CLAIMS

1. An isolated polynucleotide comprising a nucleotide sequence that is at least 90% identical to, or complementary to, at least 300 contiguous nucleotides of anyone of SEQ ID NOs: 2, 1, and 3.

2. The isolated polynucleotide of claim 1, wherein said nucleotide sequence is at least 95% or 100% identical to, or complementary to, at least 300 contiguous nucleotides of any one of SEQ ID NOs: 2, 1, and 3, optionally wherein said nucleotide sequence comprises all or a portion of any one of SEQ ID NOs: 4-18.

3. A recombinant vector comprising an isolated polynucleotide of claim 1 or 2.

4. The recombinant vector of claim 3, wherein said vector is
(i) an sAd4310A adenoviral vector comprising any one of SEQ ID NOs: 40-45, or
(ii) an sAd4287 adenoviral vector comprising any one of SEQ ID NOs: 34-39,
(iii) an sAd4312 adenoviral vector comprising any one of SEQ ID NOs: 46-51.

5. A recombinant adenovirus comprising an isolated polynucleotide of claim 1 or 2.

6. The recombinant adenovirus of claim 5, wherein said isolated polynucleotide comprises a deletion in or of the E1 region, said deletion rendering said recombinant virus a replication-defective virus, optionally wherein said isolated polynucleotide comprises a deletion in or of the E3 region and/or E4 region and/or said recombinant adenovirus further comprises a heterologous nucleotide sequence encoding an antigenic or therapeutic gene product of interest, or fragment thereof.

7. The recombinant adenovirus of claim 6, wherein said antigenic gene product, or fragment thereof, comprises a bacterial, viral, parasitic, or fungal protein, or fragment thereof, optionally wherein:

(i) said viral protein, or fragment thereof, is from a viral family selected from the group consisting of *Retroviridae,* such as human immunodeficiency virus (HIV), such as an Env, Gag, Pol, Nef, Tat, Rev, Vif, Vpr, or Vpu protein, or a fragment thereof, *Flaviviridae,* such as hepatitis C virus (HCV), yellow fever virus, and Japanese encephalitis virus, *Arenaviridae, Bunyaviridae, Filoviridae,* such as Ebola virus and Marburg virus, *Togaviridae,* such as rubella virus, *Poxviridae*, such as *Variola major, Variola minor,* and monkeypox virus, *Herpesviridae,* such as varicella zoster virus (VZV), cytomegalovirus (CMV), and herpes simplex virus (HSV), *Orthomyxoviridae,* such as influenza, *Coronaviridae, Rhabdoviridae,* such as rabies virus, *Paramyxoviridae,* such as measles virus and mumps virus, *Picornaviridae,* such as hepatitis A virus (Hep A) and poliovirus, *Hepadnaviridae,* such as hepatitis B virus (HBV), *Papillomaviridae,* such as human papillomavirus (HPV), *Parvoviridae, Astroviridae*, *Polyomaviridae, Calciviridae,* and *Reoviridae,* such as rotavirus; or

(ii) said bacterial protein, or fragment thereof, is from *Mycobacterium tuberculosis, Mycobacterium bovis, Mycobacterium africanum, Mycobacterium microti, Mycobacterium leprae, Pseudomonas aeruginosa, Salmonella typhimurium, Escherichia coli, Klebsiella pneumoniae, Streptococcus pneumoniae, Staphylococcus aureus, Francisella tularensis, Brucella, Burkholderia mallei, Yersinia pestis, Corynebacterium diphtheria, Neisseria meningitidis, Bordetella pertussis, Clostridium tetani,* or *Bacillus anthracis;* or

(iii) said parasitic protein, or fragment thereof, is from *Toxoplasma gondii, Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, Trypanosoma* spp., or *Legionella* spp; or

(iv) said fungal protein, or fragment thereof, is from *Aspergillus, Blastomyces dermatitidis, Candida, Coccidioides immitis, Cryptococcus neoformans, Histoplasma capsulatum var. capsulatum, Paracoccidioides brasiliensis, Sporothrix schenckii, Zygomycetes* spp., *Absidia corymbifera, Rhizomucor pusillus,* or *Rhizopus arrhizus.*

