CLAIMS

1. An immunogenic composition or product combination comprising:

(a) a nucleic acid comprising at least one nucleic acid sequence encoding hepatitis D antigen (HDAg) and at least one nucleic acid sequence encoding PreS1; and

(b) a polypeptide comprising at least one HDAg polypeptide sequence and at least one PreS1 polypeptide sequence.

2. The immunogenic composition or product combination of claim 1, wherein the at least one nucleic acid sequence encoding HDAg comprises SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 3 or SEQ ID NO: 4, or any combination thereof.

3. The immunogenic composition or product combination of claim 1 or 2, wherein the at least one nucleic acid sequence encoding PreS1 comprises SEQ ID NO: 9 or SEQ ID NO: 10 or both.

4. The immunogenic composition or product combination of any one of claims 1-3, wherein the nucleic acid is configured such that each HDAg nucleic acid sequence is grouped with a PreS1 nucleic acid sequence, and wherein the PreS1 nucleic acid sequence is immediately downstream of the HDAg nucleic acid sequence.

5. The immunogenic composition or product combination of claim 4, further comprising at least one nucleic acid sequence encoding an autocatalytic peptide cleavage site, wherein the grouped HDAg and PreS1 nucleic acid sequences are separated by the at least one nucleic acid sequence encoding the autocatalytic peptide cleavage site.

6. The immunogenic composition or product combination of claim 5, wherein the at least one nucleic acid sequence encoding the autocatalytic peptide cleavage site comprises a nucleic acid sequence selected from the group consisting of porcine teschovirus-1 2A (P2A), foot-and-mouth disease virus 2A (F2A), equine rhinitis A virus (ERAV) 2A (E2A) and *Thosea*

asigna virus 2A (T2A) nucleic acid, and wherein each encoded autocatalytic peptide cleavage site may optionally include a GSG (glycine-serine-glycine) motif at its N-terminus.

7. The immunogenic composition or product combination of claim 5 or 6, wherein the at least one nucleic acid sequence encoding the autocatalytic peptide cleavage site comprises SEQ ID NO: 13.

8. The immunogenic composition or product combination of any one of claims 1-7, wherein the nucleic acid is codon optimized for expression in a human.

9. The immunogenic composition or product combination of any one of claims 1-8, wherein the nucleic acid comprises a sequence having at least 80%, 85%, 90%, 95%, 99%, or 100% homology to SEQ ID NO: 15-24 or 35-36.

10. The immunogenic composition or product combination of any one of claims 1-9, wherein the nucleic acid comprises a sequence having at least 80%, 85%, 90%, 95%, 99%, or 100% homology to SEQ ID NO: 18, or SEQ ID NO: 35-36.

11. The immunogenic composition or product combination of any one of claims 1-10, wherein the at least one HDAg polypeptide comprises SEQ ID NO: 5, SEQ ID NO: 6, SEQ ID NO: 7 or SEQ ID NO: 8 or any combination thereof.

12. The immunogenic composition or product combination of any one of claims 1-11, wherein the at least one PreS1 polypeptide sequence comprises SEQ ID NO: 11 or SEQ ID NO: 12 or both.

13. The immunogenic composition or product combination of any one of claims 1-12, wherein the at least one PreS1 polypeptide sequence is downstream of the at least one HDAg polypeptide sequence.

14. The immunogenic composition or product combination of any one of claims 1-13, wherein the polypeptide comprises a sequence having at least 80%, 85%, 90%, 95%, 99%, or 100% homology to the sequence of SEQ ID NO: 25-34 or 37.

15. The immunogenic composition or product combination of any of claims 1-14, wherein the polypeptide comprises a sequence having at least 80%, 85%, 90%, 95%, 99%, or 100% homology to the sequence of SEQ ID NO: 29, 31, 32, or 37.

16. The immunogenic composition or product combination of any one of claims 1-15, wherein the polypeptide is recombinantly expressed.

17. The immunogenic composition or product combination of claim 16, wherein the polypeptide is recombinantly expressed in a mammalian, bacterial, yeast, insect, or cell-free system.

18. The immunogenic composition or product combination of any one of claims 1-17, further comprising an adjuvant.

19. The immunogenic composition or product combination of claim 18, wherein the adjuvant is alum, QS-21 or MF59, or any combination thereof.

20. The immunogenic composition or product combination of any one of claims 1-19, wherein the nucleic acid comprises DNA.

21. The immunogenic composition or product combination of any one of claims 1-20, wherein the nucleic acid is provided in a recombinant vector.

22. Use of the immunogenic composition or product combination of any one of claims 1-21, in the preparation of a medicament or combination medicament for generating an immune response in a subject, wherein

at least one prime dose comprising the nucleic acid is to be administered to the subject; and

at least one boost dose comprising the polypeptide is to be administered to the subject.

23. Use of:

(a) the nucleic acid comprising at least one nucleic acid sequence encoding hepatitis D antigen (HDAg) and at least one nucleic acid sequence encoding PreS1 as defined in any one of claims 1-21; and

(b) the polypeptide comprising at least one HDAg polypeptide sequence and at least one PreS1 polypeptide sequence as defined in any one of claims 1-21;

in the preparation of an immunogenic composition or product combination for generating an immune response in a subject, wherein

at least one prime dose comprising the nucleic acid is to be administered to the subject; and

at least one boost dose comprising the polypeptide is to be administered to the subject.

24. The use of claim 22 or claim 23, wherein the at least one boost dose further comprises an adjuvant.

25. The use of claim 24, wherein the adjuvant is alum, QS-21, or MF59, or any combination thereof.

26. The use of any one of claims 22-25, wherein the at least one boost dose is to be administered at least 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 24, 36, or 48 days or weeks after the at least one prime dose is to be administered or within a range of time defined by any two of the aforementioned time points e.g., within 1-48 days or 1-48 weeks.

