Claims

1. An isolated canine influenza virus type A, wherein said influenza virus has an HA serotype of H3 and wherein said influenza virus comprises a polynucleotide which encodes a polypeptide comprising the amino acid sequence shown in SEQ ID NO: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said polynucleotide encodes a polypeptide comprising 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NO: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34; or wherein said influenza virus comprises a polypeptide comprising the amino acid sequence shown in SEQ ID NO: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said polypeptide comprises 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NO: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.

2. The influenza virus according to claim 1, wherein said influenza virus has the serotype H3N8.

3. The influenza virus according to claim 1, wherein said influenza virus comprises a polynucleotide comprising the nucleotide sequence shown in SEQ ID NO: 1, 3, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, or 31, or said polynucleotide comprises 98% or greater sequence identity with the nucleotide sequence shown in SEQ ID NO: 1, 3, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, or 31.

4. The influenza virus according to claim 1, wherein said influenza virus is the viral isolate designated as A/canine/Florida/43/04 and deposited with the ATCC under ATCC Accession No. PTA-7914 or the viral isolate designated as A/canine/Florida/242/2003 and deposited with the ATCC under ATCC Accession No. PTA-7915.

5. An isolated polynucleotide that comprises a gene of a canine influenza virus of any one of claims 1 to 4.

6. The polynucleotide according to claim 5, wherein said polynucleotide encodes a polypeptide comprising the amino acid sequence shown in SEQ ID NOs: 2, 4, 8, 10, 12,

14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said polynucleotide encodes a polypeptide comprising 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NOs: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.

7. The polynucleotide according to claim 5, wherein said polynucleotide comprises the nucleotide sequence shown in SEQ ID NOs: 1, 3, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, or 31, or said polynucleotide comprises 98% or greater sequence identity with the nucleotide sequence shown in SEQ ID NOs: 1, 3, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, or 31.

8. A polynucleotide expression construct comprising a polynucleotide of any one of claims 5 to 7.

9. An isolated polypeptide encoded by a polynucleotide of any one of claims 5 to 7.

10. A composition comprising a diluent and an immunogen of the canine influenza virus of any one of claims 1 to 4, wherein said immunogen is capable of inducing an immune response against an influenza virus that is capable of infecting a canid animal.

11. The composition according to claim 10, wherein said immunogen comprises cell-free whole virus, or a portion thereof; a viral polynucleotide; a viral protein; a viral polypeptide or peptide; a virus infected cell; a recombinant viral vector based construct; a reassortant virus; or naked nucleic acid of said virus.

12. The composition according to claim 11, wherein said viral protein, polypeptide, or peptide comprises an amino acid sequence shown in SEQ ID NOs: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said viral protein, polypeptide, or peptide comprises 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NOs: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.

13. The composition according to claim 11, wherein said viral polynucleotide encodes a polypeptide comprising an amino acid sequence shown in SEQ ID NOs: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said polynucleotide encodes a polypeptide comprising 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NOs: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.

14. Use of an effective amount of an influenza virus according to any of claims 1 to 5, a polynucleotide expression construct of claim 9, a polypeptide according to claim 10, or a composition according to any one of claims 10 to 13, in the manufacture of a medicament to induce for inducing an immune response in canid animals against a canine influenza virus.

15. The use according to claim 14, wherein said composition comprises a viral protein, polypeptide, or peptide comprising an amino acid sequence shown in SEQ ID NOs: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said viral protein, polypeptide, or peptide comprises 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NOs: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.

16. The use according to claim 14, wherein said immune response is a protective immune response that prevents or inhibits infection of said canid animals by an influenza virus.

17. The use according to claim 14, wherein said composition further comprises an adjuvant.

18. The use according to claim 14, wherein said animal is a canid.

19. The use according to claim 14, wherein said canid animal is a domesticated dog.

20. The use according to claim 14, wherein said composition is for administration parenterally.

21. The use according to claim 20, wherein said composition is for administration subcutaneously, intraperitoneally, or intramuscularly.

22. The use according to claim 14, wherein said composition is for administration nasally or orally.

23. A cell comprising a canine influenza virus of any one of claims 1 to 4 or a polynucleotide of any one of claims 5 to 7 or a polypeptide of claim 9.

24. The cell according to claim 23, wherein said cell is a canid animal cell.

25. A reassortant virus comprising at least one gene, or a polynucleotide of a canine influenza virus of any of claims 1 to 4.

