WHAT IS CLAIMED IS:

1. An HIV-1 vaccine comprising one or more carriers and one or more population episensus antigens determined using the EpiGraph approach.

2. The vaccine of claim 1, wherein

   i. the carrier is DNA, protein, or a vector,
   ii. the carrier is a viral vector or a bacterial vector,
   iii. the carrier is a viral vector comprising a cytomegalovirus (CMV), poxvirus, adenoviruses, rubella, sendai virus, rhabdovirus, alphavirus or adeno-associated virus backbone, or
   iv) the carrier is a human CMV (HCMV) backbone or a rhesus CMV (RhCMV) backbone.

3. The vaccine of claim 2, wherein:
   i. the CMV backbone lacks the UL130-128 gene region,
   ii. CMV backbone lacks the UL82 gene encoding the tegument protein pp71, or
   iii. the CMV backbone lacks the UL130-128 gene region and the UL82 gene encoding the tegument protein pp71.

4. The vaccine of any one of claims 1-3, wherein:
   i. the population episensus antigen comprises epitopes from Gag, Pol, Nef, Env, Tat, Rev, Vpr, Vif, or Vpu; or

   ii. the population episensus antigen comprises Gag epitopes, wherein the amino acid sequence of the population episensus antigen comprises the amino acid sequence of SEQ ID NO: 697, SEQ ID NO: 698, SEQ ID NO: 699, or SEQ ID NO: 700.

5. The vaccine of any one of claims 1-4, wherein:

   i. the population episensus antigen comprises epitopes from a conserved region of HIV;
   ii. the population episensus antigen comprises epitopes from a conserved region of Gag, Pol, or Nef; or
   iii. the population episensus antigen comprises epitopes from a conserved region of the p24 capsid protein of Gag.

6. The vaccine of any one of claims 1-5, wherein the population episensus antigen is a fusion antigen comprising two or more population episensus antigens.

7. The vaccine of claim 6, wherein:

i. the fusion antigen comprises a population episensus antigen comprising Gag epitopes and a population episensus antigen comprising Nef epitopes;
ii. the fusion antigen comprises a population episensus antigen comprising epitopes from a conserved region of Gag and a population episensus antigen comprising epitopes from a conserved region of Nef, or
iii. the fusion antigen comprises a population episensus antigen comprising epitopes from a conserved region of the p24 capsid protein Gag and a population episensus antigen comprising epitopes from a conserved region of Nef.

8. The vaccine of any one of claims 1-7, wherein:

i. the population episensus antigen is central to the HIV-1 B clade epidemic in the United States
ii. the population episensus antigen is central to the HIV-1 C clade epidemic in South Africa;
iii. the population episensus antigen is central to the HIV-1 2-clade regional epidemic in Thailand; or
iv. the population episensus antigen is central to the HIV-1 M-group global set.

9. The vaccine of claim 8, wherein:

i. the population episensus antigen comprises Gag epitopes,
ii. the population episensus antigen comprises epitopes from a conserved region of Gag;
iii. the population episensus antigen comprises epitopes from a conserved region of the p24 capsid protein of Gag;
iv. the population episensus antigen comprises Nef epitopes;

v. the population episensus antigen comprises epitopes from a conserved region of Nef;

vi. the population episensus antigen comprises Pol epitopes; or

vii. the population episensus antigen comprises epitopes from a conserved region of Pol.

10. The vaccine of claim 9, wherein the population episensus antigen comprises the amino acid sequence selected from the group consisting of SEQ ID NOs: 703, 704, 709-712, and 717-753.

11. The vaccine of claim 8, wherein the population episensus antigen is a fusion antigen comprising two or more population episensus antigens.

12. The vaccine of claim 11, wherein:

i) the fusion antigen comprises a population episensus antigen comprising Gag epitopes and a population episensus antigen comprising Nef epitopes;

ii) the fusion antigen comprises a population episensus antigen comprising epitopes from a conserved region of Gag and a population episensus antigen comprising epitopes from a conserved region of Nef; or

iii) the fusion antigen comprises a population episensus antigen comprising epitopes from a conserved region of the p24 capsid protein of Gag and a population episensus antigen comprising epitopes from a conserved region of Nef.

13. The vaccine of claim 12, wherein the fusion antigen comprises an amino acid sequence selected from the group consisting of: SEQ ID NOs: 701, 702, and 705-708.

14. The vaccine of any one of claims 1-13, wherein the vaccine is a prophylactic vaccine or a therapeutic vaccine.

15. The vaccine of any one of claims 1-14, further comprising one or more tailored antigens.

16. The vaccine of claim 15, wherein:

i. the carrier is DNA, protein, or a vector,

ii. the carrier is a viral vector or a bacterial vector,

iii. the carrier is a viral vector comprising a cytomegalovirus (CMV), poxvirus, adenoviruses, rubella, sendai virus, rhabdovirus, alphavirus or adeno-associated virus backbone, or

iv. the carrier is a human CMV (HCMV) backbone or a rhesus CMV (RhCMV) backbone.

17. The vaccine of claim 15 or 16, wherein:

i. the CMV backbone lacks the UL130-128 gene region

ii. the CMV backbone lacks the UL82 gene encoding the tegument protein pp71, or

iii. the CMV backbone lacks the UL130-128 gene region and the UL82 gene encoding the tegument protein pp71.

