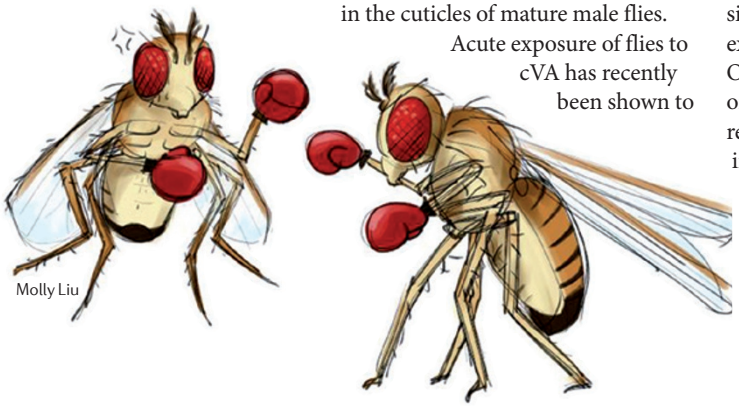
BEHAVIOURAL NEUROSCIENCE

Fly fisticuffs

Social isolation causes behavioural and physiological changes in many animal species, from flies to humans. Collectively, such changes can lead to a phenomenon known as 'isolation syndrome', which is attenuated by social interaction, but the mechanisms underlying this attenuating effect are unknown. Now, however, Liu *et al*. show that in *Drosophila melanogaster*, aggression demonstrated by isolated males towards other males and attenuation of this aggression following social exposure to other flies are mediated by the same pheromone but by different olfactory receptor neurons (ORNs) in fly antennae.

> two classes of ORNs mediate the different effects of cVA following acute and chronic exposure

The volatile pheromone 11-cis-vaccenyl acetate (cVA) is produced in the cuticles of mature male flies. Acute exposure of flies to cVA has recently been shown to induce aggression through Or67d ORNs, and Liu *et al.* found that chronic cVA exposure mimics social exposure in reducing male aggression. A simple hypothesis would have been that chronic exposure causes the Or67d ORNs to be desensitized, leading to a reduction of cVA activation of 67d ORN in acute exposure. Surprisingly, Liu and colleagues found that there was no desensitization and that an entirely different type of ORN is activated. Using temperature-sensitive mutants, the authors independently manipulated synaptic transmission of Or65a and Or67d ORNs. They found that inhibition of Or67d neuronal activity attenuated acute aggression but had no effect on the reduction in aggression observed following chronic cVA exposure. Conversely, blockade of Or65a neurons during chronic cVA or social exposure abolished this reduction in aggression. These findings suggest that these two classes of ORNs mediate the different effects of cVA following acute and chronic exposure.



Molly Liu

The authors then used mutant flies expressing temperature-sensitive transient receptor potential (TRP) channels to study selective activation of the two types of ORN. They found that activation of Or65a ORNs mimicked the attenuating effects of chronic cVA or social exposure on inter-male aggression, indicating a key role for this type of ORN.

Or65a ORNs project to the antennal lobe, which contains neurons that project onto higher brain areas and interneurons that are involved in the modulation of local circuits. By using temperature-sensitive mutants to selectively modulate neural transmission in both projection neurons and local interneurons, the authors found that disruption of a subset of local interneurons eliminated social suppression of aggression. The different mechanisms involved in production and attenuation of aggression suggest potential for the chemical modulation of aggressive behaviour in other animals.

Sian Lewis

ORIGINAL RESEARCH PAPER Liu, W. *et al.* Social regulation of aggression by pheromonal activation of Or65a olfactory neurons in *Drosophila*. *Nature Neurosci.* **14**, 896–902 (2011)
FURTHER READING Wang, L. *et al.* Hierarchical chemosensory regulation of male-male social interactions in *Drosophila*. *Nature Neurosci.***14**, 757–762 (2011) | Wang, L. & Anderson, D. J. Identification of an aggression-promoting pheromone and its receptor neurons in *Drosophila*. *Nature* **463**, 227–231 (2010)

ERRATUM

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Nature Reviews Neuroscience **12**, 434–435 (2011)

On page 434 of this highlight, the credit for the illustration was incorrectly given. The correct name for the illustrator is Molly Liu. This has been corrected in the online version.