~~12. The vaccine combination according to claims 1-10 for use in generating a protective immune response against at least one filovirus subtype, wherein the~~

second composition is used for priming said immune response and the first composition is used for boosting said immune response.

13. The vaccine combination of claims 1-12, wherein the boosting composition comprises two or more doses of the vector of the boosting composition.

14. A kit comprising:

(a) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding an antigenic protein of at least one filovirus subtype, together with a pharmaceutically acceptable carrier; and

(b) a second composition comprising an immunologically effective amount of a fowlpox vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;

wherein one of the compositions is a priming composition and the other composition is a boosting composition.

15. A kit comprising:

(a) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding antigenic proteins of at least two filovirus subtypes, together with a pharmaceutically acceptable carrier; and

(b) a second composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;

wherein one of the compositions is a priming composition and the other composition is a boosting composition.

16. A kit according to claims 14-15, wherein the first composition comprises a MVA vector comprising a nucleic acid encoding an antigenic protein of a second filovirus subtype, a third filovirus subtype or at least four filovirus subtypes.

17. A kit according to claims 14-16, wherein the MVA vector in the first composition comprises a nucleic acid encoding an antigenic protein selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.

18. A kit according to claims 14-16, wherein the MVA vector in the first composition comprises a nucleic acid encoding an antigenic protein selected from the group having: SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:20, SEQ ID NO:29 and SEQ ID NO:31.

19. A kit according to claims 14-16, wherein the MVA vector in the first composition comprises a nucleic acid encoding an antigenic protein selected from the group having: SEQ ID NO:6, SEQ ID NO:20, SEQ ID NO:29 and SEQ ID NO:31.

20. A kit according to claims 14-19, for use in generating a protective immune response against at least one filovirus subtype, wherein the first composition is used for priming said immune response and the second composition is used for boosting said immune response.

21. A kit according to claims 14-19, for use in generating a protective immune response against at least one filovirus subtype, wherein the second composition is used for priming said immune response and the first composition is used for boosting said immune response.

22. A kit according to claim 14-21, wherein the boosting composition comprises two or more doses of the vector of the boosting composition.

23. A recombinant Modified Vaccinia Virus (MVA) vector comprising a nucleotide sequence encoding two or more antigenic determinants of a filovirus protein for use in the treatment and/or prevention of a filovirus-caused disease.

24. The recombinant MVA vector for use according to claim 23, wherein the filovirus is selected from an Ebola virus (EBOV) or a Marburg virus (MARV).

25. The recombinant MVA vector for use according to claims 23 or 24, wherein the antigenic determinant of the EBOV protein is from one or more EBOV subtypes selected from the group consisting of Zaire Ebola virus (ZEBOV), Sudan Ebola virus (SEBOV), Cote d'Ivoire Ebola virus (EBOV-Cdl), Reston Ebola virus (EBOV-Reston) and Bundibugyo Ebola virus (BEBOV).

26. The recombinant MVA vector for use according to claims 23-25, wherein the antigenic determinant of the filovirus proteins is an envelope glycoprotein (GP).

27. The recombinant MVA vector for use according to claims 23-26 comprising a nucleotide sequence encoding an antigenic determinant of two or more Ebola subtypes.

28. The recombinant MVA vector for use according to claim 23-27, wherein the antigenic determinant of the filovirus protein is selected from the group consisting of: an envelope glycoprotein (GP), nucleoprotein (NP), virion protein 35 (VP35), virion protein 40 (VP40), virion protein 30 (VP30), virion protein 24 (VP24), and RNA-directed RNA polymerase protein (L).

~~29. The recombinant MVA vector for use according to claims 23-28, wherein the antigenic determinant of the filovirus protein is selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.~~

~~30. The recombinant MVA vector for use according to claims 23-28, wherein the antigenic determinant of the filovirus proteins comprises SEQ ID NO:29 and/or SEQ ID NO:6, SEQ ID NO:20 and SEQ ID NO:31.~~

~~31.~~7. The recombinant MVA vector ~~of~~for use according to claim~~s~~ ~~6~~23-28, wherein said nucleic acid comprises the ~~nucleotide~~ sequence set forth in~~encoding the antigenic determinants comprise SEQ ID NO: 28 and/or~~ SEQ ID NO:5, SEQ ID NO:19, SEQ ID NO:28, or ~~and~~ SEQ ID NO:30.

