

Supplementary Material

Table S1 Details of odors used in the screen for LmigOR3.

Odor name	CAS No.	Solvent	Purity
(-)-carveol	99-48-9	paraffin oil	98%
(±)-2-butanol	15982-73-6	paraffin oil	99.5%
(±)-2-heptanol	543-49-7	paraffin oil	98%
(±)-3-heptanol	589-82-2	paraffin oil	99%
(±)-menthol	15356-76-4	paraffin oil	99%
(+)-borneol	464-43-7	paraffin oil	98%
(+)-limonene oxide	2206-27-1	paraffin oil	99.9%
(1R)-(+)-alpha-pinene	7785-70-8	paraffin oil	99%
(1R)-(+)-camphor	464-93-3	paraffin oil	99%
(R)-(-)-carvone	6485-40-1	paraffin oil	98%
R-(+)-citronellal	2385-77-5	paraffin oil	90%
(R)-(+)-limonene	5989-27-5	paraffin oil	97%
1,1-dimethoxyethane	534-15-6	paraffin oil	95%
1,3-propanedithiol	109-80-8	paraffin oil	99%
1,4-diaminobutane	110-60-1	paraffin oil	99%
1-butanol	71-36-3	paraffin oil	99.8%
1-nonanol	143-08-8	paraffin oil	98%
1-octanol	111-87-5	paraffin oil	99%
1-octen-3-ol	3391-86-4	paraffin oil	98%
1-pentanol	71-41-0	paraffin oil	99%
1-propanol	71-23-8	paraffin oil	99.5%
2,3-butanedione (diacetyl)	431-03-8	paraffin oil	97%
2,3-dimethylpyrazine	5910-84-4	paraffin oil	99%
2,4,5-trimethyl thiazole	13623-11-3	paraffin oil	98%
2,5-dimethylpyrazine	123-32-0	paraffin oil	98%
2,6-dimethylpyrazine	108-50-9	paraffin oil	98%
2-acetylfuran	1192-62-7	paraffin oil	99%
2-acetylthiazole	24295-03-3	paraffin oil	99%
2-butanol	78-92-2	paraffin oil	99.5%
2-butanone	78-93-3	paraffin oil	99%
2-decanone	693-54-9	paraffin oil	98%
2-furaldehyde	98-01-1	paraffin oil	99%
2-heptanone	110-43-0	paraffin oil	98%
2-hexanol	626-93-7	paraffin oil	99%
2-hexanone	591-78-6	paraffin oil	99%
2-isobutyl-3-methoxy-pyrazine	24683-00-9	paraffin oil	99%
2-isobutylthiazole	18140-74-9	paraffin oil	99%
2-methoxy-3-methyl-pyrazine	2847-30-5	paraffin oil	99%
2-methoxypyrazine	3149-28-8	paraffin oil	95%
2-methyl-1-propanol	78-83-1	paraffin oil	99.5%

2-methylcyclohexanol	583-59-5	paraffin oil	99%
2-methylpyrazine	109-08-0	paraffin oil	99.5%
2-methylquinoxaline	7251-61-8	paraffin oil	97%
2-octanol	123-96-6	paraffin oil	97%
2-octanone	111-13-7	paraffin oil	98%
2-octenoic acid	1871-67-6	paraffin oil	85%
2-pentanol	6032-29-7	paraffin oil	98%
2-pentanone	107-87-9	paraffin oil	97%
2-propanol	67-63-0	paraffin oil	99.5%
3-(methylthio)-1-propanol	105-10-2	paraffin oil	98%
3-heptanone	106-35-4	paraffin oil	98%
3-hexanol	623-37-0	paraffin oil	97%
3-hydroxy-2-butanone	513-86-0	paraffin oil	96%
3-methyl-1-butanol	123-51-3	paraffin oil	99%
3-methylindole	83-34-1	paraffin oil	98%
3-nonanone	925-78-0	paraffin oil	99%
3-octanol	20296-29-1	paraffin oil	99%
3-octanone	106-68-3	paraffin oil	98%
3-pentanone	96-22-0	paraffin oil	99%
4,5-dimethylthiazole	3581-91-7	paraffin oil	97%
4-allyl-1,2-dimethoxy-benzene	97-15-2	paraffin oil	99%
4-isopropylbenzaldehyde	122-03-2	paraffin oil	98%
4-methylcyclohexanol	589-91-3	paraffin oil	99%
4-methylthiazole	693-95-8	paraffin oil	99%
4-methylvaleric acid	646-07-1	paraffin oil	99%
4-penten-1-ol	821-09-0	paraffin oil	99%
5-methylquinoxaline	13708-12-8	paraffin oil	98%
6-heptenoic acid	1119-60-4	paraffin oil	99%
7-oxabicyclo[2.2.1]-heptane	279-49-2	paraffin oil	98%
acetic acid	64-19-7	paraffin oil	99%
acetone	67-64-1	paraffin oil	99.9%
acetophenone	98-86-2	paraffin oil	99%
acetyl pyrazine	22047-25-2	paraffin oil	97%
alpha-lonone	127-41-3	paraffin oil	90%
alpha-terpineol	98-55-5	paraffin oil	99%
ammonia	7664-41-7	paraffin oil	99%
benzaldehyde	100-52-7	paraffin oil	99%
benzoic acid	65-85-0	paraffin oil	99.5%
benzyl alcohol	100-51-6	paraffin oil	99%
benzylamine	100-46-9	paraffin oil	99%
benzyl benzoate	120-51-4	paraffin oil	99%
benzyl trans-2-methyl-2-butenoate	37526-88-8	paraffin oil	90%
beta-citronellol	106-22-9	paraffin oil	95%

