We claim:

1. A composition comprising an MHC ligand peptide covalently attached to an MHC class II molecule comprising an MHC class II α chain or a portion thereof and an MHC class II β chain or a portion thereof,

wherein the MHC ligand peptide is covalently attached to the MHC class II molecule by a peptide linker,

wherein the MHC ligand peptide or the peptide linker comprises a first cysteine and the MHC class II molecule comprises a second cysteine, and

wherein the first cysteine and the second cysteine form a disulfide bond such that the MHC ligand peptide is bound in a peptide-binding groove formed by the MHC class II α chain or the portion thereof and the MHC class II β chain or the portion thereof.

2. The composition of claim 1, wherein the MHC class II α chain or the portion thereof comprises an α1 domain, and the MHC class II β chain or the portion thereof comprises a β1 domain.

3. The composition of claim 2, wherein the MHC class II α chain or the portion thereof comprises an MHC class II α chain extracellular domain, and the MHC class II β chain or the portion thereof comprises an MHC class II β chain extracellular domain.

4. The composition of claim 2 or 3, wherein:

(1) the MHC class II α chain or the portion thereof comprises the α1 domain, an α2 domain, a transmembrane domain, and a cytoplasmic domain; and

(2) the MHC class II β chain or the portion thereof comprises the β1 domain, a β2 domain, a transmembrane domain, and a cytoplasmic domain.

5. The composition of any preceding claim, wherein the composition is membrane-anchored or is soluble.

6. The composition of claim 5, wherein the composition is soluble, and wherein:

(1) the MHC class II α chain or the portion thereof comprises the α1 domain and an α2 domain but does not comprise a transmembrane domain or a cytoplasmic domain; and

(2) the MHC class II β chain or the portion thereof comprises the β1 domain and a β2 domain but does not comprise a transmembrane domain or a cytoplasmic domain.

7. The composition of claim 5 or 6, wherein the composition is soluble, and wherein the MHC class II α chain or the portion thereof and the MHC class II β chain or the portion thereof are linked by a Jun-Fos zipper, electrostatic engineering, knobs-into-holes, an immunoglobulin scaffold, an immunoglobulin Fc region, or a linker.

8. The composition of claim 7, wherein the MHC class II α chain or the portion thereof and the MHC class II β chain or the portion thereof are linked by a Jun-Fos zipper comprising a Jun leucine zipper dimerization motif and a Fos leucine zipper dimerization motif, and

wherein the MHC class II α chain or the portion thereof is linked to the Jun leucine zipper dimerization motif and the MHC class II β chain or the portion thereof is linked to the Fos leucine zipper dimerization motif, or the MHC class II α chain or the portion thereof is linked to the Fos leucine zipper dimerization motif and the MHC class II β chain or the portion thereof is linked to the Jun leucine zipper dimerization motif.

9. The composition of claim 8, wherein the C-terminal end of the MHC class II α chain or the portion thereof is linked to the Jun leucine zipper dimerization motif and the C-terminal end of the MHC class II β chain or the portion thereof is linked to the Fos leucine zipper dimerization motif, or

wherein the C-terminal end of the MHC class II α chain or the portion thereof is linked to the Fos leucine zipper dimerization motif and the C-terminal end of the MHC class II β chain or the portion thereof is linked to the Jun leucine zipper dimerization motif.

10. The composition of claims 8 or 9, wherein the MHC class II α chain or the portion thereof is linked to the Jun leucine zipper dimerization motif by an MHC-Jun linker, and the MHC class II β chain or the portion thereof is linked to the Fos leucine zipper dimerization motif by an MHC-Fos linker, or

wherein the MHC class II α chain or the portion thereof is linked to the Fos leucine zipper dimerization motif by the MHC-Fos linker, and the MHC class II β chain or the portion thereof is linked to the Jun leucine zipper dimerization motif by the MHC-Jun linker.

11. The composition of claim 10, wherein the MHC-Jun linker and the MHC-Fos linker each comprise the sequence set forth in SEQ ID NO: 1.

