

## **“Unhealthy” frontal brain regions may drive addiction**

**Previous research has suggested that drugs of abuse are addictive as they are able to ‘hijack’ the brain’s reward system. However, researchers from the ORYGEN Research Centre and Melbourne Neuropsychiatry Centre at the University of Melbourne, suggest that this theory fails to account for the addict’s inability to control drug use when faced with apparently dire consequences. Instead, they suggest that the compulsive nature of addiction can be better explained by “diminished health” of key regions in the frontal cortex that help inhibit inappropriate behaviours. Moreover, they have now found evidence to support these notions.**

Dr Murat Yücel and his colleagues recruited a sample of individuals who have been addicted to heroin for nearly 10 years and used brain-imaging technology to probe the physiological and biochemical properties of a key region of the frontal cortex (called the cingulate cortex). They discovered two important differences between the opiate-using group and a very similar group of individuals who have never used heroin. First, the opiate-using group needed to activate the brains’ “inhibitory control circuit” significantly greater degree (thereby placing greater physiological demand on this circuit) in order to successfully inhibit their responses so as to avoid making an error on a neuropsychological test. Second, the opiate-using group displayed markedly reduced concentrations of a particular brain metabolite (called N-acetylaspartate) in the frontal cortex, which provides an index of the general “health” state of neurons in the area (generally speaking, more is better).

Dr Yücel suggests that these findings have a number of important implications. They suggest that long-term exposure to opiates has adverse effects on the health of key brain regions that help individuals control their behaviours in an adaptive manner. Specifically, Dr Yücel says “it leads to reduced efficiency requiring individuals to place much greater, perhaps compensatory, physiological demand on the brain to achieve normal levels of behavioural control. This may help explain why it takes addicted individuals enormous effort to exercise control over their drug-taking behaviour in the face of adverse consequences, and why they are vulnerable to relapse back into uncontrolled, compulsive patterns of use.”

Dr Dan Lubman, an addiction psychiatrist and another senior investigator on the project, says “this new evidence is likely to inform the development of innovative strategies for the treatment of addiction. In particular, these findings tell us that we need to offer pharmacological and psychological treatments that help bolster the efficiency of the frontal cortex and the individual’s ability to inhibit their urge to use drugs.”

In future, the researchers would like to examine whether these processes recover with abstinence.

The paper outlining the findings, along with a feature “Image” article, was recently published in the July edition of the prestigious journal *Molecular Psychiatry*, volume 12 (main article: pages 691-702; Image: page 611).