

CLAIMS

1. A method for identifying a compound that binds, suppresses, blocks, inhibits, and/or modulates the activity of an olfactory receptor that is activated by a malodor-causing substance comprising:

- a. contacting a test substance and a malodor-causing substance to at least one olfactory receptor selected from the group consisting of Olfr1193, Olfr1093, Olfr1097, Olfr166, Olfr169, Olfr738, Olfr742, Olfr207, Olfr665, Olfr669, Olfr1211, OR52N5, OR2L13, OR2AJ1, OR4C15, OR5AC2, OR8H3, OR11G2, OR52N2, and OR5T1;
- b. measuring the response of the olfactory receptor to the malodor-causing substance by measuring the response of the olfactory receptor in the presence and absence of the test substance;
- c. identifying a test substance that modulates the response of the olfactory receptor on the basis of the response that was measured in the presence and absence of the test substance; and
- d. selecting the identified test substance as a compound that modulates the response of the olfactory receptor to the malodor-causing substance,

wherein the malodor-causing substance is dimethyl trisulfide (DMTS) or dimethyl disulfide (DMDS).

2. A method for identifying a malodor inhibitor comprising:

- a. contacting a test substance and a malodor-causing substance to at least one olfactory receptor, wherein the receptor comprises a polypeptide comprising an amino acid sequence having at least 70%, 75%, 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% sequence identity to SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 18, SEQ ID NO: 20, SEQ ID NO: 22, SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 28, SEQ ID NO: 30, SEQ ID NO: 32, SEQ ID NO: 34, SEQ ID NO: 36, SEQ ID NO: 38, or SEQ ID NO: 40;

- b. measuring the response of the olfactory receptor polypeptide to the malodor-causing substance;
- c. identifying, based on the measured response, a test substance that can suppress the response of the olfactory receptor; and
- d. selecting, as a malodor inhibitor, the test substance that suppresses the response of the olfactory receptor,

wherein the malodor-causing substance is DMTS or DMDS.

3. A method for identifying a compound that binds, suppresses, blocks, inhibits, and/or modulates the activity of at least one olfactory receptor that is activated by a malodor-causing substance, the method comprising:

- a. contacting the receptor, or a chimera or fragment thereof with a compound; and
- b. determining whether the compound has an effect on the activity of the receptor;

wherein the receptor is a polypeptide

- i) comprising an amino acid sequence having at least 70%, 75%, 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% sequence identity to SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 18, SEQ ID NO: 20, SEQ ID NO: 22, SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 28, SEQ ID NO: 30, SEQ ID NO: 32, SEQ ID NO: 34, SEQ ID NO: 36, SEQ ID NO: 38, or SEQ ID NO: 40; or
- ii) encoded by a nucleic acid molecule comprising a nucleic acid sequence having at least 70%, 75%, 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% sequence identity to SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 13, SEQ ID NO: 15, SEQ ID NO: 17, SEQ ID NO: 19, SEQ ID NO: 21, SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 27, SEQ ID NO: 39, SEQ ID NO: 31, SEQ ID NO: 33, SEQ ID NO: 35, SEQ ID NO: 37, SEQ ID NO: 39 or the reverse complement thereof;

wherein the malodor-causing substance is dimethyl trisulfide (DMTS) or dimethyl disulfide (DMDS).

4. A method of identifying a compound that putatively modulates DMTS or DMDS associated malodor comprising: (i) contacting a cell line that expresses a DMTS or DMDS receptor polypeptide with at least one compound; (ii) screening for compounds that bind, suppress, block, inhibit, and/or modulate the activity of said olfactory receptor polypeptide; and (iii) identifying a compound that putatively modulates DMTS or DMDS associated malodor if it binds, suppresses, blocks, inhibits, and/or modulates the activity of said DMTS or DMDS receptor polypeptide,

wherein the receptor polypeptide

- a. comprises an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 18, SEQ ID NO: 20, SEQ ID NO: 22, SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 28, SEQ ID NO: 30, SEQ ID NO: 32, SEQ ID NO: 34, SEQ ID NO: 36, SEQ ID NO: 38, or SEQ ID NO: 40; or
- b. is encoded by a nucleic acid molecule comprising a nucleic acid sequence having at least 70%, 75%, 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% sequence identity to SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 13, SEQ ID NO: 15, SEQ ID NO: 17, SEQ ID NO: 19, SEQ ID NO: 21, SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 27, SEQ ID NO: 39, SEQ ID NO: 31, SEQ ID NO: 33, SEQ ID NO: 35, SEQ ID NO: 37, SEQ ID NO: 39 or the reverse complement thereof.

