IN THE NEWS

Don't call us, we'll call you

We've heard it before: mobile phones aren't good for your brain. First it was a risk of developing tumours, and now it seems that mobile phones can kill neurons. Referring to work by Leif Salford and his colleagues (Lund University, Sweden), *BBC News* (UK, 5 February 2003) reported that "mobile phones damage key brain cells and could trigger the early onset of Alzheimer's disease." In the study, published in *Environmental Health Perspectives*, Salford and his group exposed rats to two hours of radiation at a level equivalent to that emitted by mobile phones. Fifty days later, the scientists "found long exposure to operating handsets destroys cells in areas of the brain important for memory, movement and learning, and fear it could cause the premature onset of illnesses usually linked to ageing" (*The Herald Sun*, Australia, 7 February 2003).

Speaking to *BBC News*, Salford is quoted as saying that mobile phones might have the same effect in people, "A rat's brain is very much the same as a human's. They have the same blood–brain barrier and neurons." And in a statement that will horrify teenagers around the world, he added, "maybe we should think about restricting our use of mobile phones."

Not surprisingly, the mobile phone industry received the news with scepticism. In the UK, "a spokeswoman for the Mobile Operators Association dismissed this latest study" (*BBC News*). In South Africa, the chairman of the Cellular Telecommunications Association is quoted as saying that "governments worldwide had adopted comprehensive international safety guidelines" for the operation of mobile phones (*The Mercury*, South Africa, 6 February 2003), a statement that will probably not reassure all consumers. Just in case, it might be better to stick to text messaging for now, at least until someone models its effects on rat's paws.

Juan Carlos López

OLFACTORY CODING

Seeing how flies smell

The development of imaging systems involving calcium-sensitive fluorescent dyes has provided an unprecedented opportunity to observe the activity of neurons and circuits in real time. In a report in *Cell*, Wang *et al*. describe how they have used a dye called G-CaMP to study the relationship between structure and function in the *Drosophila* olfactory system.

In *Drosophila*, each olfactory sensory neuron expresses one of around 80 different odorant receptor subtypes. Projections from neurons that express the same receptor converge in structures called glomeruli in the antennal lobe. The glomeruli are innervated by the dendrites of projection neurons, which relay information to the mushroom bodies and protocerebrum. The fly olfactory system has become a popular model for studying olfactory coding because it is much simpler and more accessible than that of vertebrates, yet the glomerular anatomy of the primary relay centres is strikingly similar.

Wang *et al*. imaged the heads of flies in which either the projection neurons or the sensory neurons expressed the G-CaMP protein. The fluorescent intensity of this protein reflects the intracellular calcium level (a signature of electrical activity), and the authors detected the fluorescence using two-photon microscopy. This sensitive detection system enabled them to generate a high-resolution map of the glomeruli that were activated by different odours at concentrations that the fly would encounter in its natural environment.

The authors showed that each odour activated a specific combination of glomeruli. The response patterns were highly reproducible, not only between different trials in the same fly, but also between different flies. Interestingly, imaging of sensory and projection neurons produced the same odour-evoked patterns of glomerular activity, indicating that the pattern generated by the stimulation of sensory neurons is transmitted intact to higher processing centres in the brain.

Wang *et al*. also used this imaging technique to examine the molecular basis of olfactory coding in the fly. Sensory neurons that express the *or43a* receptor gene project to the DA4 glomerulus, and the authors identified a range of odours that activate DA4, but not another glomerulus, VA1lm. However, when they expressed *or43a* ectopically in the neurons that project to VA1lm, this glomerulus now responded to the same range of odours as DA4. This implies that the response patterns of individual glomeruli are probably determined by single receptor subtypes.

By combining calcium imaging with two-photon microscopy, Wang *et al*. have generated a model to test various principles of olfactory coding in flies, many of which might also be relevant to vertebrates. In addition to providing new insights into olfaction, this imaging technique is also likely to have more general applications for measuring neuronal activity in the fly brain in relation to various behaviours.

Heather Wood

References and links

ORIGINAL RESEARCH PAPER Wang, J. W. *et al*. Two-photon calcium imaging reveals an odor-evoked map of activity in the fly brain. *Cell* **112**, 271–282 (2003)

FURTHER READING Nakai, J. *et al.* A high signal-to-noise Ca^{2+} probe composed of a single green fluorescent protein. *Nature Biotech.* **19**, 137–141 (2001) | Vosshall, L. B. Olfaction in *Drosophila*. *Curr. Opin. Neurobiol.* **10**, 498–503 (2000)

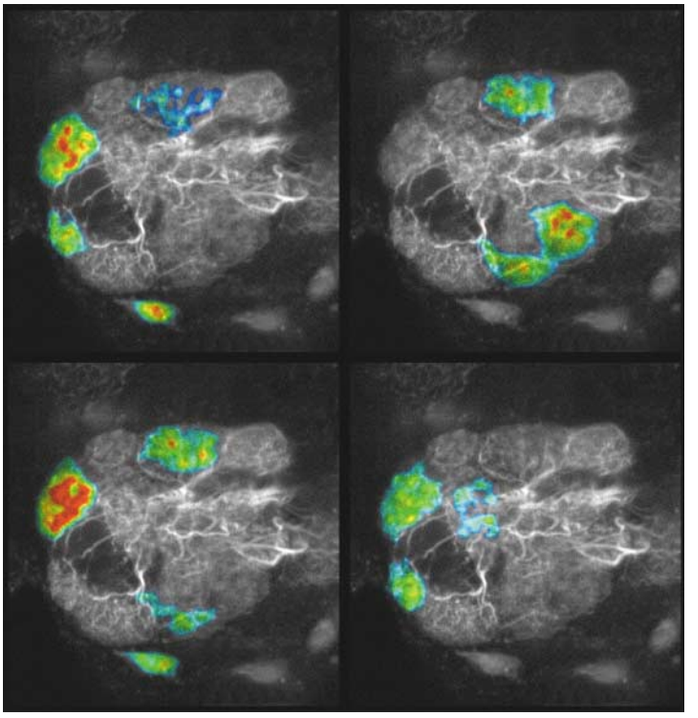
WEB SITES

Axel lab: http://cpmcnet.columbia.edu/dept/neurobeh/axel/overview.html

Flybase: http://flybase.bio.indiana.edu/

or43a

Movies online: http://www.cell.com/cgi/content/full/112/2/271/DC1



A fly antennal lobe, in which G-CaMP — a calcium-sensitive green fluorescent protein — is expressed only in projection neurons that innervate the lobe. The high signal-to-noise ratio of G-CaMP provides a representation, at cellular resolution, of a defined population of neurons in the brain as the fly is stimulated by odorants at physiological concentrations. Different odours elicit different patterns of activation in the antennal lobe. Courtesy of J. W. Wang, Center for Neurobiology and Behavior, Columbia University, New York, USA.