

CLAIM(S):

1. An isolated polynucleotide encoding a polypeptide having sweet-taste modulation activity, wherein the polynucleotide sequence encodes a polypeptide selected from the group consisting of:
 - (a) a polypeptide sequence selected from the group consisting of SEQ ID NO: 3, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:17, SEQ ID NO:71, SEQ ID NO:72, SEQ ID NO:73, SEQ ID NO:74, and SEQ ID NO:75;
 - (b) a polypeptide having at least 80% sequence identity to the polypeptide sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, and SEQ ID NO:17; and
 - (c) a polypeptide sequence modified from the polypeptide sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, and SEQ ID NO:17 by deletion, insertion, substitution, or addition of no more than 24 amino acids.
2. The isolated polynucleotide of claim 1, wherein the polypeptide sequence of the polypeptide having sweet-taste modulation activity is the polypeptide sequence set forth in SEQ ID NO:3, or a polypeptide sequence having at least 80% sequence identity to SEQ ID NO:3.
3. The isolated polynucleotide of claim 1 or 2, wherein the polypeptide sequence comprises amino acid residues 1-11, 17-32, 39, 40, 45-67, 73-100, and 110-121 of SEQ ID NO:3.
4. The isolated polynucleotide of claim 1 or 2, wherein the polypeptide sequence of the polypeptide having sweet-taste modulation activity comprises SEQ ID NO:71, SEQ ID NO:72, SEQ ID NO:73, SEQ ID NO:74, or SEQ ID NO:75.
5. The isolated polynucleotide of claim 4, wherein the polypeptide sequence of the polypeptide having sweet-taste modulation activity comprises SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 30, SEQ ID NO: 38, SEQ ID NO: 42, SEQ ID NO: 44, SEQ ID NO: 46,

SEQ ID NO: 50, SEQ ID NO: 52, SEQ ID NO: 54, SEQ ID NO: 58, SEQ ID NO: 60, SEQ ID NO: 62, SEQ ID NO: 64, SEQ ID NO: 66, or SEQ ID NO: 68.

6. The isolated polynucleotide of claim 4 or 5, wherein the polynucleotide comprises SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 29, SEQ ID NO: 37, SEQ ID NO: 41, SEQ ID NO: 43, SEQ ID NO: 45, SEQ ID NO: 49, SEQ ID NO: 51, SEQ ID NO: 53, SEQ ID NO: 57, SEQ ID NO: 59, SEQ ID NO: 61, SEQ ID NO: 63, SEQ ID NO: 65, or SEQ ID NO: 67.

7. The isolated polynucleotide of any one of claims 1-6, operably linked to a heterologous regulatory element.

8. The isolated polynucleotide of any one of claims 1-7, wherein the polynucleotide sequence further encodes a histidine tag.

9. An expression cassette comprising the isolated polynucleotide of any one of claims 1-8.

10. A vector comprising the isolated polynucleotide of any one of claims 1-8.

11. A host cell transformed with the vector of claim 10.

12. A method of producing a protein having sweet-taste modulation activity, comprising culturing the host cell of claim 11 in a medium under conditions that result in producing the protein having sweet-taste modulation activity.

13. An isolated polypeptide comprising a polypeptide sequence having at least 80% sequence identity to a polypeptide sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, and SEQ ID NO:17,

wherein the polypeptide optionally contains at least one substitution modification relative to the polypeptide sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, and SEQ ID NO:17, or

wherein the polypeptide optionally further comprises a histidine tag, and

wherein the polypeptide has sweet-taste modulation activity.

14. The isolated polypeptide of claim 13, wherein the polypeptide comprises SEQ ID NO:3 or polypeptide sequence with at least 80% sequence identity to SEQ ID NO:3.

