CLAIMS

1. A peptide immunogen construct represented by the following formulae:

$$(A)_n\text{-(Target antigenic site)-}(B)_o\text{-}(Th)_m\text{-}(A)_n\text{-}X$$

or

$$(A)_n\text{-}(Th)_m\text{-}(B)_o\text{-(Target antigenic site)-}(A)_n\text{-}X$$

or

$$(A)_n\text{-}(Th)_m\text{-}(B)_o\text{-(Target antigenic site)-}(B)_o\text{-}(Th)_m\text{-}(A)_n\text{-}X$$

or

$$\{(A)_n\text{-}(Th)_p\text{-}(B)_o\text{-(Target antigenic site)-}(B)_o\text{-}(Th)_p\text{-}(A)_n\text{-}X\}_m$$

wherein:

each A is independently an amino acid;

each B is independently a heterologous spacer;

each Th is independently a promiscuous artificial Th epitope selected from the group consisting of SEQ ID NOs: 1-52;

the Target antigenic site is a B cell epitope from a foreign-antigen protein, a self-antigen protein, a CTL epitope, a Tumor-Associated Carbohydrate Antigen (TACA), a B cell epitope from a neoantigen, a small molecule drug, or an immunologically reactive analogue thereof;

X is an amino acid, α-COOH, or α-$CONH_2$;

n is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10;

m is 1, 2, 3, or 4; and

o is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; and

p is 0, 1, 2, 3, or 4.

2. The peptide immunogen construct of claim 1, wherein the target antigenic site is a B cell epitope from a self-antigen protein selected from the group consisting of:

(a) an Aβ peptide having the amino acid sequence of SEQ ID NO: 56, 57, 58, 59, or 60;

(b) an alpha-Syn peptide having the amino acid sequence of SEQ ID NO: 61;

(c) an IgE EMPD peptide having the amino acid sequence of SEQ ID NO: 62;

(d) a Tau peptide having the amino acid sequence of SEQ ID NO: 63, 69, 70, or 71;

(e) an IL-31 peptide having the amino acid sequence of SEQ ID NO: 64 or 72; and

(f) an IL-6 peptide having the amino acid sequence of SEQ ID NO: 145.

3. The peptide immunogen construct of claim 1, wherein the heterologous spacer of component B is selected from the group consisting of an amino acid, Lys-, Gly-, Lys-Lys-Lys-, (α, ε-N)Lys, ε-N-Lys-Lys-Lys-Lys (SEQ ID NO: 53), Lys-Lys-Lys-εNLys (SEQ ID NO: 54), Gly-Gly, Pro-Pro-Xaa-Pro-Xaa-Pro (SEQ ID NO: 55), and any combination thereof.

4. The peptide immunogen of claim 1, wherein the target antigenic site is a CTL epitope having an amino acid sequence selected from the group consisting of SEQ ID NOs: 76-144.

5. The peptide immunogen of claim 1, wherein the target antigenic site is a TACA selected from the group consisting of GD3, GD2, Globo-H, GM2, Fucosyl GM1, GM2, PSA, Le^y, Le^x, SLe^x, SLe^a, Tn, TF, and STn.

6. The peptide immunogen of claim 1, wherein the target antigenic site is a B cell epitope from a neoantigen selected from the group consisting of SEQ ID NOs: 73-75.

7. The peptide immunogen of claim 1, wherein the target antigenic site is a small molecule drug.

8. A pharmaceutical composition comprising the peptide immunogen construct according to claim 1.