

Supplementary references for Table 2

1. Sokolowski, M. B. C., Abramson, C. I. & Craig, D. P. A. Ethanol self-administration in free-flying honeybees (*Apis mellifera* L.) in an operant conditioning protocol. *Alcoholism, clinical and experimental research* **36**, 1568–1577 (2012).
2. Abramson, C. I., Fellows, G. W., Browne, B. L., Lawson, A. & Ortiz, R. A. Development of an ethanol model using social insects: II. Effect of Antabuse on consumatory responses and learned behavior of the honey bee (*Apis mellifera* L.). *Psychological reports* **92**, 365–378 (2003).
3. Abramson, C. I. *et al.* The development of an ethanol model using social insects I: behavior studies of the honey bee (*Apis mellifera* L.). *Alcoholism, Clinical and Experimental Research* **24**, 1153–1166 (2000).
4. Devineni, A. V & Heberlein, U. Preferential ethanol consumption in *Drosophila* models features of addiction. *Current biology* **19**, 2126–2132 (2009).
5. Kaun, K. R., Azanchi, R., Maung, Z., Hirsh, J. & Heberlein, U. A *Drosophila* model for alcohol reward. *Nature neuroscience* **14**, 1–13 (2011).
6. Shohat-Ophir, G., Kaun, K. R., Azanchi, R. & Heberlein, U. Sexual Deprivation Increases Ethanol Intake in *Drosophila*. *Science* **335**, 1351–1355 (2012).
7. Abramson, C. I. *et al.* Development of an ethanol model using social insects: III. Preferences for ethanol solutions. *Psychological reports* **94**, 227–239 (2004).
8. Schneider, A. *et al.* Neuronal basis of innate olfactory attraction to ethanol in *Drosophila*. *PloS one* **7**, e52007 (2012).
9. Scholz, H., Ramond, J., Singh, C. M. & Heberlein, U. Functional Ethanol Tolerance in *Drosophila*. *Neuron* **28**, 261–271 (2000).
10. Berger, K. H. *et al.* Ethanol sensitivity and tolerance in long-term memory mutants of *Drosophila melanogaster*. *Alcoholism, clinical and experimental research* **32**, 895–908 (2008).
11. Berger, K. H., Heberlein, U. & Moore, M. S. Rapid and Chronic: Two Distinct Forms of Ethanol Tolerance in *Drosophila*. *Alcoholism: Clinical & Experimental Research* **28**, 1469–1480 (2004).
12. Cowmeadow, R. B., Krishnan, H. R. & Atkinson, N. S. The *slowpoke* Gene Is Necessary for Rapid Ethanol Tolerance in *Drosophila*. *Alcoholism: Clinical and experimental research* **29**, 1777–1786 (2005).
13. Urizar, N. L., Yang, Z., Edenberg, H. J. & Davis, R. L. *Drosophila* homer is required in a small set of neurons including the ellipsoid body for normal ethanol sensitivity and tolerance. *The Journal of neuroscience* **27**, 4541–4551 (2007).
14. Bhandari, P., Kendler, K. S., Bettinger, J. C., Davies, A. G. & Grotewiel, M. An assay for evoked locomotor behavior in *Drosophila* reveals a role for integrins in ethanol sensitivity and rapid ethanol tolerance. *Alcoholism, clinical and experimental research* **33**, 1794–1805 (2009).
15. Scholz, H. Influence of the biogenic amine tyramine on ethanol-induced behaviors in *Drosophila*. *Journal of neurobiology* **63**, 199–214 (2005).

16. Davies, A. G., Bettinger, J. C., Thiele, T. R., Judy, M. E. & McIntire, S. L. Natural variation in the *npr-1* gene modifies ethanol responses of wild strains of *C. elegans*. *Neuron* **42**, 731–143 (2004).
17. Mitchell, P. *et al.* A differential role for neuropeptides in acute and chronic adaptive responses to alcohol: behavioural and genetic analysis in *Caenorhabditis elegans*. *PloS one* **5**, e10422 (2010).
18. Mustard, J. A. *et al.* Acute ethanol ingestion impairs appetitive olfactory learning and odor discrimination in the honey bee. *Neurobiology of learning and memory* **90**, 633–643 (2008).