butyl acetate	123-86-4	paraffin oil	99.7%
butylamine	109-73-9	paraffin oil	99%
butyl butyrate	109-21-7	paraffin oil	98%
butyraldehyde	123-72-8	paraffin oil	99%
butyric acid	107-92-6	paraffin oil	99%
camphene	79-92-5	paraffin oil	95%
caryophyllene oxide	1139-30-6	paraffin oil	99%
chlorobenzene	108-90-7	paraffin oil	99%
cineole	470-82-6	paraffin oil	99%
cis-2-hexen-1-ol	928-94-9	paraffin oil	95%
cis-9-tricosene	27519-02-4	paraffin oil	97%
citral	5392-40-5	paraffin oil	95%
citronellyl acetate	150-84-5	paraffin oil	97%
cyclohexanone	108-94-1	paraffin oil	99.8%
decanoic acid	334-48-5	paraffin oil	98%
decyl aldehyde	112-31-295	paraffin oil	95%
dimethoxymethane	109-87-5	paraffin oil	99.5%
docosane	629-97-0	paraffin oil	99.5%
dodecyl aldehyde	112-31-295	paraffin oil	92%
ethanolamine	141-43-5	paraffin oil	99.5%
ethyl 2-methylbutyrate	7452-79-1	paraffin oil	99%
ethyl acetate	141-78-6	paraffin oil	99.8%
ethyl alcohol	925-93-9	paraffin oil	99%
ethyl butyrate	105-54-4	paraffin oil	99%
ethyl formate	109-94-4	paraffin oil	97%
ethyl isobutyrate	97-62-1	paraffin oil	99%
ethyl propionate	105-37-3	paraffin oil	99%
ethyl pyrazine	13925-00-3	paraffin oil	98%
eugenol	97-53-0	paraffin oil	99%
farnesol	4602-84-0	paraffin oil	95%
formic acid	64-18-6	paraffin oil	88%
furfuryl heptanoate	39481-28-2	paraffin oil	98%
furfuryl octanoate	39252-03-4	paraffin oil	98%
gamma-valerolactone	108-29-2	paraffin oil	99%
geraniol	106-24-1	paraffin oil	98%
geranyl acetate	105-87-3	paraffin oil	98%
geranyl acetone	689-67-8	paraffin oil	97%
heneicosane	629-94-7	paraffin oil	98%
heptaldehyde	111-71-7	paraffin oil	95%
hexanal	66-25-1	paraffin oil	98%
hexane	71-23-8	paraffin oil	99.5%
hexanoic acid	142-72-8	paraffin oil	99%
hexyl acetate	142-92-7	paraffin oil	99%

hexyl alcohol	111-27-3	paraffin oil	99%
hexylamine	111-36-2	paraffin oil	99%
indole	120-72-9	paraffin oil	99%
isoamyl acetate	123-92-2	paraffin oil	99%
isoamyl alcohol	12-51-3	paraffin oil	98%
isovaleric acid	503-74-2	paraffin oil	99%
L-bornyl acetate	5655-61-8	paraffin oil	95%
linalool	78-70-6	paraffin oil	97%
linalyl acetate	115-95-7	paraffin oil	97%
methyl acetate	79-20-9	paraffin oil	99.5%
methyl alcohol	67-56-1	paraffin oil	99.93%
methyl anthranilate	134-20-3	paraffin oil	99%
methyl isobutyrate	547-63-7	paraffin oil	99%
methyl laurate	111-82-0	paraffin oil	99.55%
methyl palmitate	112-39-0	paraffin oil	99%
methyl salicylate	119-96-8	paraffin oil	99%
methyl sulfoxide	2206-27-1	paraffin oil	99.9%
myrcene	123-35-5	paraffin oil	90%
nerol	106-25-2	paraffin oil	97%
nonanoic acid	112-05-0	paraffin oil	96%
nonyl acetate	124-19-6	paraffin oil	95%
o-eugenol	579-60-2	paraffin oil	98%
octanoic acid	124-07-2	paraffin oil	99.5%
octyl acetate	112-14-1	paraffin oil	99%
octyl aldehyde	124-13-0	paraffin oil	99%
p-cresol	106-44-5	paraffin oil	99%
p-cymene	99-87-6	paraffin oil	99%
p-tolualdehyde	104-87-0	paraffin oil	97%
p-xylene	106-42-3	paraffin oil	99%
pentacosane	629-99-2	paraffin oil	99.5%
pentane	109-66-0	paraffin oil	99%
phenylacetaldehyde	122-78-1	paraffin oil	90%
pentyl acetate	628-63-7	paraffin oil	98%
pentyl propionate	674-54-4	paraffin oil	99%
pentyl valerate	2173-56-0	paraffin oil	97%
phenethyl alcohol	60-12-8	paraffin oil	99%
propionic acid	79-09-4	paraffin oil	99.5%
propyl acetate	109-60-4	paraffin oil	99%
propyl disulfide	629-19-6	paraffin oil	99%
propyl propionate	106-93-7	paraffin oil	99%
propyl valerate	141-06-0	paraffin oil	99.7%
pyrazine	2847-30-5	paraffin oil	99%
pyrrolidine	123-75-1	paraffin oil	99%

