

A death pheromone, oleic acid, triggers hygienic behavior in honey bees (*Apis mellifera* L.)

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Table S1. Log10 transformed SPME GC-MS peak areas for N = 5 brood from each stage from 5 different colonies (only peaks with > 4,000 cts apex intensity are displayed)

Peak #	Retention time (min)	Proposed identity	Larvae		Prepupae		Pupae	
			Ave	St. Dev.	Ave	St. Dev.	Ave	St. Dev.
1	2.49	Thiobis-methane	6.50	0.13	6.48	0.14	6.53	0.12
2	2.97	2-propanone	4.89	0.16	5.49	0.10	5.81	0.12
3	3.04	Octane	4.99	0.33	4.07	0.27	4.08	0.53
4	3.75	Isopropanol	5.81	0.16	4.61	0.23	5.11	0.25
5	10.23	Isoamyl acetoacetate	4.98	0.50	3.93	0.50	3.82	0.36
6*	11.78	β -cis-Ocimene	6.22	0.39	6.43	0.23	5.73	0.15
7	13.81	β -octahydroindoloquinolizine	4.88	0.10	4.69	0.22	4.77	0.21
8	17.17	Acetic acid	4.66	0.67	3.58	0.19	3.96	0.16
9	19.94	Ethyl 4-(chloromethylene)-2,2-diphenyl-3-oxazoline-5-carboxylate	4.63	0.14	4.17	0.30	4.20	0.18
10	20.78	Propanoic acid	5.09	0.87	4.50	1.29	3.43	0.22
11	21.07	n/a	4.48	0.11	3.80	0.44	3.36	0.14
12	25.56	1,3-diphenyl-1-trimethylsilyloxy-1-pentene	4.20	0.36	3.75	0.29	3.68	0.18

*Compound identity confirmed as β -ocimene based on spectral matching and comparing the retention time to a standard.

Table S2. Log10 transformed hexane wash GC-MS peak areas for N = 5 brood from each stage from 5 different colonies (only peaks with > 4,000 cts apex intensity are displayed)

Peak #	RT	Proposed identity	Larvae		Prepupae		Pupae	
			Ave.	St. Dev.	Ave.	St. Dev.	Ave.	St. Dev.
1	14.78	Triacontane	6.24	0.21	6.02	0.10	6.46	0.07
2	14.93	2-methyl hexadecane	5.83	0.09	6.18	0.12	6.27	0.06
3	15.91	n-pentacosane	6.78	0.19	6.57	0.12	6.92	0.02
4	16.07	Heptadecane	6.41	0.11	6.90	0.10	6.84	0.04
5	17.27	Octacosane	7.04	0.09	7.29	0.09	7.64	0.02
6	17.47	1-eicosanol	6.82	0.11	7.47	0.09	7.56	0.03
7	18.09	Tricosane	5.44	0.10	6.08	0.09	6.58	0.02
8	18.31	Hexatriacontane	5.35	0.18	6.29	0.09	6.58	0.02
9	19.14	Nonacosane	6.50	0.06	6.83	0.12	7.42	0.03
10	19.41	2-methyl-octadecane	6.55	0.23	7.15	0.08	7.56	0.01
11	22.01	Tetracosane	6.07	0.07	6.13	0.10	6.67	0.07
12	22.41	2-methyl-eicosane	6.56	0.28	6.82	0.08	7.31	0.02
13	27.28	2-methyl-octadecane	6.24	0.27	6.42	0.14	6.84	0.05

Table S3. Comparing binding constants between our study and a previous report

Protein	Ligand	McAfee et al 2017		Guarna et al 2015	
		IC ₅₀ (μM)	K _d	IC ₅₀ (μM)	K _d
OBP16	Oleic acid	1.5	0.48	0.9	0.4
	Ocimene	2.3	0.74		
	Hexane	40	12.9		
	Phenylethyl acetate	40	12.9	8	3.7
	1-NPN	0.6	0.97		
OBP18	Oleic acid	0.3	0.13	0.1	0.04
	Ocimene	7	3.13		
	Hexane	>50			
	Phenylethyl acetate	>50	2.5	1.1	
	1-NPN	1.1	2.8		

Table S4. Odor toxicity assays

Odor	Number with halted development	% with halted development
Hexane	0	0
β-ocimene	0	0
Oleic acid	6	40
Mix	4	27

Table S5: Frequencies of brood ages across all front-way odor assays

	Total brood	% Larvae	% Prepupae	% Pupae
Hexane	822	10.5	60.1	29.4
Mix	853	12.5	62.1	25.3
Ocimene	817	6.2	63.8	30.0
Oleic acid	818	8.8	65.0	26.2
Phenethyl acetate	803	8.5	62.5	29.0
Overall	4113	9.3	62.7	28.0