8. The recombinant adenovirus of any one of claims 5-7, for use in treating a subject having a disease.

9. The recombinant adenovirus for use according to claim 8, wherein said recombinant adenovirus comprises an antigenic gene product, or fragment thereof, that promotes an immune response in said subject against an infective agent, optionally wherein said infective agent is:

(i) a virus from a viral family selected from the group consisting of *Retroviridae,* such as human immunodeficiency virus (HIV), such as an Env, Gag, Pol, Nef, Tat, Rev, Vif, Vpr, or Vpu protein, or a fragment thereof, *Flaviviridae,* such as hepatitis C virus (HCV), yellow fever virus, and Japanese encephalitis virus, *Arenaviridae, Bunyaviridae, Filoviridae,* such as Ebola virus and Marburg virus, *Togaviridae,* such as rubella virus, *Poxviridae,* such as *Variola major, Variola minor,* and monkeypox virus, *Herpesviridae,* such as varicella zoster virus (VZV), cytomegalovirus (CMV), and herpes simplex virus (HSV), *Orthomyxoviridae,* such as influenza, *Coronaviridae, Rhabdoviridae,* such as rabies virus, *Paramyxoviridae,* such as measles virus and mumps virus, *Picornaviridae,* such as hepatitis A virus (Hep A) and poliovirus, *Hepadnaviridae,* such as hepatitis B virus (HBV), *Papillomaviridae,* such as human papillomavirus (HPV), *Parvoviridae, Astroviridae, Polyomaviridae, Calciviridae,* and *Reoviridae,* such as rotavirus; or

(ii) a bacterium, such as a *Mycobacterium tuberculosis, Mycobacterium bovis, Mycobacterium africanum, Mycobacterium microti, Mycobacterium leprae, Pseudomonas aeruginosa, Salmonella typhimurium, Escherichia coli, Klebsiella pneumoniae, Streptococcus pneumoniae, Staphylococcus aureus, Francisella tularensis, Brucella, Burkholderia mallei, Yersinia pestis, Corynebacterium diphtheria, Neisseria meningitidis, Bordetella pertussis, Clostridium tetani,* or *Bacillus anthracis;* or

(iii) a parasite, such as *Toxoplasma gondii, Plasmodium falciparum , Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, Trypanosoma* spp., or *Legionella* spp; or

(iv) a fungus, such as *Aspergillus, Blastomyces dermatitidis, Candida, Coccidioides immitis, Cryptococcus neoformans, Histoplasma capsula tum var. capsulatum, Paracoccidioides brasiliensis, Sporothrix schenckii, Zygomycetes* spp., *Absidia corymbifera, Rhizomucor pusillus,* or *Rhizopus arrhizus.*

10. The recombinant adenovirus for use according to claim 8 or 9, wherein said disease is acquired immune deficiency syndrome (AIDS), cancer, tuberculosis, leprosy, typhoid fever, pneumonia, meningitis, staphylococcal scalded skin syndrome (SSSS), Ritter's disease, tularemia (rabbit fever), brucellosis, Glanders disease, bubonic plague, septicemic plague, pneumonic plague, diphtheria, pertussis (whooping cough), tetanus, anthrax, hepatitis, smallpox, monkeypox, measles, mumps, rubella, chicken pox, polio, rabies, Japanese encephalitis, herpes, mononucleosis, influenza, Ebola virus disease, hemorrhagic fever, yellow fever, Marburg virus disease, toxoplasmosis, malaria, trypanosomiasis, legionellosis, aspergillosis, blastomycosis, candidiasis (thrush), coccidioidomycosis, cryptococcosis, histoplasmosis, paracoccidioidomycosis, sporotrichosis, or sinus-orbital zygomycosis.