~~32. A recombinant MVA vector comprising a nucleotide sequence encoding an antigenic protein of a filovirus glycoprotein and encoding a filovirus virion protein 40 (VP40) for use in the treatment and/or prevention of a filovirus-caused disease.~~

~~33. The recombinant MVA vector for use of claim 32, wherein the nucleotide sequence encoding an antigenic protein of the filovirus virion protein 40 (VP40) comprises SEQ ID NO:33.~~

~~34. A recombinant MVA vector comprising a nucleotide sequence selected from the group consisting of a) SEQ ID NO:5, SEQ ID NO:19 and SEQ ID NO:30, b) SEQ ID NO:5, SEQ ID NO:19, SEQ ID NO:28 and SEQ ID NO:30 and c) SEQ ID NO:19 and SEQ ID NO:33.~~

~~35. The vaccine combination according to claims 1-13, the recombinant MVA vector for use according to claims 23-33 or the recombinant MVA vector of claim 34, wherein the MVA used for generating the recombinant virus is a MVA-BN virus or a derivative having the capability of reproductive replication in vitro in chicken embryo fibroblasts (CEF) cells, but no capability of reproductive replication in the human keratinocyte cell line HaCat, the human bone osteosarcoma cell line 143B, the human embryo kidney cell line 293, and the human cervix adenocarcinoma cell line HeLa.~~

~~36. The vaccine combination according to claims 1-13, the recombinant MVA vector for use according to claims 23-33 or the recombinant MVA vector of claim 34, wherein the MVA used for generating the recombinant virus is MVA-BN as deposited at the European Collection of Animal Cell cultures (ECACC) under accession number V00083008.~~

37. The recombinant MVA vector for use according to claims 23-33, 35 or 36 comprising a nucleic acid encoding a co-stimulatory molecule.

38. The recombinant MVA vector according to claims 23-37 for affecting an immune response in a subject.

39. The recombinant MVA vector according to claims 23-37 for use as medicament or vaccine.

40. A vaccine, a composition or a cell comprising the recombinant MVA vector according to claims 23-37.

41. The recombinant MVA for use according to claims 23-33 or 35-39, wherein the recombinant MVA vector is to be administered once, twice, three times or four times.

42. The recombinant MVA of claims 32-33 for use as a medicament or vaccine for inducing an enhanced immune response against a filovirus infection, wherein the MVA is capable of producing filovirus-like particles in the subject to be treated.

43. A kit comprising the recombinant MVA vector according to claims 23-33 or 35-39 in a first vial or container for a first administration (priming) and in a second vial or container for a second administration (boosting).

44. The kit according to claim 43, comprising in a third, fourth or further vial or container the recombinant MVA vector for a third, fourth or further administration.

45. The use of the vaccine combination of claims 1-11 or the recombinant MVA vector of claims 23-36 for manufacturing a pharmaceutical for treatment and/or prevention of a filovirus-caused disease.

46. A pharmaceutical composition comprising the MVA vector of any one of claims 23-36 and a pharmaceutically acceptable carrier, diluent and/or additive.

47. A recombinant FPV vector comprising a nucleotide sequence encoding at least one antigenic determinant of a filovirus protein under the control of the FPV-40K promoter having SEQ ID NO:26.

48. The recombinant FPV vector of claim 47, wherein the filovirus is selected from an Ebola virus (EBOV) or a Marburg virus (MARV).

49. The recombinant FPV vector according to claim 48, wherein the antigenic determinant of the EBOV protein is from one or more EBOV subtypes selected from the group consisting of Zaire Ebola virus (ZEBOV), Sudan Ebola virus

(SEBOV), Cote d'Ivoire Ebola virus (EBOV-CdI), Reston Ebola virus (EBOV-Reston) and Bundibugyo Ebola virus (BEBOV).

