CLAIMS:

1. An Invasion Plasmid Antigen B (IpaB) polypeptide antigen comprising three to six non-natural amino acid (nnAA) incorporated into the IpaB polypeptide antigen amino acid sequence, wherein the nnAA is incorporated at a position selected from K241, K262, K269, K283, K289, K299, C309, K312, S329, S333, D347, E360, K368, E372, K376, D380, K384, E387, D392, K394, K395, K397, K424, K429, K436, K440, K448, K451, K470, and K482 of SEQ ID NO: 1.

2. The IpaB antigen of claim 1, wherein the nnAA is incorporated at a position selected from K289, K299, K368, K395, K436, and K470.

3. The IpaB antigen of claim 2, wherein the IpaB polypeptide antigen comprises an nnAA incorporated at:

(a) each of positions K289, K368, and K395 of SEQ ID NO: 1;

(b) each of positions K299, K395, and K436 of SEQ ID NO: 1;

(c) each of positions K299, K368, and K395 of SEQ ID NO: 1;

(d) each of positions K289, K368, K395, and K436 of SEQ ID NO: 1;

(e) each of positions K299, K395, K436, and K470 of SEQ ID NO: 1; or

(f) each of positions K299, K368, K395, and K436 of SEQ ID NO: 1.

4. The IpaB antigen of claim 3, wherein the IpaB polypeptide antigen comprises:

(a) the amino acid sequence of SEQ ID NO: 2;

(b) the amino acid sequence of SEQ ID NO: 3;

(c) the amino acid sequence of SEQ ID NO: 4;

(d) the amino acid sequence of SEQ ID NO: 5;

(e) the amino acid sequence of SEQ ID NO: 6; or

(f) the amino acid sequence of SEQ ID NO: 7.

5. The IpaB antigen of any one of claims 1 - 4, wherein the nnAA is selected from 2-amino-3-(4-azidophenyl)propanoic acid (pAF), 2-amino-3-(4-(azidomethyl)phenyl)propanoic acid (pAMF), 2-amino-3-(5-(azidomethyl)pyridin-2-yl)propanoic acid, 2-amino-3-(4-(azidomethyl)pyridin-2-yl)propanoic acid, 2-amino-3-(6-(azidomethyl)pyridin-3-yl)propanoic

acid, 2-amino-5-azidopentanoic acid, and 2-amino-3-(4-(azidomethyl)phenyl)propanoic acid, or any combination thereof.

6. The IpaB antigen of claim 5, wherein the nnAA is pAMF.

7. The IpaB antigen of claims 1-6, conjugated to one or more of an O-antigen *Shigella* polysaccharide (OPS).

8. The IpaB polypeptide antigen of claim 7, wherein the one or more OPS is selected from serotypes 1a, 1b, 2a, 2b, 3b, 4a, 4b, 5a, 5b, 6, 7a, 7b, or combinations of the foregoing.

9. An immunogenic composition comprising the IpaB antigen of any one of claims 1-8.

10. The immunogenic composition of claim 9, further comprising at least one excipient selected from vehicles, solubilizers, emulsifiers, stabilizers, preservatives, isotonicity agents, buffer systems, dispersants, diluents, viscosity modifiers, and absorption enhancers.

11. The immunogenic composition of claims 9 or 10, further comprising an adjuvant.

12. The immunogenic composition of any one of claims 9-11, formulated as a sterile injectable solution or a lyophilized form.

13. A method for expressing the IpaB polypeptide antigen of any one of claims 1-8 comprising expressing the IpaB polypeptide antigen using cell-free protein synthesis in the presence of an exogenous IpgC chaperone protein.

14. The method of claim 13, wherein the IpaB polypeptide antigen is from a *Shigella* species selected from *S. dysenteriae*, *S. flexneri*, *S. boydii*, and *S. sonnei*.

15. The method of claim 13 or claim 14, wherein the IpaB polypeptide antigen comprises an amino acid sequence that is at least 80%, 90%, 95%, 96%, 97%, 98%, or 99% identical to the amino acid sequence of SEQ ID NO: 1.

16. The method of claim 13, wherein at least one non-natural amino acid (nnAA) is incorporated into the IpaB polypeptide antigen amino acid sequence.

17. The method of claim 16, wherein the nnAA is selected from 2-amino-3-(4-azidophenyl)propanoic acid (pAF), 2-amino-3-(4-(azidomethyl)phenyl)propanoic acid (pAMF), 2-amino-3-(5-(azidomethyl)pyridin-2-yl)propanoic acid, 2-amino-3-(4-(azidomethyl)pyridin-2-yl)propanoic acid, 2-amino-3-(6-(azidomethyl)pyridin-3-yl)propanoic acid, 2-amino-5-azidopentanoic acid, and 2-amino-3-(4-(azidomethyl)phenyl)propanoic acid, or any combination thereof.

18. The method of any one of claims 13-17, wherein the IpgC chaperone protein comprises an amino acid sequence that is at least 95% identical to SEQ ID NO: 8.

19. The method of any of claims 13-18, further comprising purifying the IpaB polypeptide antigen.

20. The method of claim 19, wherein the IpaB polypeptide antigen is purified in the presence of a detergent effective to degrade the IpgC chaperone protein without substantially affecting the IpaB polypeptide antigen.

21. The method of claim 20, wherein the detergent is lauryldimethylamine oxide (LDAO).

22. The method of claim 21, wherein LDAO is present at an amount of 0.1% v/v or less.

23. A purified IpaB antigen prepared by the method of any one of claims 13-22.

24. Use of the immunogenic composition of any one of claims 9-12 in the manufacture of a medicament for immunizing a subject against *Shigella dysentery*.

25. The use of claim 24, wherein the immunogenic composition is to be administered to the subject as an intramuscular injection, or wherein the immunogenic composition is to be administered to the subject transmucosally

26. The use of claim 24 or 25, wherein the subject exhibits symptoms of *Shigella dysentery* and the immunogenic composition is to be administered as a therapeutic vaccine.

27. Use of the immunogenic composition of any one of claims 9-12 in the manufacture of a medicament for reducing the risk of *Shigella* dysentery infection developing in a subject.

28. Use of the immunogenic composition of any one of claims 9-12 in the manufacture of a medicament for inducing a protective immune response against a *Shigella* bacterium in a subject.