Claims

1. A meat substitute ~~or a food ingredient~~ comprising an animal myoglobin from mammoth, pig, sheep, cow, chicken or tuna or derived therefrom.

2. A meat substitute ~~or food ingredient~~ according to claim 1, wherein the myoglobin is from steppe mammoth, woolly mammoth or derived therefrom.

3. A meat substitute ~~or food ingredient~~ according to claim 1 or 2, wherein said animal myoglobin is represented by one of the following amino acid sequences:
   - a) comprising at least 70% sequence identity with SEQ ID NO: 3, and having at least one of the following amino acid combinations:
     - F at position 30, and/or
     - Q at position 65, and/or
     - H at position 92, and/or
     - H at position 94, and/or
     - F at position 30 and Q at position 65, and/or
     - F at position 30 and H at position 92, and/or
     - F at position 30 and H at position 94, and/or
     - Q at position 65 and H at position 92, and/or
     - Q at position 65 and H at position 94, and/or
     - H at position 92 and H at position 94, and/or
     - F at position 30 and Q at position 65 and H at position 92, and/or
     - F at position 30 and Q at position 65 and H at position 94, and/or
     - F at position 30 and H at position 92 and H at position 94, and/or
     - Q at position 65 and H at position 92 and H at position 94, and/or
     - F at position 30 and Q at position 65 and H at position 92 and H at position 94;
   - b) comprising at least 70% sequence identity with SEQ ID NO: 2 or 3, Q or H at position 65 and H at position 94 and optionally having at least one of the following amino acids at the following places within SEQ ID NO: 2 or 3: E at position 9, K at position 13, T as position 14, P at position 23, L at position 27, V at position 31, G at position 54, Q at position 65, V at position 67, Q at position 84, Q at position 88, I at position 102, E at position 123 and/or I at position 143;
   - c) comprising at least 70% sequence identity with SEQ ID NO: 1, Q or H at position 65 and H at position 94 and optionally having at least one of the following amino acids at the following places within SEQ ID NO: 1: E at position 9, K at position 13, T as position 14, P at position 23, L at position 27, V at position 31, G at position 54, Q at position 65, V at position 67, Q at position 84, Q at position 88, I at position 102 and/or E at position 123;
   - d) comprising at least 70% identity with SEQ ID NO: 4, 5 or 6, Q or H at position 65 and H at position 94 and optionally having at least one of the following amino acids at the

following places within SEQ ID NO: 4, 5 or 6: N at position 13, Q at position 27, I at position 31, N at position 67, A at position 128, S at position 133, A at position 145 and/or L at position 150;

- e) comprising at least 70% identity with SEQ ID NO: 7, Q or H at position 65 and H at position 94 and optionally having at least one of the following amino acids at the following places within SEQ ID NO: 7: Q at position 6, Q at position 10, T at position 13, I at position 14, H at position 27, M at position 31, H at position 35, D at position 36, D at position 42, R at position 43, G at position 49, P at position 53, Q at position 55, G at position 58, A at position 67, Q at position 72, K at position 75, Q at position 79, N at position 82, S at position 85, T at position 93, V at position 111, I at position 116, A at position 117, E at position 118, A at position 121, S at position 128, K at position 133, S at position 145 and/or F at position 150; or
- f) comprising at least 70% identity with SEQ ID NO: 8, Q or H at position 65 and H at position 94.

4. A meat substitute ~~or food ingredient~~ according to any one of claims 1 to 3, which does not comprise a leghemoglobin which has been produced by a bacterium living in symbiosis in the root nodules of a soy plant and/or which comprises as sole heme-containing protein the myoglobin as defined in any one of claims 1 to 3.

5. A meat substitute according to any one to claims 1 to 4, wherein the meat substitute mimicks the aspect, form, structure, composition, flavor, texture, color, aroma, appearance and/or nutritional value of meat.

~~6. A food ingredient according to any one of claims 1 to 4, wherein the food ingredient mimicks the composition, flavor, color, aroma and/or nutritional value of meat.~~

~~7.~~6. A gene construct comprising a nucleic acid encoding a myoglobin as defined in any one of claims 1 to ~~4~~5.

~~8.~~7. A gene construct according to claim ~~7~~6, wherein the nucleic acid is selected from the group consisting of:

(a) a nucleotide sequence encoding a polypeptide represented by an amino acid sequence comprising a sequence that has at least 75% sequence identity or similarity with the amino acid sequence defined in claim 3 a), b), c), or d)

(b) a nucleotide sequence that has at least 60% sequence identity with the nucleotide sequence of SEQ ID NO: , 9, 10, 11, 12, 13, 14, 15, 16; and

(c) a nucleotide sequence the sequence of which differs from the sequence of a nucleotide sequence of (b) due to the degeneracy of the genetic code.

~~9.~~8. A gene construct according to claim ~~7~~ 6 or ~~8~~7, further comprising a promoter.

~~10.~~9. A gene construct according to any one of claims ~~7-9~~ 6-8, further comprising a signal peptide, preferably a signal peptide that facilitates excretion of the expressed myoglobin.

~~11.~~10. A gene construct according to any one of claims 6 to ~~10~~9, wherein said nucleotide sequence is represented by SEQ ID NO: 19, 20, 21, 22, 23 or 24.

~~12.~~11. A gene construct according to claim ~~11~~10, wherein said gene construct is represented by SEQ ID NO: 25, 26, 27, 28, 29 or 30.

~~13.~~12. A vector comprising a gene construct as defined in any one of claims ~~7~~ 6 to ~~12~~11.

~~14.~~13. A host cell comprising a gene construct as defined in any one of claims ~~7~~ 6 to ~~12~~11.

~~15.~~14. A host cell according to claim ~~14~~ 13 which is a prokaryote or a eukaryote.

~~16.~~15. A method for producing a myoglobin as defined in any one of claims 1 to 3, comprising culturing the host cell of claims ~~14~~ 13 or ~~15~~ 14 in a suitable medium and optionally recovering the host cell and/or the myoglobin.

~~17.~~16. A method according to claim ~~16~~15, wherein the produced myoglobin does not comprise a signal peptide.

~~18.~~17. A method according to claim ~~16~~ 15 or ~~17~~16, wherein the recovered myoglobin is purified, preferably substantially purified.

~~19.~~18. A method according to any one of claims ~~16~~ 15 to ~~18~~17, wherein the host cell produces the myoglobin extracellularly.

~~20.~~19. A method for producing a meat substitute ~~or a food ingredient~~ as defined in any one of claims 1 to ~~6~~5, comprising formulating the myoglobin obtainable from the method of any one of claims ~~16~~ 15 to ~~19~~ 18 into a meat substitute or a food ingredient.

~~21.~~20. A protein, wherein said protein may be represented by a sequence comprising SEQ ID NO: 3.