26. An isolated virus that comprises one or more polynucleotides wherein said one or more polynucleotides encode a canine influenza virus protein selected from the group consisting of hemagglutinin (HA), neuraminidase (NA), nucleoprotein (NP), matrix protein (MA), polymerase basic (PB) 1, PB2, polymerase acidic (PA), and non-structural protein (NS), wherein said one or more polynucleotides encodes a polypeptide comprising the amino acid sequence shown in SEQ ID NO: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said polynucleotide encodes a polypeptide comprising 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NO: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34; or wherein said virus comprises one or more polypeptides comprising the amino acid sequence shown in SEQ ID NO: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said polypeptide comprises 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NO: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.

27. The virus according to claim26, wherein said one or more polynucleotides comprise a nucleotide sequence selected from the group consisting of SEQ ID NOs: 1, 3, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, and 31.

28. The virus according to claim 26, wherein said HA protein comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 16 and 32.

29. A vaccine comprising a canine influenza virus of any of claims 1 to 4.

30. The vaccine according to claim 29, wherein said influenza virus comprises a polypeptide comprising 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.

31. The vaccine according to claim 29, wherein said influenza virus comprises a polynucleotide which encodes a polypeptide comprising the amino acid sequence shown in SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said polynucleotide encodes a polypeptide comprising 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.

32. The vaccine according to claim 29, wherein said influenza virus comprises a polynucleotide comprising the nucleotide sequence shown in SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, or 31, or said polynucleotide comprises 98% or greater sequence identity with the nucleotide sequence shown in SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, or 31.

33. The vaccine according to claim 29, wherein said influenza virus is inactivated or attenuated.

34. The vaccine according to claim 29, wherein said influenza virus is provided in a pharmaceutically acceptable carrier or diluent.

35. The vaccine according to claim 29, wherein said influenza virus comprises a polynucleotide encoding a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at

position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

36. The vaccine according to claim 29, wherein said influenza virus comprises a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

37. The vaccine according to claim 29, wherein said canine influenza virus comprises a polynucleotide encoding a hemagglutinin (HA) that comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

38. The vaccine according to claim 29, wherein said polynucleotide comprises the nucleotide sequence of SEQ ID NO:15 or SEQ ID NO:31, or a nucleotide sequence comprising 98% or greater sequence identity to SEQ ID NO:15 or SEQ ID NO:31.

39. A recombinant viral vector or polynucleotide vector comprising a polynucleotide which encodes a polypeptide comprising the amino acid sequence shown in SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34, or said polynucleotide encodes a polypeptide comprising 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.

40. A recombinant viral vector or polynucleotide vector comprising a polynucleotide comprising the nucleotide sequence shown in SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, or 31, or said polynucleotide comprises 98% or greater sequence identity with the nucleotide sequence shown in SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, or 31.

41. A recombinant viral vector or polynucleotide vector comprising a polynucleotide encoding a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

42. The vector according to claim 41, wherein said polynucleotide encodes a hemagglutinin (HA) that comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

43. The vector according to claim 41, wherein said polynucleotide comprises the nucleotide sequence of SEQ ID NO:15 or SEQ ID NO:31, or a nucleotide sequence comprising 98% or greater sequence identity to SEQ ID NO:15 or SEQ ID NO:31.

44. The vector according to any one of claims 39 to 43, wherein said recombinant viral vector is from adenovirus, avipox, herpesvirus, vaccinia virus, canarypox, entomopox, swinepox, or West Nile virus.

45. The vector according to any one of claims 39 to 43, wherein said recombinant viral vector is a canarypox viral vector.

46. The vector according to any one of claims 39 to 43, wherein said polynucleotide vector is a viral vector.

47. A vaccine comprising a vector of any of claims 39 to 46.

48. The vaccine according to claim 47, wherein said vaccine comprises an adjuvant and/or diluent.

49. Use of an effective amount of a vaccine of any one of claims 29 to 38 or a vector of any one of claims 39 to 46, or a vaccine of claim 47 or 48, in the manufacture of a medicament for inducing an immune response in canid animals against a canine influenza virus.

50. The influenza virus according to claim 1, wherein said influenza virus comprises a polynucleotide which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes a polypeptide comprising 98% or greater sequence identity with the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34.