11. The recombinant adenovirus for use according to any one of claims 8-10, wherein said subject is human.

12. The recombinant adenovirus for use according to any one of claims 8-11, wherein:

(a) said recombinant adenovirus is formulated for intramuscular, intravenous, intradermal, percutaneous, intraarterial, intraperitoneal, intralesional, intracranial, intraarticular, intraprostatical, intrapleural, intratracheal, intranasal, intravitreal, intravaginal, intrarectal, topical, intratumoral, peritoneal, subcutaneous, subconjunctival, intravesicular, mucosal, intrapericardial, intraumbilical, intraocular, oral, topical, or local administration, for administration by inhalation, injection, infusion, continuous infusion, localized perfusion bathing target cells directly, catheter, lavage, or gavage, or in a creme or lipid composition; and/or

(b) said adenovirus is formulated as a pharmaceutical composition comprising a pharmaceutically acceptable carrier.

13. The recombinant adenovirus for use according to claim 12, wherein said pharmaceutical composition is formulated for administration in at least one or two doses, optionally wherein said pharmaceutical composition is formulated for administration as prime boost.

14. A method of producing a recombinant adenovirus according to any one of claims 5-7, wherein said method comprises culturing a cell in a suitable medium; transfecting said cell with an isolated polynucleotide according to claim 1 or 2 or a recombinant vector according to claim 3 or 4 allowing replication of said polynucleotide or vector in said cell; and harvesting produced recombinant adenovirus from said medium and/or said cell.

15. The method of claim 14, wherein said cell is a bacterial, plant, or mammalian cell, optionally wherein said mammalian cell is a Chinese hamster ovary (CHO) cell.

CLAIMS

1. An isolated polynucleotide comprising a nucleotide sequence that is:

(i) greater than 97% identical to at least 300 contiguous nucleotides of the nucleic acid sequence of SEQ ID NO: 1, or a complementary sequence thereto,

(ii) greater than 96% identical to at least 300 contiguous nucleotides of the nucleic acid sequence of SEQ ID NO: 2, or a complementary sequence thereto, or

(iii) greater than 91% identical to at least 300 contiguous nucleotides of the nucleic acid sequence of SEQ ID NO: 3, or a complementary sequence thereto.

2. An isolated polynucleotide comprising a nucleotide sequence that is at least 90% identical to one or more hexon hypervariable regions (HVRs) 1 to 7 set forth within SEQ ID NOs: 10-12, or a complementary sequence thereto.

3. The isolated polynucleotide of claim 2, wherein said isolated polynucleotide comprises at least 300 contiguous nucleotides of the nucleic acid sequence of any one of SEQ ID NOs: 10-12, or a complementary sequence thereto.

4. The isolated polynucleotide of claim 2 or 3, wherein said isolated polynucleotide comprises a nucleotide sequence that is at least 90% identical to one or more of:

(i) HVR1 comprising nucleotides 403 to 489 of SEQ ID NO: 10, or a complementary sequence thereto,

(ii) HVR2 comprising nucleotides 520 to 537 of SEQ ID NO: 10, or a complementary sequence thereto,

(iii) HVR3 comprising nucleotides 592 to 618 of SEQ ID NO: 10, or a complementary sequence thereto,

(iv) HVR4 comprising nucleotides 706 to 744 of SEQ ID NO: 10, or a complementary sequence thereto,

(v) HVR5 comprising nucleotides 763 to 786 of SEQ ID NO: 10, or a complementary sequence thereto,

(vi) HVR6 comprising nucleotides 856 to 874 of SEQ ID NO: 10, or a complementary sequence thereto, and/or

(vii) HVR7 comprising nucleotides 1201 to 1296 of SEQ ID NO: 10, or a complementary sequence thereto.

5. The isolated polynucleotide of claim 2 or 3, wherein said isolated polynucleotide comprises a nucleotide sequence that is at least 90% identical to one or more of:

(i) HVR1 comprising nucleotides 403 to 477 of SEQ ID NO: 11, or a complementary sequence thereto,

(ii) HVR2 comprising nucleotides 505 to 516 of SEQ ID NO: 11, or a complementary sequence thereto,

(iii) HVR3 comprising nucleotides 571 to 591 of SEQ ID NO: 11, or a complementary sequence thereto,

(iv) HVR4 comprising nucleotides 679 to 690 of SEQ ID NO: 11, or a complementary sequence thereto,

(v) HVR5 comprising nucleotides 709 to 735 of SEQ ID NO: 11, or a complementary sequence thereto,

(vi) HVR6 comprising nucleotides 805 to 816 of SEQ ID NO: 11, or a complementary sequence thereto, and/or

(vii) HVR7 comprising nucleotides 1144 to 1236 of SEQ ID NO: 11, or a complementary sequence thereto.