50. The recombinant FPV according to claims 47-49, wherein the antigenic determinant of the filovirus protein is selected from the group consisting of: an envelope glycoprotein (GP), nucleoprotein (NP), virion protein 35 (VP35), virion protein 40 (VP40), virion protein 30 (VP30), virion protein 24 (VP24), and RNA-directed RNA polymerase protein (L).

51. The recombinant FPV vector according to claim 50, wherein the antigenic determinant of the filovirus protein encodes an antigenic protein selected from the group of: SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.

52. The recombinant FPV according to claims 47-51 for use in the treatment and/or prevention of a filovirus-caused disease.

53. The recombinant FPV according to claims 47-51 for use in priming or boosting an immune response against a filovirus.

54. The recombinant FPV for use according to claims 52 or 53, wherein the recombinant FPV vector is to be administered once, twice, three times or four times.

55. The use of the recombinant FPV of claims 47-51 for manufacturing a medicament or vaccine for treatment and/or prevention of a filovirus-caused disease.

56. A method of inducing an immune response against a filovirus in a subject, the method comprising administering to the subject:

(a) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding an antigenic protein of at least one filovirus subtype, together with a pharmaceutically acceptable carrier; and

(b) a second composition comprising an immunologically effective amount of a fowlpox vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;

wherein one of the compositions is a priming composition and the other composition is a boosting composition.

57. A method of inducing an immune response against a filovirus in a subject, the method comprising administering to the subject:

(a) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding antigenic proteins of at least two filovirus subtypes, together with a pharmaceutically acceptable carrier; and

(b) a second composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;

wherein one of the compositions is a priming composition and the other composition is a boosting composition.

58. A method according to claim 56, wherein the first composition comprises a MVA vector comprising a nucleic acid encoding an antigenic protein of a second filovirus subtype.

59. A method according to claim 58, wherein the first composition comprises a MVA vector comprising a nucleic acid encoding an antigenic protein of a third filovirus subtype.

60. A method according to claims 56-59, wherein the MVA vector in the first composition comprises a nucleic acid encoding an antigenic protein selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.

61. A method according to claims 56-59, wherein the MVA vector in the first composition comprises a nucleic acid encoding antigenic proteins of at least four filovirus subtypes.

62. A method according to claims 56-61, wherein the MVA vector in the first composition comprises a nucleic acid encoding antigenic proteins from four different filovirus subtypes having SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.

63. A method according to claims 56-62, wherein the boosting composition is administered 2-12 weeks after administering the priming composition.

64. The method according to claims 56-63, wherein the boosting composition is administered two or more times to the subject.

65. A method for affecting an immune response in a subject comprising administering to the subject the recombinant MVA vector according to claims 23-39.

66. A method of generating a recombinant MVA vector for use in the treatment and/or prevention of a filovirus-caused disease comprising the steps of:

(a) infecting a host cell with a MVA virus,

(b) transfecting the infected cell with a recombinant vector comprising at least one nucleotide sequence encoding an antigenic determinant of any of the filovirus proteins in claims 23-37, said nucleic acid sequence further comprising a genomic MVA virus sequence capable of directing the integration of the at least one nucleotide sequence into the MVA virus genome, and

(c) identifying, isolating and optionally purifying the generated recombinant MVA virus,

preferably wherein the order of step a) and b) can be changed such that step b) is the first step and a) the second.

67. A method of generating a recombinant FPV vector for use in the treatment and/or prevention of a filovirus-caused disease comprising the steps of:

(a) infecting a host cell with an FPV virus,

(b) transfecting the infected cell with a recombinant vector comprising at least one nucleotide sequence encoding an antigenic determinant of any of the filovirus proteins in claims 47-51, said nucleic acid sequence further comprising a genomic FPV virus sequence capable of directing the integration of the at least one nucleotide sequence into the FPV virus genome, and

(c) identifying, isolating and optionally purifying the generated recombinant FPV virus, preferably wherein the order of step a) and b) can be changed such that step b) is the first step and a) the second.