19. Robinson, B. G., Khurana, S., Kuperman, A. & Atkinson, N. S. Neural adaptation leads to cognitive ethanol dependence. *Current biology* **22**, 2338–2341 (2012).
20. Ammons, A. D. & Hunt, G. J. Identification of Quantitative Trait Loci and candidate genes influencing ethanol sensitivity in honey bees. *Behavior genetics* **38**, 531–553 (2008).
21. Cakmak, I., Abramson, C. I., Seven-Cakmak, S., Nentchev, P. & Wells, H. Observations of ethanol exposure on the queen honey bee *Apis mellifera anatoliaca* (Preliminary note). *Bulletin of Insectology* **62**, 99–101 (2009).
22. Maze, I. S., Wright, G. A. & Mustard, J. A. Acute ethanol ingestion produces dose-dependent effects on motor behavior in the honey bee (*Apis mellifera*). *Journal of insect physiology* **52**, 1243–1253 (2006).
23. Friedman, R., Bittner, G. & Blundon, J. Electrophysiological and Behavioral Effects of Ethanol on Crayfish. *Journal of pharmacology and experimental therapeutics* **246**, 125–131 (1988).
24. Cohan, F. M. & Hoffmann, A. A. Genetic divergence under uniform selection. II. different responses to selection for knockdown resistance to ethanol among *Drosophila melanogaster* populations and their replicate lines. *Genetics* **114**, 145–163 (1986).
25. Eddison, M. *et al.* *arouser* reveals a role for synapse number in the regulation of ethanol sensitivity. *Neuron* **70**, 979–990 (2011).
26. Lasek, A. W., Giorgetti, F., Berger, K. H., Taylor, S. & Heberlein, U. *Lmo* genes regulate behavioral responses to ethanol in *Drosophila melanogaster* and the mouse. *Alcoholism, clinical and experimental research* **35**, 1600–1606 (2011).
27. Kong, E. C. *et al.* A pair of dopamine neurons target the D1-like dopamine receptor DopR in the central complex to promote ethanol-stimulated locomotion in *Drosophila*. *PloS one* **5**, e9954 (2010).
28. Rodan, A. R., Kiger, J. A. & Heberlein, U. Functional dissection of neuroanatomical loci regulating ethanol sensitivity in *Drosophila*. *The Journal of neuroscience* **22**, 9490–9501 (2002).
29. Dzitoyeva, S., Dimitrijevic, N. & Manev, H. Gamma-aminobutyric acid B receptor 1 mediates behavior-impairing actions of alcohol in *Drosophila*: adult RNA interference and pharmacological evidence. *Proceedings of the National Academy of Sciences* **100**, 5485–5490 (2003).
30. Stevenson, C. G. & Beane, W. S. A low percent ethanol method for immobilizing planarians. *PloS one* **5**, e15310 (2010).
31. Milan, N. F., Kacsoh, B. Z. & Schlenke, T. A. Alcohol consumption as self-medication against blood-borne parasites in the fruit fly. *Current biology* **22**, 488–93 (2012).

32. Abramson, C. I., Place, A. J., Aquino, I. S. & Fernandez, A. Development of an ethanol model using social insects: IV. Influence of ethanol on the aggression of Africanized honey bees (*Apis mellifera* L.). *Psychological reports* **94**, 1107–15 (2004).
33. Ammons, A. D. & Hunt, G. J. Characterization of honey bee sensitivity to ethanol vapor and its correlation with aggression. *Alcohol* **42**, 129–136 (2008).
34. Abramson, C. I., Sanderson, C., Painter, J., Barnett, S. & Wells, H. Development of an ethanol model using social insects: V. Honeybee foraging decisions under the influence of alcohol. *Alcohol* **36**, 187–193 (2005).
35. Bozic, J., Abramson, C. I. & Bedencic, M. Reduced ability of ethanol drinkers for social communication in honeybees (*Apis mellifera carnica* Poll.). *Alcohol* **38**, 179–183 (2006).
36. Wright, G. A., Lillvis, J. L., Bray, H. J. & Mustard, J. A. Physiological state influences the social interactions of two honeybee nest mates. *PLoS one* **7**, e32677 (2012).
37. Nathaniel, T. I., Panksepp, J. & Huber, R. Drug-seeking behavior in an invertebrate system: evidence of morphine-induced reward, extinction and reinstatement in crayfish. *Behavioural brain research* **197**, 331–338 (2009).