15. The isolated polypeptide of claim 13 or 14, wherein the polypeptide comprises amino acid residues 1-11, 17-32, 39, 40, 45-67, 73-100, and 110-121 of SEQ ID NO:3.
16. The isolated polypeptide of claim 13 or 14, wherein the polypeptide comprises SEQ ID NO:71, SEQ ID NO:72, SEQ ID NO:73, SEQ ID NO:74, or SEQ ID NO:75.
17. The isolated polypeptide of claim 16, wherein the polypeptide comprises SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 30, SEQ ID NO: 38, SEQ ID NO: 42, SEQ ID NO: 44, SEQ ID NO: 46, SEQ ID NO: 50, SEQ ID NO: 52, SEQ ID NO: 54, SEQ ID NO: 58, SEQ ID NO: 60, SEQ ID NO: 62, SEQ ID NO: 64, SEQ ID NO: 66, or SEQ ID NO: 68.
18. An isolated polynucleotide, wherein the polynucleotide sequence comprises a polynucleotide selected from the group consisting of:
- (a) the nucleic acid sequence set forth in SEQ ID NO:2; and
 - (b) a nucleic acid sequence having at least 90% sequence identity to the nucleic acid sequence set forth in SEQ ID NO:2,
- wherein the polynucleotide encodes a polypeptide having sweet-taste modulation activity.
19. The isolated polynucleotide of claim 18, wherein the polypeptide sequence of the polypeptide having sweet-taste modulation activity is selected from the group consisting of SEQ ID NO:3, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:17, SEQ ID NO:71, SEQ ID NO:72, SEQ ID NO:73, SEQ ID NO:74, and SEQ ID NO:75.
20. The isolated polynucleotide of claim 18 or 19, wherein the polynucleotide comprises the nucleic acid sequence of SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 29, SEQ ID NO: 37, SEQ ID NO: 41, SEQ ID NO: 43, SEQ ID NO: 45, SEQ ID NO: 49, SEQ ID NO: 51, SEQ ID NO: 53, SEQ ID NO: 57, SEQ ID NO: 59, SEQ ID NO: 61, SEQ ID NO: 63, SEQ ID NO: 65, or SEQ ID NO: 67.
21. The isolated polynucleotide of any of claims 18-20, operably linked to a heterologous regulatory element.
22. The isolated polynucleotide of any one of claims 18-21, wherein the polypeptide of (a) and (b) further comprises a nucleotide sequence encoding a histidine tag.
23. An expression cassette comprising the polynucleotide of any one of claims 18-22.

24. A vector comprising the polynucleotide of claim 23.
25. A host cell transformed with the vector of claim 24.
26. A method of producing a protein having sweet-taste modulation activity, comprising culturing the host cell of claim 25 in a medium under conditions that result in producing the protein having sweet-taste modulation activity.
27. A composition, comprising a combination of
- (a) a product for oral administration, wherein the product is not *Mattirolomyces terfezioides* truffle, and
- (b) a sweetening composition comprising an isolated polypeptide, wherein:
- (i) the polypeptide comprises an amino acid sequence having at least 80% sequence identity to a polypeptide selected from the group consisting of SEQ ID NO:3, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, and SEQ ID NO:17; or
- (ii) the polypeptide is the polypeptide of any one of claims 13-17;
- wherein the combination has enhanced sweet taste compared to the product for oral administration.
28. A method for modulating the taste of a product for oral administration, comprising:
- combining the product for oral administration with an effective amount of a sweetening composition comprising an isolated polypeptide, wherein:
- (i) the polypeptide comprises an amino acid sequence having at least 80% sequence identity to a polypeptide selected from the group consisting of SEQ ID NO:3, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, and SEQ ID NO:17; or
- (ii) the polypeptide is the polypeptide of any one of claims 13-17,
- wherein the product for oral administration is not *Mattirolomyces terfezioides* truffle, and
- wherein the combination has enhanced sweet taste compared to the product for oral administration.

29. The composition of claim 27 or the method of claim 28, wherein the product for oral administration is a food, a beverage, a dietary supplement composition, or a pharmaceutical composition.
30. The composition of claim 27 or the method of claim 28, wherein the product for oral administration is a food product selected from the group consisting of baked goods; sweet bakery products, pre-made sweet bakery mixes for preparing sweet bakery products; pie fillings and other sweet fillings, gelatins and puddings; frozen desserts; yogurts; snack bars; bread products; pre-made bread mixes for preparing bread products; sauces, syrups and dressings; sweet spreads; confectionary products; and sweetened breakfast cereals.
31. The composition of claim 27 or the method of claim 28, wherein the product for oral administration is a beverage product selected from the group consisting of carbonated beverages; non-carbonated beverages; and beverage concentrates.
32. A method for purifying a polypeptide having sweet-taste modulation activity comprising:
- (a) obtaining a composition comprising the polypeptide,
 - (b) purifying the composition via hydrophobic interaction chromatography (HIC) followed by size exclusion chromatography (SEC),
- wherein:
- (i) the polypeptide comprises an amino acid sequence having at least 80% sequence identity to a polypeptide selected from the group consisting of SEQ ID NO:3, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, and SEQ ID NO:17; or
 - (ii) the polypeptide is the polypeptide of any one of claims 13-17.