68. A method of inducing an immune response against a filovirus in a subject comprising administering to the subject:

(a) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding at least one antigenic determinant of a filovirus protein; and

(b) a second composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding at least one antigenic determinant of a filovirus protein;

~~OR~~

~~(c) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding at least one antigenic determinant of a filovirus protein; and~~

~~(d) a second composition comprising an immunologically effective amount of an FPV vector comprising a nucleic acid encoding at least one antigenic determinant of a filovirus protein~~

~~wherein one of the compositions is a priming composition and the other composition is a boosting composition.~~

~~69. The method of claims 68, wherein the antigenic determinant is an EBOV glycoprotein, preferably a EBOV glycoprotein selected from the group consisting of Zaire Ebola virus (ZEBOV), Sudan Ebola virus (SEBOV), Cote d'Ivoire Ebola virus (EBOV-Cdl), Reston Ebola virus (EBOV-Reston) and Bundibugyo Ebola virus (BEBOV).~~

~~70. The method of claims 68, wherein the antigenic determinant of the filovirus protein is selected from the group consisting of an envelope glycoprotein (GP), nucleoprotein (NP), virion protein 35 (VP35), virion protein 40 (VP40), virion protein 30 (VP30), virion protein 24 (VP24), and RNA-directed RNA polymerase protein (L).~~

~~71. The method according to claims 70, wherein the antigenic determinant of the filovirus protein is selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.~~

~~72.~~8. The recombinant MVA vector of claim 1, wherein, when administered, the administration ~~A method of~~ provides~~ing~~ protective immunity or a protective immune response in the~~a~~ subject.~~, the method comprising administering to the subject:~~

~~(a) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding an antigenic protein of at least one filovirus subtype, together with a pharmaceutically acceptable carrier; and~~

~~(b) a second composition comprising an immunologically effective amount of a fowlpox vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;~~

wherein one of the compositions is a priming composition and the other composition is a boosting composition.

73. A method of providing protective immunity or a protective immune response in a subject comprising administering to the subject:

(a) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding antigenic proteins of at least two filovirus subtypes, together with a pharmaceutically acceptable carrier; and

(b) a second composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;

wherein one of the compositions is a priming composition and the other composition is a boosting composition.

74. A method according to claim 72 wherein the first composition comprises a MVA vector comprising a nucleic acid encoding an antigenic protein of a second filovirus subtype.

75. A method according to claim 74, wherein the first composition comprises a MVA vector comprising a nucleic acid encoding an antigenic protein of a third filovirus subtype.

76.9. The recombinantA method according to claims 72-75, wherein the MVA vector of claim 1, wherein in the recombinant MVA vector first composition comprises at least onea nucleic acid encoding the sequences set forth inan antigenic protein selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, and SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.

77.10. The recombinantA method according to claims 72-75, wherein the MVA vector of claim 1 further comprising in the first composition comprises a nucleic acid encoding CD40L antigenic proteins of at least four filovirus subtypes.

78.11. The recombinantA method according to claims 72-77, wherein the MVA vector of claim 10, wherein in the CD40L comprises the amino acid sequence set forth infirst composition comprises a nucleic acid encoding antigenic proteins from four different filovirus subtypes having SEQ ID NO:102, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.

79. A method according to claims 72-78, wherein the boosting composition is administered 2-12 weeks after administering the priming composition.

80. The method according to claims 72-79, wherein the boosting composition is administered two or more times to the subject.

81. A method according to claim 72, wherein the first composition comprises a MVA vector comprising a nucleic acid encoding an antigenic protein of a second filovirus subtype.

82. A method according to claim 72 or 73, wherein the first composition comprises a MVA vector comprising a nucleic acid encoding an antigenic protein of a third filovirus subtype.

83.12. The recombinantA method according to claims 72-82, wherein the MVA vector of claim 11, wherein in the first composition comprises a nucleic acid encoding CD40L comprises the sequence set forth inan antigenic protein selected from the group consisting of SEQ ID NO:92, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.

84. A method according to claims 72-82, wherein the MVA vector in the first composition comprises a nucleic acid encoding antigenic proteins of at least four filovirus subtypes.

85. A method according to claims 72-84, wherein the MVA vector in the first composition comprises a nucleic acid encoding antigenic proteins from four different filovirus subtypes having SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO: 20, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:34 and SEQ ID NO:37.