12. The composition of any preceding claim, wherein the MHC ligand peptide:

(I) is about 10 to about 18 amino acids in length, is about 10 to about 15 amino acids in length, or is about 10 to about 12 amino acids in length;

(II) comprises residues P-1 to P9 or residues P-3 to P9;

(III) is an antigenic MHC ligand peptide; or

(IV) is associated with a T-cell-mediated disease.

13. The composition of any preceding claim, wherein:

(I) the peptide linker linking the MHC ligand peptide to the MHC class II molecule is a flexible linker;

(II) the peptide linker linking the MHC ligand peptide to the MHC class II molecule comprises one or more flexible amino acids and one or more polar amino acids;

(III) the peptide linker linking the MHC ligand peptide to the MHC class II molecule does not comprise any charged amino acids;

(IV) the peptide linker linking the MHC ligand peptide to the MHC class II molecule comprises a cleavage site, wherein the cleavage site is a tobacco etch virus (TEV) protease cleavage site;

(V) the peptide linker linking the MHC ligand peptide to the MHC class II molecule is non-immunogenic;

(VI) the peptide linker linking the MHC ligand peptide to the MHC class II molecule is connected to the N-terminal end of the MHC class II β chain or the portion thereof;

(VII) the peptide linker linking the MHC ligand peptide to the MHC class II molecule is connected to the N-terminal end of the MHC class II α chain or the portion thereof;

(VIII) the peptide linker linking the MHC ligand peptide to the MHC class II molecule is at least about 9 amino acids in length;

(IX) the peptide linker linking the MHC ligand peptide to the MHC class II molecule is between about 9 and about 50 amino acids in length; or

(X) the peptide linker linking the MHC ligand peptide to the MHC class II molecule comprises 2-4 repeats of the sequence set forth in SEQ ID NO: 4.

14. The composition of any preceding claim, wherein:

(I) the peptide linker linking the MHC ligand peptide to the MHC class II molecule comprises the first cysteine, wherein the first cysteine is the only cysteine in the peptide linker linking the MHC ligand peptide to the MHC class II molecule, and wherein the first cysteine is in the first four amino acids of the peptide linker linking the MHC ligand peptide to the MHC class II molecule; or

(II) the peptide linker linking the MHC ligand peptide to the MHC class II molecule comprises 2-4 repeats of the sequence set forth in SEQ ID NO: 4, wherein one amino acid in one of the repeats is mutated to cysteine, and wherein the peptide linker linking the MHC ligand peptide to the MHC class II molecule comprises the sequence set forth in SEQ ID NO: 21.

15. The composition of any one of claims 1-13, wherein the MHC ligand peptide comprises the first cysteine, and wherein the first cysteine faces away from an epitope formed by the composition.

16. The composition of any preceding claim, wherein the second cysteine is in the MHC class II α chain or the portion thereof, and wherein the peptide linker linking the MHC ligand peptide to the MHC class II molecule is connected to the N-terminal end of the MHC class II β chain or the portion thereof.

17. The composition of any preceding claim, wherein the second cysteine is not present in a wild type MHC class II molecule corresponding to the MHC class II molecule in the composition, and wherein the second cysteine is in place of a non-cysteine amino acid in the corresponding wild type MHC class II molecule.

18. The composition of claim 17, wherein the second cysteine is in the MHC class II α chain or the portion thereof, and

wherein the second cysteine is at a position corresponding to position 101 in the sequence set forth in SEQ ID NO: 49 when the MHC class II α chain or the portion thereof is optimally aligned with SEQ ID NO: 49.

19. The composition of any preceding claim, wherein the MHC class II molecule lacks a cysteine present in a corresponding wild type MHC class II molecule, and wherein the cysteine present in the corresponding wild type MHC class II molecule has been replaced with an alanine or a glutamine in the MHC class II molecule in the composition.

20. The composition of any one of claims 1-18, wherein the MHC class II α chain or the portion thereof lacks a cysteine present in a corresponding wild type MHC class II α chain, and wherein the cysteine present in the corresponding wild type MHC class II α chain has been replaced with an alanine or a glutamine in the MHC class II α chain or the portion thereof in the composition.

