BEHAVIOURAL GENETICS

Taming of the vole

Whether you are a home-loving, faithful type or more of a Casanova could be further from your control than you might think. Reporting in *Nature*, Lim and colleagues elegantly show that the expression of a single gene, *V1aR*, is responsible for promiscuous versus monogamous behaviour in voles.

Voles are ideal for studying social behaviour as different species of vole show different levels of social attachment. For example, male prairie voles are faithful creatures that seek close physical contact with their mates and care for their young, in contrast to their more promiscuous relatives, meadow voles, who live more solitary lives and give minimal care to their young.

Vasopressin and dopamine are thought to be key signals that regulate the extent of attachment between animals. In fact, vasopressin 1a receptors (V1aRs) are more abundant in the ventral forebrain — part of the brain's reward system — in male prairie voles than in male meadow voles. Using viral vector-mediated gene transfer, Lim *et al.* showed that increasing the expression of *V1aR* in the ventral forebrain of male meadow voles caused them to spend more time with their original female partner after sex and to spurn other females, in contrast to control animals. Moreover, the authors show that dopamine has an important role in this behaviour, as blocking dopamine receptors in meadow voles, as previously shown in prairie voles, cancels out the effects of *V1aR* overexpression.

Lim *et al.* argue that these results can be attributed to the simultaneous activation of reward and recognition pathways causing parallel V1aR and dopamine-receptor activation in the ventral forebrain. This, they say, triggers an association between the rewarding nature of sex and the unique physical characteristics of the female vole, leading to partner preference.

The similarity in related molecular and neuronal circuitry between these two species of vole, and the distinct effect of altering the expression of one receptor in this circuitry, indicates the remarkable capacity of evolution to act selectively on a single gene to induce profound changes in social behaviour.

It is likely that other genes in these pathways and their interactions with social and environmental factors also contribute to the variability in this behaviour. That said, key regulators, such as V1aR, will provide important insights into the molecular mechanisms in the brain that contribute to complex social behaviour, and might in turn shed light on some disorders of social behaviour in humans.

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References and links

ORIGINAL RESEARCH PAPER Lim, M. M. *et al.* Enhanced partner preference in a promiscuous species by manipulating the expression of a single gene. *Nature* **429**, 754–757 (2004)
FURTHER READING Insel, T. R. & Young, L. J. The neurobiology of attachment. *Nature Rev. Neurosci.* **2**, 129–136 (2001) | Balaban, E. Why voles stick together. *Nature* **429**, 711–712 (2004)
WEB SITE
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http://www.emory.edu/YERKES/YOUNG/

Meadow voles. Image courtesy of M. Lim, Emory University.