6. The isolated polynucleotide of claim 2 or 3, wherein said isolated polynucleotide comprises a nucleotide sequence that is at least 90% identical to one or more of:

(i) HVR1 comprising nucleotides 403 to 474 of SEQ ID NO: 12, or a complementary sequence thereto,

(ii) HVR2 comprising nucleotides 505 to 522 of SEQ ID NO: 12, or a complementary sequence thereto,

(iii) HVR3 comprising nucleotides 577 to 597 of SEQ ID NO: 12, or a complementary sequence thereto,

(iv) HVR4 comprising nucleotides 685 to 726 of SEQ ID NO: 12, or a complementary sequence thereto,

(v) HVR5 comprising nucleotides 748 to 777 of SEQ ID NO: 12, or a complementary sequence thereto,

(vi) HVR6 comprising nucleotides 847 to 864 of SEQ ID NO: 12, or a complementary sequence thereto, and/or

(vii) HVR7 comprising nucleotides 1192 to 1284 of SEQ ID NO: 12, or a complementary sequence thereto.

7. The isolated polynucleotide of any one of claims 1-6, wherein said nucleotide sequence is at least 95% identical to, or complementary to, at least 300 contiguous nucleotides of the nucleic acid sequence of SEQ ID NO: 3.

8. The isolated polynucleotide of any one of claims 1-7, wherein said nucleotide sequence comprises at least 300 contiguous nucleotides of any one of SEQ ID NOs: 2, 1, and 3, or a complementary sequence thereto.

9. The isolated polynucleotide of claim 8, wherein said nucleotide sequence comprises all or a portion of any one of SEQ ID NOs: 4-18, or a complementary sequence thereto.

10. A recombinant vector comprising the isolated polynucleotide of any one of claims 1-9.

11. The recombinant vector of claim 10, wherein said vector is

(i) an sAd4310A adenoviral vector comprising polynucleotides comprising the sequence of any one of SEQ ID NOs: 40-45, or

(ii) an sAd4287 adenoviral vector comprising polynucleotides comprising the sequence of any one of SEQ ID NOs: 34-39,

(iii) an sAd4312 adenoviral vector comprising polynucleotides comprising the sequence of any one of SEQ ID NOs: 46-51.

12. A recombinant adenovirus comprising an isolated polynucleotide of any one of claims 1-9.

13. The recombinant adenovirus of claim 12, wherein said isolated polynucleotide comprises a deletion in or of the E1 region, said deletion rendering said recombinant virus a replication-defective virus.

14. The recombinant adenovirus of claim 13, wherein said isolated polynucleotide comprises a deletion in or of the E3 region and/or E4 region and/or said recombinant adenovirus further comprises a heterologous nucleotide sequence encoding an antigenic or therapeutic protein of interest, or fragment thereof.

15. The recombinant adenovirus of claim 14, wherein said recombinant adenovirus promotes an antibody immune response against the antigenic or therapeutic protein of interest, or fragment thereof, encoded by the heterologous nucleotide sequence.

16. The recombinant adenovirus of claim 15, wherein said antibody immune response is determined using a D^b/AL11 tetramer binding assay.

17. The recombinant adenovirus of claim 15, wherein said antibody immune response is determined using an IFN-γ ELISPOT assay.

18. The recombinant adenovirus of any one of claims 12-17, wherein said recombinant adenovirus stimulates low neutralizing antibody titers when administered to a human subject.

19. The recombinant adenovirus of claim 18, wherein said low neutralizing antibody titers are determined using a luciferase virus neutralization assay.

20. The recombinant adenovirus of any one of claims 12-19, wherein said antigenic protein, or fragment thereof, comprises a bacterial, viral, parasitic, or fungal protein, or fragment thereof.