38. Dziopa, L. *et al.* Morphine-conditioned cue alters c-Fos protein expression in the brain of crayfish. *Brain research bulletin* **85**, 385–395 (2011).
39. Nathaniel, T. I., Panksepp, J. & Huber, R. Effects of a single and repeated morphine treatment on conditioned and unconditioned behavioral sensitization in Crayfish. *Behavioural brain research* **207**, 310–320 (2010).
40. Lozada, M., Romano, A. & Maldonado, H. Effect of morphine and naloxone on a defensive response of the crab *Chasmagnathus granulatus*. *Pharmacology, biochemistry, and behavior* **30**, 635–640 (1988).
41. Panksepp, J. B. & Huber, R. Ethological analyses of crayfish behavior: a new invertebrate system for measuring the rewarding properties of psychostimulants. *Behavioural brain research* **153**, 171–180 (2004).
42. Raffa, R. B. Amphetamine Conditioned Place Preference in Planarians. *Journal of behavioral and brain science* **3**, 131–136 (2013).
43. Raffa, R. B. *et al.* The kappa-opioid receptor antagonist nor-BNI inhibits cocaine and amphetamine, but not cannabinoid (WIN 52212-2), abstinence-induced withdrawal in planarians: an instance of “pharmacologic congruence”. *Brain research* **1193**, 51–56 (2008).
44. Alcaro, A., Panksepp, J. & Huber, R. d-Amphetamine stimulates unconditioned exploration/approach behaviors in crayfish: towards a conserved evolutionary function of ancestral drug reward. *Pharmacology, biochemistry, and behavior* **99**, 75–80 (2011).
45. Wright, G. A. *et al.* Caffeine in Floral Nectar Enhances a Pollinator’s Memory of Reward. *Science* **339**, 1202–1204 (2013).
46. Si, A., Zhang, S.-W. & Maleszka, R. Effects of caffeine on olfactory and visual learning in the honey bee (*Apis mellifera*). *Pharmacology, biochemistry, and behavior* **82**, 664–672 (2005).
47. Mustard, J. A., Dews, L., Brugato, A., Dey, K. & Wright, G. A. Consumption of an acute dose of caffeine reduces acquisition but not memory in the honey bee. *Behavioural brain research* **232**, 217–224 (2012).

48. Lin, F. J. *et al.* Effect of taurine and caffeine on sleep-wake activity in *Drosophila melanogaster*. *Nature and science of sleep* **2**, 221–231 (2010).
49. Nathaniel, T. I., Panksepp, J. & Huber, R. Alteration of c-Fos mRNA in the accessory lobe of crayfish is associated with a conditioned-cocaine induced reward. *Neuroscience research* **72**, 243–256 (2012).
50. Raffa, R. B., Dasrath, C. S. & Brown, D. R. Disruption of a drug-induced choice behavior by UV light. *Behavioural pharmacology* **14**, 569–571 (2003).
51. Barron, A. B., Maleszka, R., Helliwell, P. G. & Robinson, G. E. Effects of cocaine on honey bee dance behaviour. *The Journal of experimental biology* **212**, 163–168 (2009).
52. Søvik, E., Cornish, J. L. & Barron, A. B. Cocaine tolerance in honey bees. *PLOS ONE* **8**, e64920 (2013).
53. Rawls, S. M., Rodriguez, T., Baron, D. A. & Raffa, R. B. A nitric oxide synthase inhibitor (L-NAME) attenuates abstinence-induced withdrawal from both cocaine and a cannabinoid agonist (WIN 55212-2) in Planaria. *Brain research* **1099**, 82–87 (2006).
54. Raffa, R. B. & Desai, P. Description and quantification of cocaine withdrawal signs in Planaria. *Brain research* **1032**, 200–202 (2005).
55. Raffa, R. B. & Valdez, J. M. Cocaine withdrawal in Planaria. *European journal of pharmacology* **430**, 143–145 (2001).
56. Nathaniel, T. I., Huber, R. & Panksepp, J. Repeated cocaine treatments induce distinct locomotor effects in crayfish. *Brain research bulletin* **87**, 328–333 (2012).