21. The composition of claim 20, wherein the cysteine in the corresponding wild type MHC class II α chain is at a position corresponding to position 70 in the sequence set forth in SEQ ID NO: 49 when the MHC class II α chain or the portion thereof is optimally aligned with SEQ ID NO: 49.

22. The composition of any preceding claim, wherein the composition further comprises one or more immunostimulatory molecules.

23. The composition of claim 22, wherein:

(I) the one or more immunostimulatory molecules comprise a pan-DR-binding epitope (PADRE) and/or a peptide from lymphocytic choriomeningitis virus (LCMV);

(II) the one or more immunostimulatory molecules are directly or indirectly covalently linked to the MHC class II molecule; or

(III) the one or more immunostimulatory molecules are directly or indirectly covalently linked to the MHC class II α chain or the portion thereof and/or the MHC class II β chain or the portion thereof.

24. The composition of any preceding claim, wherein the MHC class II molecule is a human MHC class II molecule.

25. The composition of claim 24, wherein the human MHC class II molecule is selected from the group consisting of HLA-DQ, HLA-DR, and HLA-DP.

26. The composition of claim 25, wherein the human MHC class II molecule is an HLA-DQ2 molecule or wherein the human MHC class II molecule is an HLA-DR2 molecule.

27. The composition of any preceding claim, wherein the MHC class II α chain or the portion thereof comprises an MHC class II α chain extracellular domain, and the MHC class II β chain or the portion thereof comprises an MHC class II β chain extracellular domain,

wherein the peptide linker linking the MHC ligand peptide to the MHC class II molecule is a flexible linker between about 9 and about 50 amino acids in length that comprises the first cysteine and is connected to the N-terminal end of the MHC class II β chain or the portion thereof,

wherein the second cysteine is in the MHC class II α chain or the portion thereof and is not present in a wild type MHC class II molecule corresponding to the MHC class II molecule in the composition, and

wherein the MHC class II molecule lacks a cysteine present in a corresponding wild type MHC class II molecule.

28. The composition of claim 27, wherein the composition is soluble,

wherein the MHC class II α chain or the portion thereof comprises the α1 domain and an α2 domain but does not comprise a transmembrane domain or a cytoplasmic domain,

wherein the MHC class II β chain or the portion thereof comprises the β1 domain and a β2 domain but does not comprise a transmembrane domain or a cytoplasmic domain, and

wherein the MHC class II α chain or the portion thereof and the MHC class II β chain or the portion thereof are linked by a Jun-Fos zipper comprising a Jun leucine zipper dimerization motif and a Fos leucine zipper dimerization motif.

29. The composition of claim 27 or 28, wherein the second cysteine is at a position corresponding to position 101 in the sequence set forth in SEQ ID NO: 49 when the MHC class II α chain or the portion thereof is optimally aligned with SEQ ID NO: 49, and

wherein the cysteine in the corresponding wild type MHC class II molecule is at a position corresponding to position 70 in the sequence set forth in SEQ ID NO: 49 when the MHC class II α chain or the portion thereof is optimally aligned with SEQ ID NO: 49.

30. The composition of any one of claims 27-29, wherein the MHC class II molecule is a human MHC class II molecule is selected from the group consisting of HLA-DQ, HLA-DP, and HLA-DR.

31. The composition of claim 30, wherein the human MHC class II molecule is HLA-DQ.

32. A nucleic acid encoding the composition of any preceding claim.

33. Use of the composition of any one of claims 1-31 or a nucleic acid encoding the composition in the manufacture of a medicament for treating an autoimmune disease, wherein the medicament is an immunotherapy drug.

34. The use of the composition or nucleic acid encoding the composition according to claim 33, wherein the immunotherapy drug is an antigen-binding protein.

35. The use of the composition or nucleic acid encoding the composition according to claim 34, wherein the antigen-binding protein specifically binds the composition.