

WHAT IS CLAIMED IS:

1. A method to produce a full-length antibody comprising a heavy chain (HC) and a light chain (LC), wherein the method comprises:
 - culturing *E. coli* cells expressing a coding sequence for the HC and a coding sequence for the LC under conditions permissible for producing the HC and LC in a culture medium, and
 - wherein the full-length antibody is produced in an amount of at least about 200 mg per liter of the culture medium, or
 - wherein the weight percentage of the full-length antibody produced relative to the weight of cell pellet produced from the *E. coli* cells is in a range from 0.05% to 20%.
2. The method of claim 1, wherein at least some of the *E. coli* cells contain an oxidative cytoplasm.
3. The method of claim 1, wherein the method comprises transforming the plasmid to the *E. coli* strain.
4. The method of claim 1 or 3, wherein the HC and LC are produced in the cytoplasm of the *E. coli*.
5. The method of claim 1, wherein the method further comprises assembling the produced HC and LC under non-reducing conditions to form the full-length antibody.
6. The method of claim 1 or 5, wherein the molar ratio of the produced HC and the produced LC from the *E. coli* is about 1:1 to about 1:3.
7. The method of any one of claims 1-6, wherein expression of HC, LC, or both is controlled by a promoter,
 - wherein the promoter is a T7 promoter or a promoter that has substantially similar promoter strength as the T7 promoter, or

wherein the promoter is a T5 promoter or a promoter that has substantially similar promoter strength as the T5 promoter.

8. The method of any one of claims 1-6, wherein the plasmid comprises a bicistronic operon, wherein the bicistronic operon comprises the coding sequence for the HC and the coding sequence for LC, or

wherein the plasmid comprises a first monocistronic operon for the HC and a second monocistronic operon for LC.

9. The method of claim 8, wherein the bicistronic operon comprises a promoter that drives expression of both the HC and LC, and wherein the promoter is a T7 promoter or a promoter that has substantially similar promoter strength as the T7 promoter, or wherein the first monocistronic operon or the second monocistronic operon comprise a T7 promoter.

10. The method of claim 9, wherein the bicistronic operon comprises a T7 terminator, or

wherein the first monocistronic operon or the second monocistronic operon comprises a T7 terminator.

11. The method of any of claims 1-10, wherein the *E. coli* cells comprises a first ribosome-binding site for translation of the HC and a second ribosomal binding site for translation of LC, wherein the first and second ribosomal binding sites are selected such that the molar ratio of HC and LC produced from the *E. coli* ranges from 1:1 to 1:3.

12. The method of claim 11, wherein the first ribosomal binding site is transcribed from a DNA sequence that is selected from the group consisting of SEQ ID NO: 17-19, and the second ribosomal binding sequence is transcribed from a DNA sequence that is selected from the group consisting of SEQ ID NO: 20-23.

13. The method of claim 12, wherein the first ribosomal binding site has a sequence of SEQ ID NO: 17 or SEQ ID NO: 18.

14. The method of claim 1, wherein the HC and/or the LC of the full-length antibody comprises at least one non-natural amino acid.

15. The method of claim 14, wherein the coding sequence of the HC and /or the coding sequence of the LC has been modified to have at least one non-natural amino acid codon, wherein the non-natural amino acid codon that does not result in incorporation of any naturally occurring amino acids.

16. The method of claim 14, wherein the at least one non-natural amino acid is introduced by charging a tRNA that contains anticodons that are complementary to the at least one non-natural amino acid codon.

17. The method of claim 16, wherein the at least one non-natural amino acid codon is the amber codon TAG.

18. The method of claim 16, wherein the at least one non-natural amino acid is para-methylazido-L-phenylalanine (pAMF), AEK, or pAcF.

19. The method of any one of claims 15-18, wherein the codon that is immediately 3' to at least one of the non-natural amino acid is codon optimized.

20. The method of claim 1, wherein the full-length antibody is the B10 antibody, an H01 antibody, a 7219 antibody, an anti-PD1 antibody, an anti-Tim3 antibody, an anti LAG3 antibody, or an anti-Her 2 antibody.

21. The method of claim 20, wherein the coding sequence for the HC of the B10 antibody contains a mutation relative to SEQ ID NO: 1, wherein said the mutation results in a codon for a natural amino acid being substituted with a non-natural amino acid codon,

wherein the natural amino acid is one or more amino acid selected from F404, Y180, and F241, and

wherein a non-natural amino acid is introduced to the HC by charging a tRNA that is complementary to the non-natural amino acid codon.

22. The method of claim 20 or 21, wherein the coding sequence for the LC of the B10 antibody or the coding sequence for the LC of the trastuzumab contains at least one mutation relative to SEQ ID NO: 2, wherein the at least one mutation results in a codon for a natural amino acid being substituted with a non-natural amino acid codon, wherein the wherein the natural amino acid is K42 or E161.

23. The method of claim 14, wherein the method further comprises covalently linking a warhead moiety to the non-natural amino acid on the HC or the LC of the full-length antibody via a linker.

24. The method of claim 23, wherein the warhead is SC236 or Aminoxy-PEG8-methane.