5. An isolated polypeptide comprising an amino acid sequence having at least 70%, 75%, 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% sequence identity to SEQ ID NO: 4, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 18, SEQ ID NO: 20, SEQ ID NO: 22, SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 28, SEQ ID NO: 30, SEQ ID NO: 32, SEQ ID NO: 36, SEQ ID NO: 38, or SEQ ID NO: 40.

6. An isolated nucleic acid molecule comprising

- a. a nucleic acid sequence encoding the polypeptide of claim 5; or

- b. a nucleic acid sequence having at least 70%, 75%, 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% sequence identity to SEQ ID NO: 3, SEQ ID NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 13, SEQ ID NO: 15, SEQ ID NO: 17, SEQ ID NO: 19, SEQ ID NO: 21, SEQ ID NO: 23, SEQ ID NO: 25, SEQ ID NO: 27, SEQ ID NO: 39, SEQ ID NO: 31, SEQ ID NO: 35, SEQ ID NO: 37, SEQ ID NO: 39 or the reverse complement thereof.
- 7. A recombinant nucleic acid molecule comprising
 - a. a nucleic acid comprising a tag combination that comprises at least one of a Lucy tag, a FLAG[®] tag, and/or a Rho tag; and
 - b. a nucleic acid encoding a receptor selected from the group consisting of Olfr1193, Olfr1093, Olfr1097, Olfr166, Olfr169, Olfr738, Olfr742, Olfr207, Olfr665, Olfr669, Olfr1211, OR4S2, OR52N5, OR2L13, OR2AJ1, OR4C15, OR5AC2, OR8H3, OR11G2, OR52N2, and OR5T1 or the complement thereof.
- 8. The recombinant nucleic acid molecule of claim 7, wherein the Lucy tag comprises SEQ ID NO: 47, the FLAG[®] tag comprises SEQ ID NO: 43 and the Rho tag comprises SEQ ID NO: 45.
- 9. An expression vector comprising the nucleic acid of any one of claims 6 to 8.
- 10. A non-human host organism or a host cell that has been modified to express a receptor that is activated by DMTS or DMDS, wherein the receptor
 - a. is selected from the group consisting of Olfr1193, Olfr1093, Olfr1097, Olfr166, Olfr169, Olfr738, Olfr742, Olfr207, Olfr665, Olfr669, Olfr1211, OR52N5, OR2L13, OR2AJ1, OR4C15, OR5AC2, OR8H3, OR11G2, OR52N2, and OR5T1; or
 - b. comprises the polypeptide of claim 5 or a polypeptide encoded by the nucleic acid of any one of claims 6 to 8.
- 11. A non-human host organism or a host cell comprising

- a. the nucleic acid of any one of claims 6 to 8; or
 - b. the expression vector of claim 9.
12. The non-human host organism or host cell of claim 10 or claim 11, wherein the cell is a eukaryotic cell.
13. The non-human host organism or host cell of claim 10 or claim 11, wherein the cell is a prokaryotic cell.
14. The non-human host organism or host cell of claim 10 or claim 11, wherein the non-human host organism or host cell is selected from the group consisting of HEK293, CHO, *Xenopus oocytes*, COS, yeast and cells derived from the olfactory placode.
15. Use of a polypeptide that can be activated by DMTS or DMDS comprising an amino acid sequence having at least 70%, 75%, 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% sequence identity to SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 18, SEQ ID NO: 20, SEQ ID NO: 22, SEQ ID NO: 24, SEQ ID NO: 26, SEQ ID NO: 28, SEQ ID NO: 30, SEQ ID NO: 32, SEQ ID NO: 34, SEQ ID NO: 36, SEQ ID NO: 38, or SEQ ID NO: 40 for identifying a malodor modulating compound.