salicylaldehyde	90-02-8	paraffin oil	98%
tetracosane	646-41-1	paraffin oil	99.5%
thiazole	288-47-1	paraffin oil	99%
thymol	89-83-8	paraffin oil	98%
toluene	108-88-3	paraffin oil	99.8%
trans-2-hexen-1-ol	928-95-0	paraffin oil	96%
trans-2-hexenal	6718-26-3	paraffin oil	98%
trans-2-hexenyl acetate	2497-18-9	paraffin oil	98%
trans-2-octenal	2548-87-0	paraffin oil	94%
trans-anethole	4180-23-8	paraffin oil	99%
tricosane	639-67-5	paraffin oil	99%
vanillin	121-33-5	paraffin oil	99%
valencene	4630-07-3	paraffin oil	70%
valeraldehyde	110-62-3	paraffin oil	97%
valeric acid	109-52-4	paraffin oil	99%
xylenes	1330-20-7	paraffin oil	98.5%

Table S2 Odor response of aT1 sensilla expressed LmigOR3 to chemicals.

Classification	Odor name/Carbon number	Response(Δ spikes/s)
ketones	2-heptanone/7	30.38 \pm 5.03
	3-heptanone/7	28.7 \pm 5.22
	3-octanone/8	59.32 \pm 7.06
	2-octanone /8	39.33 \pm 7.44
	3-nonanone/9	45.22 \pm 6.97
	2-decanone/10	14.8 \pm 2.63
esters	ethyl propionate/5	8.07 \pm 2.84
	ethyl isobutyrate/6	9.83 \pm 3.90
	propyl propionate/6	11.88 \pm 5.09
	butyl acetate/6	19.27 \pm 7.07
	ethyl butyrate/6	20.3 \pm 4.00
	ethyl 2-methylbutyrate/7	15.6 \pm 2.84
	pentyl acetate/7	25.23 \pm 6.42
	trans-2-hexenyl acetate/7	43.03 \pm 5.80
	propyl valerate/8	14.9 \pm 4.36
	butyl butyrate/8	39.93 \pm 6.73
	hexyl acetate/8	43.4 \pm 9.12
	pentyl propionate/8	49.43 \pm 5.70
	heterocycles	4,5-dimethylthiazole/5
2,3-dimethylpyrazine/6		9.68 \pm 4.65
2-methoxy-3-methyl-pyrazine/6		15.13 \pm 4.44
2,5-dimethylpyrazine/6		40.25 \pm 11.88
2,4,5-trimethyl thiazole/6		51.35 \pm 9.84
2-isobutylthiazole/7		23.67 \pm 3.51
2-isobutyl-3-methoxy-pyrazine/9		52 \pm 10.43
2-methylquinoxaline/9		10.42 \pm 3.15
alcohols	benzyl alcohol/7	44.32 \pm 7.54

All the chemicals' concentration used in this study is 10% (vol/vol). \pm SEM, n = 6~7.

Figure S1.

Comparison of response patterns of LmigOR3 expressed in aT1 neurons in transgenic *Drosophila* with that of at3-1B neurons in locusts. Single sensillum recordings were performed and 6 chemicals including 2-heptanone, 2, 5-dimethylpyrazine, octanal, hexanal, trans-2-hexenal, benzaldehyde were selected to compare similarities of response patterns of at3-1B neurons in locusts with that of aT1 neurons in transgenic *Drosophila*. A. Response patterns of at3-1B neurons in locusts. These original data came from Ref. 1 (Cui et al., 2011). For each stimulation, 10 μ mol each chemical was applied on a zig-zag folded strip of filter paper (1 \times 2 cm) inserted into the wide end (0.5 cm i.d.) of a 10-cm-long Pasteur pipette as stimuli source. Similar filter paper strips, with or without 10 μ l of the solvent, were used as control stimuli. n = 2. Error bars = SEM; B. Response patterns of LmigOR3 expressed in aT1 neurons in transgenic *Drosophila*. All the chemicals' concentration used in this study is 10% (vol/vol). n = 6-7. Error bars = SEM. [1] Cui X, Wu C, Zhang L, 2011. Electrophysiological response patterns of 16 olfactory neurons from the trichoid sensilla to odorant from fecal volatiles in the locust, *Locusta migratoria manilensis*. Arch Insect Biochem Physiol. 77:45-57.