57. McClung, C. & Hirsh, J. Stereotypic behavioral responses to free-base cocaine and the development of behavioral sensitization in *Drosophila*. *Current Biology* **8**, 109–112 (1998).
58. McClung, C. & Hirsh, J. The trace amine tyramine is essential for sensitization to cocaine in *Drosophila*. *Current Biology* **9**, 853–860 (1999).
59. McClung, C. A Role for Tyramine in the Development of Sensitization to Cocaine in *Drosophila melanogaster*. (2001).
60. Andretic, R., Chaney, S. & Hirsh, J. Requirement of Circadian Genes for Cocaine Sensitization in *Drosophila*. *Science* **285**, 1066–1068 (1999).
61. Dimitrijevic, N., Dzitoyeva, S. & Manev, H. An automated assay of the behavioral effects of cocaine injections in adult *Drosophila*. *Journal of neuroscience methods* **137**, 181–184 (2004).
62. Rawls, S. M., Patil, T., Yuvashva, E. & Raffa, R. B. First evidence that drugs of abuse produce behavioral sensitization and cross sensitization in Planarians. *Behavioural Pharmacology* **21**, 301–313 (2010).
63. Carter, K., Lukowiak, K., Schenk, J. O. & Sorg, B. A. Repeated cocaine effects on learning, memory and extinction in the pond snail *Lymnaea stagnalis*. *The Journal of experimental biology* **209**, 4273–4282 (2006).
64. Lease, K. A. & Hirsh, J. A novel method of cocaine delivery to fruit flies using a graphic arts airbrush. *Journal of neuroscience methods* **141**, 89–96 (2005).
65. Palladini, G. *et al.* A pharmacological study of cocaine activity in planaria. *Comparative biochemistry and physiology part C: Comparative pharmacology* **115**, 41–45 (1996).

66. Owaisat, S., Raffa, R. B. & Rawls, S. M. In vivo comparison of harmine efficacy against psychostimulants: preferential inhibition of the cocaine response through a glutamatergic mechanism. *Neuroscience letters* **525**, 12–16 (2012).
67. Tallarida, C., Song, K., Raffa, R. B. & Rawls, S. M. Glutamate carboxypeptidase II (GCP II) inhibitor displays anti-glutamate and anti-cocaine effects in an invertebrate assay. *Amino acids* **42**, 2521–2524 (2012).
68. Pagán, O. R. *et al.* Reversal of cocaine-induced planarian behavior by parthenolide and related sesquiterpene lactones. *Pharmacology, biochemistry, and behavior* **89**, 160–170 (2008).
69. Kusayama, T. & Watanabe, S. Reinforcing effects of methamphetamine in planarians. *Neuroreport* **11**, 2511–2513 (2000).
70. Rawls, S. M., Shah, H., Ayoub, G. & Raffa, R. B. 5-HT(1A)-like receptor activation inhibits abstinence-induced methamphetamine withdrawal in planarians. *Neuroscience letters* **484**, 113–117 (2010).
71. Rawls, S. M. *et al.* Nociceptin attenuates methamphetamine abstinence-induced withdrawal-like behavior in planarians. *Neuropeptides* **42**, 229–237 (2008).
72. Ramoz, L. *et al.* Mephedrone (“bath salt”) pharmacology: insights from invertebrates. *Neuroscience* **208**, 79–84 (2012).
73. Pagán, O. R. *et al.* A cembranoid from tobacco prevents the expression of nicotine-induced withdrawal behavior in planarian worms. *European journal of pharmacology* **615**, 118–124 (2009).
74. Rawls, S. M. *et al.* Nicotine behavioral pharmacology: clues from planarians. *Drug and alcohol dependence* **118**, 274–279 (2011).
75. Rawls, S. M., Gomez, T. & Raffa, R. B. An NMDA antagonist (LY 235959) attenuates abstinence-induced withdrawal of planarians following acute exposure to a cannabinoid agonist (WIN 55212-2). *Pharmacology, biochemistry, and behavior* **86**, 499–504 (2007).
76. Buttarelli, F. R., Pontieri, F. E., Margotta, V. & Palladini, G. Cannabinoid-induced stimulation of motor activity in planaria through an opioid receptor-mediated mechanism. *Progress in neuro-psychopharmacology & biological psychiatry* **26**, 65–68 (2002).