IN THE NEWS

Follow your nose

Anyone who has travelled on a crowded subway train will have experienced the remarkable range of odours that the human body can generate, but it is debatable whether these are likely to lure us to our perfect partner. The search for chemical cues involved in human sexual selection has been hampered by the fact that our 'natural' scent is obscured by many factors, from the soap we use to the food we eat. However, Martha McClintock from the University of Chicago believes that women can still sniff out subtle differences in male body odour that reflect variation at the major histocompatibility complex (MHC).

The *New York Times* (22 January) describes the rationale behind her latest experiment: "men were told to avoid distracting odours like … spicy foods, deodorants, pets or sexual activity. Their T-shirts, worn for two days, were then placed in boxes where they could be smelled but not seen. The women were asked which box they would choose 'if they had to smell it all the time'".

The women tended to prefer the scent of a man whose MHC genes resembled those of her father, but not her mother, prompting headlines such as "Women want a man who smells like dad" (*Independent* UK, 21 January). The evolutionary implications are unclear, but one possibility is that "children inherit a tried and tested immune system while leaving room for new protective influences" (*The Mirror*, UK, 21 January).

Not everyone was convinced. Behaviourist Wayne Potts points out that "mice seek high MHC similarity in communal nest neighbours but low similarity in their sexual mates" (*Indianapolis Star*, 7 February). More worryingly, "asked what the scent reminded them of, many [women] said 'K-Mart' [a US supermarket chain], presumably because of the boxes' packaging" (*New York Times*).

Heather Wood

AXON GUIDANCE

Staying on track

Much recent research into axon guidance has focused on the roles of the Roundabout (Robo) receptors and their ligand, Slit, in the developing *Drosophila* nervous system. Just over a year ago, it was reported that in addition to preventing growth cones from re-crossing the midline, these molecules also control how far axons are repelled away from the midline after crossing. Several years ago, vertebrate homologues of Slit and Robo were identified, and *in vitro* studies implicated these in the control of axonal repulsion and branching, but their precise functions *in vivo* have not been described. A series of studies published in *Neuron* now provide some interesting new insights.

Hutson and Chien investigated the role of the Robo2 homologue Astray in axon guidance at the zebrafish optic chiasm. They showed that Astray is required both to prevent crossing errors and to correct those that do occur. Even in the background of the *bel* mutation, in which axons turn back sharply before reaching the chiasm and project ipsilaterally, axons are misrouted if Astray is inactivated. So, unlike the *Drosophila* Robos, Astray acts on both sides of the midline.

In a separate study, Plump *et al.* showed that in *Slit1*;*Slit2* double-knockout mice, an ectopic optic chiasm forms anterior to the true chiasm. Slit1 and Slit2 are expressed in complementary domains that line the route taken by retinal ganglion cell (RGC) axons in the ventral diencephalon, so they might channel the RGC axons to the correct crossing point by creating a corridor with repulsive 'walls'. If growth cones stray too close to the Slit expression domains, they are repelled back into their tract. Intriguingly, the ectopic chiasm always developed in the same position in the *Slit1*;*Slit2* mutants, indicating that other cues also restrict RGC axon movement.

Another study by Bagri *et al.* in the same laboratory revealed that Slit proteins are also important for axon guidance in other forebrain projections, including the corticofugal, cortico-cortical (callosal) and thalamocortical tracts. The *Slit1* single mutant mouse had no obvious axon guidance defects, but in the *Slit2* mutant, some axons in these tracts took an abnormally ventral course. In *Slit1*;*Slit2* mutants, the phenotype was even more severe, with some growth cones veering towards the midline. This indicates that one function of the Slit proteins is to maintain a dorsal trajectory for certain forebrain projections. The effect was not confined to projections that originate in the forebrain — 5-hydroxytryptaminergic projections from the raphe nuclei and dopaminergic projections from the substantia nigra/ventral tegmental area were also misrouted in the *Slit2* and *Slit1*;*Slit2* mutants. There is circumstantial evidence that the Slits act through Robo receptors in the forebrain, as *Robo1* and *Robo2* are expressed in the cortical plate and dorsal thalamus at the time that projections are emerging from these regions.

These results indicate that the functions of Slits and Robos in axonal repulsion have been conserved during evolution. One key difference between flies and vertebrates is that the vertebrate axons examined in these studies seem to rely on Slit and Robo throughout their journey, whereas in *Drosophila*, the Slit/Robo interactions only come into play once the growth cones have crossed the midline. Previous *in vitro* studies showed that spinal commissural axons in vertebrates, like their *Drosophila* counterparts, change their sensitivity to Slits on crossing the midline. Triple mutants of *Slit1*, *-2* and *-3*, all of which are expressed at the spinal cord midline, will be required to determine whether this holds true *in vivo*.

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References and links

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FURTHER READING Richards, L. J. Surrounded by Slit — how forebrain commissural axons can be led astray. *Neuron* **33**, 153–155 (2002)