21. The recombinant adenovirus of claim 20, wherein:

(i) said viral protein, or fragment thereof, is from a viral family selected from the group consisting of *Retroviridae*, such as human immunodeficiency virus (HIV), such as an Env, Gag, Pol, Nef, Tat, Rev, Vif, Vpr, or Vpu protein, or a fragment thereof, *Flaviviridae*, such as hepatitis C virus (HCV), yellow fever virus, and Japanese encephalitis virus, *Arenaviridae*, *Bunyaviridae*, *Filoviridae*, such as Ebola virus and Marburg virus, *Togaviridae*, such as rubella virus, *Poxviridae*, such as *Variola major, Variola minor,* and monkeypox virus, *Herpesviridae*, such as varicella zoster virus (VZV), cytomegalovirus (CMV), and herpes simplex virus (HSV), ***Orthomyxoviridae,* such as** influenza, *Coronaviridae*, *Rhabdoviridae*, such as rabies virus, *Paramyxoviridae*, such as measles virus and mumps virus, *Picornaviridae*, such as hepatitis A virus (Hep A) and poliovirus, *Hepadnaviridae*, such as hepatitis B virus (HBV), *Papillomaviridae*, such as human papillomavirus (HPV), *Parvoviridae*, *Astroviridae*, *Polyomaviridae*, *Calciviridae*, and *Reoviridae*, such as rotavirus; or

(ii) said bacterial protein, or fragment thereof, is from *Mycobacterium tuberculosis*, *Mycobacterium bovis*, *Mycobacterium africanum*, *Mycobacterium microti*, *Mycobacterium leprae*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Escherichia coli*, *Klebsiella pneumoniae*, *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Francisella tularensis*, *Brucella*, *Burkholderia mallei*, *Yersinia pestis*, *Corynebacterium diphtheria*, *Neisseria meningitidis*, *Bordetella pertussis*, *Clostridium tetani*, or *Bacillus anthracis*; or

(iii) said parasitic protein, or fragment thereof, is from *Toxoplasma gondii*, *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium ovale*, *Plasmodium malariae*, *Trypanosoma* spp., or *Legionella* spp; or

(iv) said fungal protein, or fragment thereof, is from *Aspergillus*, *Blastomyces dermatitidis*, *Candida*, *Coccidioides immitis*, *Cryptococcus neoformans*, *Histoplasma capsulatum var. capsulatum*, *Paracoccidioides brasiliensis*, *Sporothrix schenckii*, *Zygomycetes* spp., *Absidia corymbifera*, *Rhizomucor pusillus*, or *Rhizopus arrhizus*.

22. The recombinant adenovirus of any one of claims 12-21, for use in treating a subject having a disease.

23. The recombinant adenovirus for use according to claim 22, wherein said recombinant adenovirus comprises a heterologous nucleotide sequence encoding an antigenic protein, or fragment thereof, that promotes an immune response in said subject against an infective agent.

24. The recombinant adenovirus for use according to claim 23, wherein said antigenic protein, or fragment thereof, comprises a bacterial, viral, parasitic, or fungal protein, or fragment thereof.

25. The recombinant adenovirus for use according to claim 24, wherein:

(i) said viral protein, or fragment thereof, is from a viral family selected from the group consisting of *Retroviridae*, such as human immunodeficiency virus (HIV), such as an Env, Gag, Pol, Nef, Tat, Rev, Vif, Vpr, or Vpu protein, or a fragment thereof, *Flaviviridae*, such as hepatitis C virus (HCV), yellow fever virus, and Japanese encephalitis virus, *Arenaviridae*, *Bunyaviridae*, *Filoviridae*, such as Ebola virus and Marburg virus, *Togaviridae*, such as rubella virus, *Poxviridae*, such as *Variola major, Variola minor,* and monkeypox virus, *Herpesviridae*, such as varicella zoster virus (VZV), cytomegalovirus (CMV), and herpes simplex virus (HSV), ***Orthomyxoviridae*, such as** influenza, *Coronaviridae*, *Rhabdoviridae*, such as rabies virus, *Paramyxoviridae*, such as measles virus and mumps virus, *Picornaviridae*, such as hepatitis A virus (Hep A) and poliovirus, *Hepadnaviridae*, such as hepatitis B virus (HBV), *Papillomaviridae*, such as human papillomavirus (HPV), *Parvoviridae*, *Astroviridae*, *Polyomaviridae*, *Calciviridae*, and *Reoviridae*, such as rotavirus; or

