

IN THE NEWS

**Love on the brain**

With Valentine's Day coming up, it is timely to mention a recently published study that shows a neural basis for romantic love. Using MRI, Andreas Bartels and Semir Zeki at University College London found that individuals claiming to be 'truly, deeply and madly' in love exhibit unique patterns of brain activity while looking at photographs of their partners.

Not surprisingly, this generated considerable excitement in the international press. Several writers picked up on links between the brain activity and physical sensations associated with love: "... one of the newly discovered zones is closely linked to churning feelings in the stomach" (*Daily Telegraph*, 6 July 2000). There was also room for some well-worn romantic imagery, with at least three UK newspapers alluding to Cupid's arrow piercing the brain rather than the heart.

The Bartels and Zeki study also showed that being in love stimulates parts of the brain thought to be associated with addiction to drugs. This struck a chord with a reporter from the *Toronto Globe and Mail* (July 2000) who commented: "... if we apply the juridical rationale governing other things that produce similar effects ... falling in love should be declared absolutely illegal unless it can be shown that, as a byproduct of euphoria, it also relieves pain in terminally ill patients."

Although the findings are clearly of scientific interest, MRI seems a rather extreme approach to testing the devotion of a loved one, particularly if, as in this study, it is used in conjunction with techniques normally used for lie detection. As Bartels told the *Daily Mail* (6 July 2000): "It's probably easier just to ask."

Heather Wood



ION CHANNELS

Disappearing act with two barrels

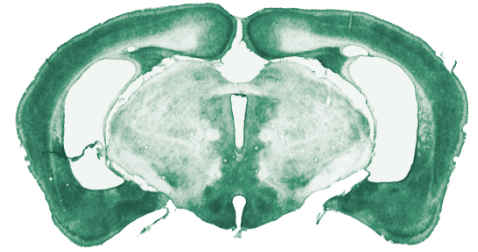
Neuroscientists seldom talk about anion channels. With the notable exception of GABA_A (and occasionally glycine) receptors, advances in the study of cation channels — be they voltage- or ligand-gated — tend to receive much more attention. But Stobrawa and her colleagues are determined to change this status quo after showing that the absence of CIC-3, a chloride channel expressed on synaptic vesicles, leads to retinal and hippocampal degeneration.

CIC channels are present in many species, from bacteria to humans. Their main structural peculiarity is that each CIC channel seems to form two pores in the membrane, like a double-barrelled gun. Although several CIC proteins (for example, CIC-3 and CIC-4) exist in the brain, the functional relevance of this family of channels is best exemplified in other organs. For instance, mutations in CIC-1 produce myotonia, and loss of

CIC-5 function causes Dent's disease, a renal disorder in which abnormal amounts of protein appear in the urine.

What is the function of CIC channels in the nervous system? Stobrawa *et al.* tackled this question by generating CIC-3 knockout mice and looking for any ensuing brain changes. They didn't have to look too hard; the absence of CIC-3 caused the complete loss of the hippocampus, which started to vanish two weeks after birth. The knockout mice were also blind, as another effect of the mutation was the progressive degeneration of the retina.

The authors also found that CIC-3 localized to synaptic vesicles and that its absence impaired vesicle acidification and changed glutamate uptake, phenotypes that could be related to the degeneration. However, as CIC-3 is ubiquitously expressed in the brain and other CIC channels were not



The absence of CIC-3 leads to hippocampal degeneration. Photograph courtesy of Thomas Jentsch, ZMNH, Hamburg University, Germany.

upregulated by the mutation, the selectivity of the damage is hard to understand and opens a new avenue of research. So, like in every murder mystery, we have a weapon — a double-barrelled gun — and two victims, but we are still missing the motive. Stay tuned for the next episode.

Juan Carlos López

References and links

ORIGINAL RESEARCH PAPER Stobrawa, S. M. *et al.* Disruption of CIC-3, a chloride channel expressed on synaptic vesicles, leads to a loss of the hippocampus. *Neuron* **29**, January (2001)

FURTHER READING Jentsch, T. J. *et al.* The CIC chloride channel family. *Pflügers Arch.* **437**, 783–795 (1999)

ENCYCLOPEDIA OF LIFE SCIENCES
Chloride channels

NEURODEGENERATIVE DISORDERS

Another chapter in the Alzheimer's vaccine saga

Two years ago, Schenk *et al.* showed that immunization with amyloid- β_{42} peptide reduced amyloid plaques accumulation in a transgenic model of Alzheimer's disease. The excitement generated by this finding was revived last December, when two independent groups reported that this vaccination procedure could also reduce memory loss in two different murine models of the disease. By using modified versions of the Morris water maze, Janus *et al.* and Morgan *et al.* obtained evidence that monthly immunization with amyloid- β reduced the behavioural deficits and plaque accumulation observed in the transgenic animals.

Although there are methodological differences

between the two papers, both of them favour the idea that a reduction in amyloid accumulation may suffice to prevent memory loss. The findings also support the hypothesis that amyloid plaques, and not other histopathological hallmarks of Alzheimer's such as neurofibrillary tangles, are responsible for the cognitive impairments that characterize the disease.

Also, the two studies are clear examples of the increasing sophistication of behavioural testing in mouse models of Alzheimer's and other neurodegenerative diseases, as the tasks used by these researchers aimed to tap into specific forms of memory. But despite this sophistication, these reports also

remind us of the need to develop a more extensive battery of tests to increase the validity of the transgenic models. These papers, together with the three recent *Science* articles on the evidence for genetic linkage of late-onset Alzheimer's disease to chromosome 10, tell us that the Alzheimer's story is far from over.

Juan Carlos López

References and links

ORIGINAL RESEARCH PAPERS Janus, C. *et al.* A β peptide immunization reduces behavioural impairment and plaques in a model of Alzheimer's disease. *Nature* **408**, 979–982 (2000) | Morgan, D. *et al.* A β peptide vaccination prevents memory loss in an animal model of Alzheimer's disease. *Nature* **408**, 979–982 (2000)

FURTHER READING Schenk, D. *et al.* Immunization with A β attenuates Alzheimer's disease-like pathology in the PDAPP mouse. *Nature* **400**, 173–177 (1999) | Chapman, P. F. Model behaviour. *Nature* **408**, 915–916 (2000)

ENCYCLOPEDIA OF LIFE SCIENCES
Alzheimer disease