CLAIMS

1. A method for selecting at least one immunogenic mutated peptide, comprising:

(a) obtaining a plurality of mutant sequences;

(b) identifying at least one epitope that derived from a disease-associated mutation;

(c) incorporating a plurality of factors associated with the immunogenicity of the at least one epitope, wherein the plurality of factors comprises a first factor that can be used to calculate a peptide-level score and a second factor that can be used to calculate a sample-level score, wherein the second factor for calculating said sample-level score comprises the clonality of the disease-associated mutation;

(d) weighing the plurality of factors;

(e) assigning an immunogenic score to the at least one epitope based on the weights of the plurality of factors;

(f) ranking the at least one epitope; and

(g) selecting at least one immunogenic mutated peptide based on a ranking result in step (f),

wherein the immunogenic mutated peptide comprises the at least one epitope that may elicit T-cell response.

2. The method of claim 1, wherein 100 or less epitopes are selected.

3. The method of claim 1, wherein 50 or less epitopes are selected.

4. The method of claim 1, wherein 30 or less epitopes are selected.

5. The method of claim 1, wherein 10 or less epitopes are selected.

6. The method of claim 1, wherein the plurality of factors accounts for the presentation of the at least one epitopes by MHC class I and class II.

7. The method of claim 5, wherein the binding affinity of the selected at least one epitopes with MHC class I has an IC50 values less than 1500 nM.

8. The method of claim 5, wherein the plurality of factors comprises MHC class I binding stability.

9. The method of claim 5, wherein the plurality of factors comprises protein abundance, gene expression or a combination thereof.

10. The method of claim 1, wherein the plurality of factors accounts for the ability for the at least one epitope to elicit immune response in cytotoxic T cells.

11. The method of claim 8, wherein the plurality of factors accounts for the ability for the at least one epitope to elicit immune response in helper T cell.

12. The method of claim 9, wherein the plurality of factors comprises the similarity of the at least one epitope to self-peptide.

13. The method of claim 9, wherein the plurality of factors comprises the homology of the at least one epitope to a known antigen.

14. The method of claim 1, wherein the variant frequency of the mutation is at least 10%.

15. The method of claim 1, wherein the variant frequency of the mutation is at least 30%.

16. The method of claim 1, wherein the plurality of factors comprises a copy number, tumor purity, or both copy number and tumor purity.

17. The method of claim 1, wherein one of the plurality of factors is the status of loss of heterozygosity.

18. The method of claim 1, wherein one of the plurality of factors is allele dosage.

19.The method of claim 1, wherein the immunogenic score is integrated from a plurality of factors including MHC class I and class II presentation of the at least one epitope, the ability for the at least one epitope to elicit immune response in both helper and cytotoxic T cells, and the clonality of the disease-associated mutation.

20. A system for selecting at least one immunogenic mutated peptide, comprising:

a hardware memory storing computer-executable means of:

(a) obtaining a plurality of mutant sequences;

(b) identifying at least one epitope that derived from a disease-associated mutation;

(c) incorporating a plurality of factors associated with the immunogenicity of the at least one epitope, wherein the plurality of factors comprises a first factor that can be used to calculate a peptide-level score and a second factor that can be used to calculate a sample-level score, wherein the second factor for calculating said sample-level score comprises the clonality of the disease-associated mutation;

(d) weighing the plurality of factors;

(e) assigning an immunogenic score to the at least one epitope based on the weights of the plurality of factors;

(f) ranking the at least one epitope; and

(g) selecting at least one immunogenic mutated peptide based on a ranking result in the step (f), wherein the immunogenic mutated peptide comprises the at least one epitope that may elicit T-cell response.