(ii) said bacterial protein, or fragment thereof, is from *Mycobacterium tuberculosis*, *Mycobacterium bovis*, *Mycobacterium africanum*, *Mycobacterium microti*, *Mycobacterium leprae*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Escherichia coli*, *Klebsiella pneumoniae*, *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Francisella tularensis*, *Brucella*, *Burkholderia mallei*, *Yersinia pestis*, *Corynebacterium diphtheria*, *Neisseria meningitidis*, *Bordetella pertussis*, *Clostridium tetani*, or *Bacillus anthracis*; or

(iii) said parasitic protein, or fragment thereof, is from *Toxoplasma gondii*, *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium ovale*, *Plasmodium malariae*, *Trypanosoma* spp., or *Legionella* spp; or

(iv) said fungal protein, or fragment thereof, is from *Aspergillus*, *Blastomyces dermatitidis*, *Candida*, *Coccidioides immitis*, *Cryptococcus neoformans*, *Histoplasma capsulatum var. capsulatum*, *Paracoccidioides brasiliensis*, *Sporothrix schenckii*, *Zygomycetes* spp., *Absidia corymbifera*, *Rhizomucor pusillus*, or *Rhizopus arrhizus*.

26. The recombinant adenovirus for use according to any one of claims 22-25, wherein said disease is acquired immune deficiency syndrome (AIDS), cancer, tuberculosis, leprosy, typhoid fever, pneumonia, meningitis, staphylococcal scalded skin syndrome (SSSS), Ritter's disease, tularemia (rabbit fever), brucellosis, Glanders disease, bubonic plague, septicemic plague, pneumonic plague, diphtheria, pertussis (whooping cough), tetanus, anthrax, hepatitis, smallpox, monkeypox, measles, mumps, rubella, chicken pox, polio, rabies, Japanese encephalitis, herpes, mononucleosis, influenza, Ebola virus disease, hemorrhagic fever, yellow fever, Marburg virus disease, toxoplasmosis, malaria, trypanosomiasis, legionellosis, aspergillosis, blastomycosis, candidiasis (thrush), coccidioidomycosis, cryptococcosis, histoplasmosis, paracoccidioidomycosis, sporotrichosis, or sinus-orbital zygomycosis.

27. The recombinant adenovirus for use according to any one of claims 22-26, wherein said subject is human.

28. The recombinant adenovirus for use according to any one of claims 22-27, wherein:

(a) said recombinant adenovirus is formulated for intramuscular, intravenous, intradermal, percutaneous, intraarterial, intraperitoneal, intralesional, intracranial, intraarticular, intraprostatical, intrapleural, intratracheal, intranasal, intravitreal, intravaginal, intrarectal, topical, intratumoral, peritoneal, subcutaneous, subconjunctival, intravesicular, mucosal, intrapericardial, intraumbilical, intraocular, oral, topical, or local administration, for administration by inhalation, injection, infusion, continuous infusion, localized perfusion bathing target cells directly, catheter, lavage, or gavage, or in a creme or lipid composition; and/or

(b) said adenovirus is formulated as a pharmaceutical composition comprising a pharmaceutically acceptable carrier.

29. The recombinant adenovirus for use according to claim 28, wherein said pharmaceutical composition is formulated for administration in at least one or two doses.

30. The recombinant adenovirus for use according to claim 29, wherein said pharmaceutical composition is formulated for administration as a prime boost.

31. A method of producing a recombinant adenovirus according to any one of claims 12-21, wherein said method comprises culturing a cell in a suitable medium; transfecting said cell with an isolated polynucleotide according to any one of claims 1-9 or a recombinant vector according to claim 10 or 11; allowing replication of said polynucleotide or vector in said cell; and harvesting produced recombinant adenovirus from said medium and/or said cell.

32. The method of claim 31, wherein said cell is a bacterial, plant, or mammalian cell.

33. The method of claim 32, wherein said mammalian cell is a Chinese hamster ovary (CHO) cell.