86. A method according to claims 84-85, wherein the boosting composition is administered 2-12 weeks after administering the priming composition.

87. The method according to claims 72-86, wherein the boosting composition is administered two or more times to the subject.

88. A method for production of filovirus-like particles in a subject comprising administering to the subject:

(a) an immunologically effective amount of a MVA vector comprising a nucleic acid encoding antigenic proteins of at least one filovirus glycoprotein and a filovirus virion protein 40 (VP40), together with a pharmaceutically acceptable carrier; and

(b) an immunologically effective amount of a fowlpox vector or a MVA vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;

wherein one of the vectors is a priming vaccine and the other vector is a boosting vaccine.

89. A method for production of filovirus-like particles in a subject comprising administering to the subject:

(a) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding antigenic proteins of at least one filovirus glycoprotein and a filovirus virion protein 40 (VP40), together with a pharmaceutically acceptable carrier; and

(b) a second composition comprising an immunologically effective amount of a fowlpox vector or a MVA vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;

wherein one of the compositions is a priming composition and the other composition is a boosting composition.

90. A method of inducing an enhanced immune response against a filovirus in a subject, the method comprising production of filovirus-like particles in the subject by administering to the subject:

(a) an immunologically effective amount of a MVA vector comprising a nucleic acid encoding antigenic proteins of at least one filovirus glycoprotein and a filovirus virion protein 40 (VP40), together with a pharmaceutically acceptable carrier; and

(b) an immunologically effective amount of a fowlpox vector or a MVA vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;

wherein one of the vectors is a priming vaccine and the other vector is a boosting vaccine.

91. A method of inducing an enhanced immune response against a filovirus in a subject, the method comprising production of filovirus-like particles in the subject by administering to the subject:

(a) a first composition comprising an immunologically effective amount of a MVA vector comprising a nucleic acid encoding antigenic proteins of at least one filovirus glycoprotein and a filovirus virion protein 40 (VP40), together with a pharmaceutically acceptable carrier; and

(b) a second composition comprising an immunologically effective amount of a fowlpox vector or a MVA vector comprising a nucleic acid encoding an antigenic protein of a first filovirus subtype, together with a pharmaceutically acceptable carrier;

wherein one of the compositions is a priming composition and the other composition is a boosting composition.

92. The method according to claims 88 to 91, wherein the filovirus VP40 is selected from the group consisting of Zaire Ebola virus (ZEBOV), Sudan Ebola virus (SEBOV), Cote d'Ivoire Ebola virus (EBOV-CdI), Reston Ebola virus (EBOV-Reston) and Bundibugyo Ebola virus (BEBOV).

93. The method according to claims 88 to 91, wherein the filovirus VP40 is selected from one or more ZEBOV, SEBOV and MARV.

94. The method according to claims 88 to 91, wherein the filovirus VP40 is selected from the group of Zaire-Mayinga or Marburg-Musoke.

95. The method according to claims 88 to 91, wherein the filovirus glycoprotein and the filovirus VP40 are selected from the same filovirus strain.

96. The method according to claims 88 to 91, wherein the MVA vector further comprises a nucleic acid encoding a filovirus nucleoprotein (NP), preferably wherein the filovirus nucleoprotein and the filovirus VP40 are derived from the same filovirus strain.

97. The method according to claim 96, wherein the filovirus strain is selected from the group of Zaire-Mayinga, Zaire-Kikwit, Zaire-Gabon, Cote d'Ivoire Ebola virus, Sudan-Boniface, Sudan-Maleo, Sudan-Gulu, Marburg-Ravn, Marburg-Ozolin, Marburg-Ratayczak, Marburg-Musoke, Marburg-Angola, preferably Zaire-Mayinga or Cote d'Ivoire Ebola virus.

98. The method according to claims 88 to 96, wherein the filovirus VP40 comprises a nucleic acid encoding the protein sequence of SEQ ID NO:34.

99. The method according to claims 88 to 96, wherein the nucleic acid encoding the antigenic protein of the filovirus VP40 comprises SEQ ID NO:33.

~~100. The method according to claims 88 to 99, wherein the recombinant fowlpox vector is to be administered once, twice, three times or four times.~~