CLAIMS

1. An IL-6 peptide immunogen construct having about 30 or more amino acids, represented by the formulae:

$(Th)_m$–$(A)_n$–(IL-6R binding region of IL-6 or a fragment thereof)–X

or

(IL-6R binding region of IL-6 or a fragment thereof)–$(A)_n$–$(Th)_m$–X

or

$(Th)_m$–$(A)_n$–(IL-6R binding region of IL-6 or a fragment thereof)–$(A)_n$–$(Th)_m$–X

wherein

Th is a heterologous T helper epitope;

A is a heterologous spacer;

(IL-6R binding region of IL-6 or a fragment thereof) is selected from the group consisting of SEQ ID NOs: 5-19;

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

m is from 1 to about 4; and

n is from 0 to about 10.

2. The IL-6 peptide immunogen construct according to claim 1, wherein the Th epitope is selected from the group consisting of SEQ ID NOs: 78-106 and 216-226.

3. The IL-6 peptide immunogen construct according to claim 1, wherein the peptide immunogen construct is selected from the group consisting of SEQ ID NOs: 107-215.

4. An IL-6 peptide immunogen construct comprising:

   a. a B cell epitope selected from the group consisting of SEQ ID NOs: 5 to 19;
   b. a T helper epitope comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 78-106, 216-226, and any combination thereof; and
   c. an optional heterologous spacer 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: 77), Lys-Lys-Lys-ε-N-Lys (SEQ ID NO: 231), and Pro-Pro-Xaa-Pro-Xaa-Pro (SEQ ID NO: 76), and any combination thereof,

wherein the B cell epitope is covalently linked to the T helper epitope directly or through the optional heterologous spacer.

5. The IL-6 peptide immunogen construct of claim 4, wherein the T helper epitope is selected from the group consisting of SEQ ID NOs: 78 to 106, and any combination thereof.

6. The IL-6 peptide immunogen construct of claim 4, wherein the optional heterologous spacer is (α, ε-N)Lys, ε-N-Lys-Lys-Lys-Lys (SEQ ID NO: 77), Lys-Lys-Lys-ε-N-Lys (SEQ ID NO: 231), or Pro-Pro-Xaa-Pro-Xaa-Pro (SEQ ID NO: 76), and any combination thereof.

7. The IL-6 peptide immunogen construct of claim 4, wherein the T helper epitope is covalently linked to the amino terminus of the B cell epitope.

8. The IL-6 peptide immunogen construct of claim 4, wherein the T helper epitope is covalently linked to the amino terminus of the B cell epitope through the optional heterologous spacer.

9. A composition comprising the IL-6 peptide immunogen construct according to claim 1.

10. A pharmaceutical composition comprising:

    a. the IL-6 peptide immunogen construct according to claim 1; and
    b. a pharmaceutically acceptable delivery vehicle and/or adjuvant.

11. The pharmaceutical composition of claim 10, wherein

    a. the IL-6R binding region or fragment thereof is selected from the group consisting of SEQ ID NOs: 5-19;
    b. the Th epitope is selected from the group consisting of SEQ ID NOs: 78-106 and 216-226; and
    c. the heterologous spacer 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: 77), Lys-Lys-Lys- ε-N-Lys (SEQ ID NO: 231), and Pro-Pro-Xaa-Pro-Xaa-Pro (SEQ ID NO: 76), and any combination thereof; and

    wherein the IL-6 peptide immunogen construct is mixed with an CpG oligodeoxynucleotide (ODN) to form a stabilized immunostimulatory complex.

12. The pharmaceutical composition of claim 10, wherein

    a. the IL-6 peptide immunogen construct is selected from the group consisting of SEQ ID NOs: 107-215; and

    wherein the IL-6 peptide immunogen construct is mixed with an CpG oligodeoxynucleotide (ODN) to form a stabilized immunostimulatory complex.

13. Use of the pharmaceutical composition according to claim 10 in the generation of antibodies against IL-6 in an animal.

14. An isolated antibody or epitope-binding fragment thereof that specifically binds to the IL-6R binding region of IL-6 or a fragment thereof in the IL-6 peptide immunogen construct according to claim 1.

15. The isolated antibody or epitope-binding fragment thereof according to claim 14 bound to the IL-6 peptide immunogen construct.

16. A composition comprising the isolated antibody or epitope-binding fragment thereof according to claim 14.

17. Use of the pharmaceutical composition according to claim 10 in the manufacture of a medicament for preventing and/or treating a disease impacted by IL-6 dysregulation in an animal.