CLAIMS

We claim:

1. An engineered pantothenate kinase polypeptide comprising an amino acid sequence having at least 85% sequence identity to SEQ ID NO: 2, or to a functional fragment thereof, wherein said polypeptide or fragment thereof comprises an amino acid substitution corresponding to amino acid position 277 and/or 281 in SEQ ID NO: 2, wherein said polypeptide has increased ability to convert ethynyl glyceraldehyde to ethynyl glyceraldehyde phosphate when compared the wild-type polypeptide having the amino acid sequence SEQ ID NO: 2.

2. The polypeptide of Claim 1, wherein the amino acid substitution is L277M or L277I.

3. The polypeptide of Claim 1, wherein the amino acid substitution is at both amino acid positions 277 and 281.

4. The polypeptide of Claim 3, wherein the amino acid substitution is L277I/I281L, L277M/1281M, or L277I/I281 M.

5. The polypeptide of Claim 4, wherein the mutation is L277I/I281 M.

6. The polypeptide of Claim 5, wherein the polypeptide further comprises amino acid substitutions selected from the group consisting of amino acid position 13, 13/14/19/22, 13/14/22, 13/14/22/37, 13/14/22/106/247, 13/14/218/247/305, 13/19, 13/22, 15/26/283, 15/27, 15/27/283, 15/27/283/305, 15/27/305, 15/283, 19/22/26/69, 19/29, 20, 20/24, 20/24/25/69/75, 20/24/30/75, 20/70/75, 22/218, 22/218/271, 24, 24/30, 24/30/75, 24/75/86/134, 26, 26/29, 27, 27/78, 27/78/123/283, 27/283, 29, and 75.

7. The polypeptide of Claim 6, wherein the amino acid substitutions is F15L/V27N/L277I/I281M/W283H.

8. The polypeptide of Claim 7, wherein the polypeptide further comprises amino acid substitutions selected from the group consisting of amino acid positions 14/19/41/157/161/261, 19/22/41/44/54/119/157/261/298/308, 19/22/54/157/169, 22/106/218, 41, 41/44/54/119/120/157/169/261, 41/44/54/119/120/157/261/298/308, 41/44/54/119/120/161/169/261/298, 41/44/54/119/298/305, 41/44/161/169/261, 41/44/169/261/298/308, 41/44/169/261/308, 41/54/119/157/169/261, 41/119/161/169/261/308,

41/119/161/308, 44/54/119/120/157/161/169, 44/54/119/120/157/161/261, 44/54/119/120/169/261, 44/54/119/157/161/261/298, 44/54/119/169, 44/76/119/157/161, 44/119/120/261, 44/119/157/161, 44/119/161/261/298, 44/157/161/169, 44/157/298, 44/261/298/308, 44/261/308, 54/119/157/161/169, 54/157/161/261/308, 119/157/161, 119/157/161/169/261, 119/169/261, 119/261/298/308, 120/157/261, 157, 157/161/169/261, 157/161/308, 157/169/261/298/308, 157/308, 250, 302, and 310.

9. The polypeptide of Claim 8, wherein the amino acid substitutions is F15L/V27N/I54V/V157M/S161K/N261G/L277I/I281 M/W283H/A308I.

10. The polypeptide of Claim 9, wherein the polypeptide further comprises amino acid substitutions selected from the group consisting of amino acid positions 24/48, 64, 71, 123, 125, 134, and 180.

11. The polypeptide of Claim 10, wherein the amino acid substitutions is F15L/V27N/154V/L123H/V157M/S161K/N261 G/L277I/I281 M/W283H/A308I.

12. The polypeptide of Claim 11, wherein the polypeptide further comprises amino acid substitutions selected from the group consisting of amino acid positions 83/84/305, 143, and 154.

13. The polypeptide of Claim 12, wherein the amino acid substitutions is F15L/V27N/154V/L123H/K143G/V157M/S161K/N261G/L277I/I281M/W283H/A308I.

14. The polypeptide of Claim 13, wherein the polypeptide further comprises amino acid substitutions selected from the group consisting of amino acid positions 13/169/213/247/283/288, 16/247, 49/247, 64/104/154/284, 75/104/284, 169/247, and 247.

15. The polypeptide of Claim 14, wherein the amino acid substitutions is F15L/V27N/154V/V75Q/T104F/L123H/K143G/V157M/S161K/N261G/L277I/I281M/W283H/L284V/A308I.

16. The polypeptide of Claim 15, wherein the polypeptide further comprises amino acid substitutions selected from the group consisting of amino acid positions 8, 8/13/14/83/247, 8/64/213/247, 8/64/247, 8/247/283, 10, and 264/276.

17. The polypeptide of Claim 16, wherein the amino acid substitutions is L8E/F15L/V27N/I54V/V75Q/T104F/L123H/K143G/V157M/S161K/F247L/N261G/L277I/I281M/H283S/L284V/A308I.

18. The polypeptide of Claim 17, wherein the polypeptide further comprises amino acid substitutions selected from the group consisting of amino acid positions 11/13/23/61/85/304, 13/19/61, 23/61, and 23/61/304.

19. A composition comprising the engineered pantothenate kinase of Claim 1.

20. A polynucleotide sequence encoding an engineered pantothenate kinase polypeptide, wherein said polynucleotide sequence comprises at least 85% sequence identity to SEQ ID NO: 1, wherein the polynucleotide sequence encodes the polypeptide of Claim 1.

21. A polynucleotide sequence encoding the engineered pantothenate kinase of Claim 1.

22. The polynucleotide sequence of Claim 21, wherein said polynucleotide sequence is operably linked to a control sequence.

23. The polynucleotide sequence of Claim 21, wherein said polynucleotide sequence is radon optimized.

24. An expression vector comprising at least one polynucleotide sequence of Claim 21.

25. A host cell comprising at least one expression vector of Claim 24.

26. A host cell comprising at least one polynucleotide sequence of Claim 21.

27. A method of producing an engineered pantothenate kinase in a host cell, comprising culturing the host cell of Claim 26, under suitable conditions, such that at least one engineered pantothenate kinase is produced.

28. The method of Claim 27, further comprising recovering at least one engineered pantothenate kinase from the culture and/or host cell.

29. The method of Claim 27, further comprising the step of purifying said at least one engineered pantothenate kinase.