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

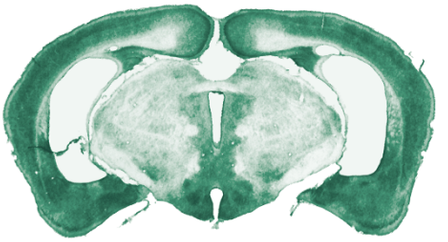
Neuroscientists seldom talk about anion channels. With the notable exception of $GABA_A$ (and occasionally glycine) receptors, advances in the study of cation channels — be they voltage- or ligand-gated — tend to receive much more attention. But Stobrawa and her colleagues are determined to change this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

ClC channels are present in many species, from bacteria to humans. Their main structural peculiarity is that each ClC channel seems to form two pores in the membrane, like a double-barrelled gun. Although several ClC proteins (for example, ClC-3 and ClC-4) exist in the brain, the functional relevance of this family of channels is best exemplified in other organs. For instance, mutations in ClC-1 produce myotonia, and loss of ClC-5 function causes Dent's disease, a renal disorder in which abnormal amounts of protein appear in the urine.

What is the function of ClC channels in the nervous system? Stobrawa *et al.* tackled this question by generating ClC-3 knockout mice and looking for any ensuing brain changes. They didn't have to look too hard; the absence of ClC-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 ClC-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 ClC-3 is ubiquitously expressed in the brain and other ClC channels were not 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



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

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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

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