51. The influenza virus according to claim 1, wherein said influenza virus comprises a polynucleotide encoding a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

52. The influenza virus according to claim 1, wherein said influenza virus comprises a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

53. The influenza virus according to claim 1, wherein said polynucleotide encodes a hemagglutinin (HA) that comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

54. The influenza virus according to claim 1, wherein said hemagglutinin (HA) comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature

form thereof, or an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

55. The influenza virus according to claim 1, wherein said polynucleotide comprises the nucleotide sequence of SEQ ID NO:15 or SEQ ID NO:31, or a nucleotide sequence comprising 98% or greater sequence identity to SEQ ID NO:15 or SEQ ID NO:31.

56. The polynucleotide according to claim 5, wherein said polynucleotide encodes a polypeptide comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes a polypeptide comprising 98% or greater sequence identity with the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34.

57. The polynucleotide according to claim 5, wherein said polynucleotide encodes a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

58. The polynucleotide according to claim 5, wherein said polynucleotide encodes a hemagglutinin (HA) that comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

59. The polynucleotide according to claim 5, wherein said polynucleotide comprises the nucleotide sequence of SEQ ID NO:15 or SEQ ID NO:31, or a nucleotide sequence comprising 98% or greater sequence identity to SEQ ID NO:15 or SEQ ID NO:31.

60. The polynucleotide expression construct according to claim 8, wherein said polynucleotide encodes a polypeptide comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes a polypeptide comprising 98%

or greater sequence identity with the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34.

61. The polynucleotide expression construct according to claim 8, wherein said polynucleotide encodes a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

62. The polynucleotide expression construct according to claim 8, wherein said polynucleotide encodes a hemagglutinin (HA) that comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

63. The polynucleotide expression construct according to claim 8, wherein said polynucleotide comprises the nucleotide sequence of SEQ ID NO:15 or SEQ ID NO:31, or a nucleotide sequence comprising 98% or greater sequence identity to SEQ ID NO:15 or SEQ ID NO:31.

64. The polypeptide according to claim 9, wherein said polypeptide comprises the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polypeptide comprises 98% or greater sequence identity with the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34.

65. The polypeptide according to claim 9, wherein said polypeptide is a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

66. The polypeptide according to claim 9, wherein said polypeptide comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof, or an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

67. The composition according to claim 10, wherein said influenza virus comprises a polynucleotide which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes a polypeptide comprising 98% or greater sequence identity with the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34.

68. The composition according to claim 10, wherein said influenza virus comprises a polynucleotide encoding a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

69. The composition according to claim 10, wherein said influenza virus comprises a hemagglutinin (HA) comprising the amino acid sequence of SEQ ID NO:33 or SEQ ID NO:34, or an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:33 or SEQ ID NO:34, wherein said HA protein comprises a serine at position 82, a leucine at position 221, a threonine at position 327, and a threonine at position 482 of the amino acid sequence.

70. The composition according to claim 11, wherein said polynucleotide encodes a hemagglutinin (HA) that comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof, or said polynucleotide encodes an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

71. The composition according to claim 11, wherein said polypeptide comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature form

thereof, or an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

72. Use of an effective amount of an influenza virus of any of claims 50 to 55, or a polynucleotide expression construct of any of claims 60 to 63, or a polypeptide of any of claims 64 to 66, the composition of any one of claims 67 to 71, in the manufacture of a medicament for inducing an immune response in canid animals against a canine influenza virus.

73. The cell according to claim 23, wherein said cell comprises the influenza virus of any one of claims 50 to 55 or the polynucleotide of any one of claims 56 to 63, or the polypeptide of any of claims 64 to 66.

74. The reassortant virus according to claim 25, wherein said reassortant virus comprises at least one gene, genomic segment, or a polynucleotide of an influenza virus of any one of claims 50 to 55.

75. The virus according to claim 26, wherein said virus comprises one or more polynucleotides of any one of claims 56 to 63.

76. The vaccine according to claim 29, wherein said influenza virus comprises a hemagglutinin (HA) that comprises the amino acid sequence of SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof, or an amino acid sequence comprising greater than 95% amino acid sequence identity to SEQ ID NO:16 or SEQ ID NO:32, or the mature form thereof.

77. The influenza virus according to claim 1, wherein said influenza virus comprises a polypeptide comprising 98% or greater sequence identity with the amino acid sequence shown in SEQ ID NO: 2, 4, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, or 34.