Research sheds new light on heroin addiction

Researchers from the Howard Florey Institute in Melbourne have identified a factor that may contribute towards the development of heroin addiction by manipulating the adenosine A2A receptor, which plays a major role in the brain's 'reward pathway'.

Using mice specifically bred without the adenosine A2A receptor, Prof Andrew Lawrence and his team showed that these mice had a reduced desire to self-administer morphine; heroin is converted to morphine in the body. The mice also self-administered less morphine compared to control littermates, but did not develop tolerance to specific behavioural effects of morphine.

The researchers also found that the mice did not develop a conditioned place preference for the drug, indicating that drug-context associations are mediated in part by this receptor. In human terms, this equates to the associative memory of the environment where the drug is used.

Collectively, these findings strongly suggest that the adenosine A2A receptor is involved in regulating the reinforcing and motivational properties of opiates.

Prof Lawrence said this was the first study to show that the adenosine A2A receptor was implicated in self-motivation to take opiates such as heroin.

"This receptor clearly plays a major role in opiate use and therefore abuse, as the mice were simply not interested in taking morphine despite it being freely available," he said.

"Although the drug-taking effects and behaviours of these mice were diminished, they still relapsed into drug-seeking after a period of withdrawal.

"This indicates that the adenosine A2A receptor has a role in the 'getting high' aspects of addiction, but not in the adaptations that contribute to relapse after going 'cold turkey'."

"The results from this study reinforce that addiction is a highly complex brain disorder that will require a multi-pronged approach to treat.

"Australia has over 50,000 heroin users. There are effective medical treatments available, such as methadone, buprenorphine and suboxone, as well as psychological interventions, but a better understanding of how heroin affects the brain could lead to improvements and broadening of these treatment options.

"Drugs alone will not be the answer – successful treatment of drug addiction will require a combination of drugs and psychotherapy," Prof Lawrence said.

"Drugs alone will not be the answer – successful treatment of drug addiction will require a combination of drugs and attention to social and psychological factors," Prof Lawrence said.

A number of major pharmaceutical companies are developing drugs that block the adenosine A2A receptor, so Prof Lawrence's research provides even more evidence that this receptor is an important target for treating drug addiction.

Prof Lawrence said that drugs affecting the adenosine A2A receptor show preclinical promise to treat alcohol addiction.

"Earlier this year we found that the adenosine A2A receptor interacts with the mGlu5 glutamate receptor found in the brain's reward pathway to regulate drug-seeking. "Consequently, a drug developed to target

both these receptors could have an even better result in treating addiction," he added.

Source: Research Australia