18. The vaccine of any one of claims 15-17, wherein:

i. the population episensus antigen comprises Gag epitopes

ii. the population episensus antigen comprises Gag epitopes, wherein the amino acid sequence of the population episensus antigen comprises the amino acid sequence of SEQ ID NO:691; or

iii. the population episensus antigen comprises the amino acid sequence of an inactivated Gag protein, wherein the amino acid sequence of the inactivated Gag protein was inactivated by eliminating a myristoylation sequence in the N-terminus of the Gag protein.

19. The vaccine of any one of claims 15-18, wherein:

i. the tailored antigen comprises Gag epitopes;

ii. the tailored antigen comprises Gag epitopes, wherein the amino acid sequence of the tailored antigen comprises the amino acid sequence of: SEQ ID NO: 692, SEQ ID NO: 693, SEQ ID NO: 694, SEQ ID NO: 695 or SEQ ID NO: 696;

iii. the vaccine comprises a first tailored antigen and a second tailored antigen, wherein the first tailored antigen and the second tailored antigen comprise two of

the amino acid sequences of: SEQ ID NO: 692, SEQ ID NO: 693, SEQ ID NO: 694, SEQ ID NO: 695 and SEQ ID NO: 696;

iv. the vaccine comprises a first tailored antigen, a second tailored antigen, and a third tailored antigen, wherein the first tailored antigen, the second tailored antigen, and the third tailored antigen comprise three of the amino acid sequences of: SEQ ID NO: 692, SEQ ID NO: 693, SEQ ID NO: 694, SEQ ID NO: 695 and SEQ ID NO: 696; or

v. the tailored antigen comprises the amino acid sequence of an inactivated Gag protein, wherein the amino acid sequence of the inactivated Gag protein was inactivated by eliminating a myristoylation sequence in the N-terminus of the Gag protein.

20. The vaccine of any one of claims 15-19, wherein:

i. the population episensus antigen is central to the HIV-1 M-group global set;

ii. the population episensus antigen is central to the HIV-1 C clade epidemic in South Africa;

iii. the population episensus antigen is central to the HIV-1 B clade epidemic in South Africa; or

iv. the population episensus antigen is central to the HIV-1 2-clade regional epidemic in Thailand.

21. The vaccine of claim 20, wherein:

i. the population episensus antigen and the tailored antigen comprise Gag epitopes;

ii. the population episensus antigen and the tailored antigen comprise epitopes from a conserved region of Gag

iii. the population episensus antigen and the tailored antigen comprise epitopes from a conserved region of the p24 capsid protein of Gag

iv. the population episensus antigen and the tailored antigen comprise Nef epitopes; or

v. the population episensus antigen and the tailored antigen comprise Pol epitopes.

22. The vaccine of claim 21, wherein:

i. the population episensus antigen comprises an amino acid sequence selected from the group consisting of:SEQ ID NOs: 754-755, 766-767, and 778 - 779;

ii. the population episensus antigen comprises an amino acid sequence selected from the group consisting of: SEQ ID NOs: 754-755, 766-767, and 778-779 and the tailored antigen comprises an amino acid sequence selected from the group consisting of: SEQ ID NOs: 756-765, 768-777, and 780-789;

iii. the vaccine comprises a first tailored antigen and a second tailored antigen, wherein the population episensus antigen comprises an amino acid sequence selected from the group consisting of: SEQ ID NOs: 754-755, 766-767, and 778-779, and wherein the first tailored antigen and the second tailored antigen comprise two of the amino acid sequences selected from the group consisting of: SEQ ID NOs: 756-765, 768-777, and 780-789; or

iv. the vaccine comprises a first tailored antigen, a second tailored antigen, and a third tailored antigen, wherein the population episensus antigen comprises an amino acid sequence selected from the group consisting of: SEQ ID NOs: 754-755, 766-767, and 778-779, and wherein the first tailored antigen, the second tailored antigen, and the third tailored antigen comprise three of the amino acid sequences selected from the group consisting of: SEQ ID NOs: 756-765, 768-777, and 780-789..

23. The vaccine of any one of claims 15-22, further comprising:

i. a HCMV vector comprising a HCMV backbone and a tailored antigen selected to be a best match natural HIV-1 strain; or

ii. a HCMV vector comprising a HCMV backbone and a tailored antigen selected to be a best match different (and distant) HIV-1 strain.

24. The vaccine of any one of claims 15-23, wherein the vaccine is a therapeutic vaccine.

25. The vaccine of any one of claims 1-14 for use in protecting a subject from an HIV-1 infection or for treating HIV-1 in a subject in need thereof.

26. The vaccine of any one of claims 15-24 for use in treating HIV-1 in a subject in need thereof.

27. A method of designing and producing an HIV-1 vaccine for a subject comprising:
(a) designing EpiGraph vaccine antigens to optimally cover the diversity within a geographic area using a vaccine antigen amino acid sequence generated using the EpiGraph method of antigen amino acid sequence selection; and,
(b) producing said designed EpiGraph vaccine antigens.

28. The method of claim 27, further comprising the steps of determining the amino acid sequence of HIV-1 viruses in an individual and inserting the Epigraph vaccine antigens into a vector.

29. A vaccine for use in inducing an effector memory T cell response comprising one or more EpiGraph vaccine antigens and a vector.

30. The vaccine of claim 29, wherein the EpiGraph vaccine antigen comprises an amino acid sequence selected from the group consisting of: SEQ ID NOs: 691-712 and SEQ ID NOs: 717-789.

31. A polypeptide comprising one or more HIV-1 population episensus antigens determined using the EpiGraph approach or HIV-1 tailored antigens, wherein the polypeptide comprises an amino acid sequence selected from the group consisting of: SEQ ID NOs: 691-712 and SEQ ID NOs: 717-789.