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BEHAVIOURAL NEUROSCIENCE

Spurned flies hit the booze

IMAGE SOURCE

> lower NPF levels that result from sexual deprivation promote reward-seeking behaviour

The brain's reward system can be activated by natural stimuli, such as social interaction, and by artificial stimuli, such as alcohol consumption. The relationship between such stimuli is poorly understood, but Shohat-Ophir and colleagues now show that social experience, specifically sexual deprivation and mating, modulate alcohol consumption in *Drosophila melanogaster*.

The authors devised a behavioural paradigm, based on the fact that previously mated females reject the advances of male flies, to test the influence of courtship and mating on ethanol preference. Male flies that were repeatedly subjected to such rejection demonstrated an increased preference for ethanol consumption and also exhibited reduced mating behaviour compared with males that had been allowed to mate with virgin females. The increased ethanol preference was lost if the rejected flies were allowed to mate.

To investigate whether sexual deprivation (prevention of copulation) or rejection was more important for the change in ethanol preference, the authors paired male flies with decapitated virgin females. In this assay, although copulation was blocked, the flies did not experience rejection. These flies exhibited an increased preference for ethanol compared with controls, suggesting that it is the lack of copulation that drives the increased ethanol preference, rather than the rejection by a female.

A previous study showed that neuropeptide F (NPF; the fly homologue of mammalian neuropeptide Y) and its receptor are involved in the regulation of ethanol-related behaviours. Interestingly, male flies that had experienced rejection by previously mated females had lower NPF mRNA levels than mated males.

Next, the authors sought to study whether activity of the NPF–NPF receptor system represented the state of the flies' reward system. They trained flies to associate different odours with potentially rewarding experiences; namely, ethanol intoxication, mating and artificial activation of the NPF system. The authors found that each of these experiences could evoke a conditioned preference for the associated odour. Importantly, artificial activation of the NPF system could prevent the rewarding effects of ethanol, suggesting that the NPF system has a key role in reward in *D. melanogaster*.

Shohat-Ophir *et al.* propose that the NPF system, which is responsive to social experience, might be crucial in regulating ethanol preference, whereby lower NPF levels that result from sexual deprivation promote reward-seeking behaviour — either through ethanol consumption or through successful copulation. These findings suggest that, in *D. melanogaster*, NPF signalling mediates responses to both natural and drug rewards.

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ORIGINAL RESEARCH PAPER Shohat-Ophir, W. *et al.* Sexual deprivation increases ethanol intake in *Drosophila*. *Science* **335**, 1351–1354 (2012)
FURTHER READING Kaun, K. R. *et al.* *Drosophila melanogaster* as a model to study drug addiction. *Hum. Genet.* 17 Feb 2012 (doi:10.1007/s00439-012-1146-6)