27. The use of any one of claims 22-26, wherein the administration is to be provided enterally, orally, intranasally, parenterally, subcutaneously, intramuscularly, intradermally, or intravenously or any combination thereof.

28. The use of any one of claims 22-27, wherein the administration is to be performed in conjunction with an antiviral therapy.

29. The use of claim 28, wherein the antiviral therapy comprises entecavir, tenofovir, lamivudine, adefovir, telbivudine, emtricitabine, interferon-α, pegylated interferon-α, or interferon alfa-2b, or any combination thereof to be administered to the subject.

30. An immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D, comprising:

(a) a nucleic acid comprising at least one nucleic acid sequence encoding hepatitis D antigen (HDAg), and at least one nucleic acid sequence encoding PreS1; and

(b) a polypeptide comprising at least one HDAg polypeptide sequence and at least one PreS1 polypeptide sequence.

31. Use of:

(a) a nucleic acid comprising at least one nucleic acid sequence encoding hepatitis D antigen (HDAg), and at least one nucleic acid sequence encoding PreS1; and

(b) a polypeptide comprising at least one HDAg polypeptide sequence and at least one PreS1 polypeptide sequence;

in the preparation of an immunogenic composition or product combination for the treatment or inhibition of hepatitis B or hepatitis D.

32. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of claim 30, or the use of claim 31, wherein the at least one nucleic acid sequence encoding HDAg comprises SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 3 or SEQ ID NO: 4, or any combination thereof.

33. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32, or the use of any one of claims 31-32, wherein the at least one nucleic acid sequence encoding PreS1 comprises SEQ ID NO: 9 or SEQ ID NO: 10 or both.

34. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-33, or the use of any one of claims 31-33, wherein the nucleic acid is configured such that each HDAg nucleic acid sequence is grouped with a PreS1 nucleic acid sequence, and wherein the PreS1 nucleic acid sequence is immediately downstream of the HDAg nucleic acid sequence.

35. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of claim 30, or the use of claim 31, further comprising at least one nucleic acid sequence encoding an autocatalytic peptide cleavage site, wherein the grouped HDAg and PreS1 nucleic acid sequences are separated by the at least one nucleic acid sequence encoding the autocatalytic peptide cleavage site.

36. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of claim 35, or the use of claim 35, wherein the at least one nucleic acid sequence encoding the autocatalytic peptide cleavage site comprises a nucleic acid sequence selected from the group consisting of porcine teschovirus-1 2A (P2A), foot-and-mouth disease virus 2A (F2A), equine rhinitis A virus (ERAV) 2A (E2A) and *Thosea asigna* virus 2A (T2A) nucleic acid, and wherein each encoded autocatalytic peptide cleavage site may optionally include a GSG (glycine-serine-glycine) motif at its N-terminus.

37. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of claim 35 or 36, or the use of claim 35 or claim 36, wherein the at least one nucleic acid sequence encoding the autocatalytic peptide cleavage site comprises SEQ ID NO: 13.

38. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-37, or the use of any one of claims 31-37, wherein the nucleic acid is codon optimized for expression in a human.

39. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-38, or the use of any

one of claims 31-38, wherein the nucleic acid comprises a sequence having at least 80%, 85%, 90%, 95%, 99%, or 100% homology to SEQ ID NO: 15-24 or 35-36.

40. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-39, or the use of any one of claims 31-39, wherein the nucleic acid comprises a sequence having at least 80%, 85%, 90%, 95%, 99%, or 100% homology to SEQ ID NO: 18, or SEQ ID NO: 35-36.

41. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-40, or the use of any one of claims 31-40, wherein the at least one HDAg polypeptide comprises SEQ ID NO: 5, SEQ ID NO: 6, SEQ ID NO: 7 or SEQ ID NO: 8 or any combination thereof.

42. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-41, or the use of any one of claims 31-41, wherein the at least one PreS1 polypeptide sequence comprises SEQ ID NO: 11 or SEQ ID NO: 12 or both.

43. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-42, or the use of any one of claims 31-42, wherein the at least one PreS1 polypeptide sequence is downstream of the at least one HDAg polypeptide sequence.

44. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-43, or the use of any one of claims 31-43, wherein the polypeptide comprises a sequence having at least 80%, 85%, 90%, 95%, 99%, or 100% homology to the sequence of SEQ ID NO: 25-34 or 37.

45. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any of claims 30 or 32-44, or the use of any one

of claims 31-44, wherein the polypeptide comprises a sequence having at least 80%, 85%, 90%, 95%, 99%, or 100% homology to the sequence of SEQ ID NO: 29, 31, 32, or 37.

46. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-45, or the use of any one of claims 31-45, wherein the polypeptide is recombinantly expressed.

47. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of claim 46, or the use of claim 46, wherein the polypeptide is recombinantly expressed in a mammalian, bacterial, yeast, insect, or cell-free system.

48. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-47, or the use of any one of claims 31-47, further comprising an adjuvant.

49. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of claim 48, or the use of claim 48, wherein the adjuvant is alum, QS-21 or MF59, or any combination thereof.

50. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-49, or the use of any claims 31-49, wherein the nucleic acid comprises DNA.

51. The immunogenic composition or product combination for use in the treatment or inhibition of hepatitis B or hepatitis D of any one of claims 30 or 32-50, or the use of any one of claims 31-50, wherein the nucleic acid is provided in a recombinant vector.