Wiping memories to tackle alcoholism

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Wine drop. Credit: Fabrizio Monti from Flickr

(Medical Xpress) -- Researchers at the University of Cambridge believe connections developed in the brain between the 'drug high' of alcohol and the situations in which it's used create loaded memories that unconsciously trigger cravings – often leading to relapse in alcoholics.

New research using rodent models reveals that drug treatment administered when a memory is forcibly surfaced permanently deletes the unconscious 'cues' that spark yearning for alcohol. With experimental medical trials expected to start in the near future, the research could revolutionise approaches to the treatment of chronic alcoholism and addiction to other drugs of abuse.

Researchers at the Behavioural and Clinical Neuroscience Institute, based in the Department of Experimental Psychology, are tackling the problem of pavlovian 'cue-drug memory' – when memories of the

people, places and drug paraphernalia around drug use become inextricably bound in the brain to an unconscious impulse to use drugs. It's a problem that affects thousands of people suffering from alcohol-dependency, and the research work is starting to show remarkable results.

Focusing on the amygdala, the part of the brain that stores this type of emotional memory, the researchers believe that a memory can be reset, preventing drug cues from driving the embedded impulses to drink that cause devastation in the lives of alcoholics – by applying drug treatments at the moment of remembering.

"Traditionally, memory was viewed as similar to a book, which can be shelved but never changed once printed. We now think that memory is more like a word processing document – you can save it and then recall it, at which point you can adapt or even delete its contents," says Dr. Amy Milton, who is leading the research.

"In the process of recalling, a memory moves from an inactive, stable state to an active, unstable state, at which point we think it can be manipulated so that the cue-drug memory never returns to the stable state. This means that the cue becomes meaningless, and can no longer initiate alcohol craving."

So far, the researchers have been working with rat models, and have been able to markedly reduce the effects of memory cues in the drug-seeking behaviour of the animals, for both cue-cocaine and cue-alcohol memories. Experimental medical studies with volunteer alcoholics are expected to begin in the next 1 to 2 years, with early indications that the drug propranolol, a beta-blocker already approved for human use, has the potential to yield excellent results.

In the rodent study, alcohol provision is paired with presentation of a

light cue, so that the animals become conditioned to associate the light with the drug high. The animals will then work to activate the light by pressing levers. Those treated with propranolol at the point of memory reactivation, a brief reminder session when the animals are exposed to the cue, but not the drug of abuse – simply stop working to activate the light.

“The animals don’t respond to the drug cue at all,” says Milton. “We track them for weeks following a single treatment and the cue-drug memory never returns. They stop working for the light because they no longer have any association with it – the stimulus becomes effectively meaningless.”

Propranolol targets a type of receptor in the brain called the beta-adrenergic receptor, which is activated in emotional situations, and helps to create a strong emotional memory. By applying the drug at the point when the memory is reactivated and in a malleable state, the processing that leads to the emotional memory is blocked – the memory is effectively reset to an unemotional state.

Crucially, the conscious memory itself does not disappear, only the emotional association formerly attached to it. “Our research, along with trials in the US on fear memories in post-traumatic stress disorder, suggest that addicts will still remember experiences – the places, people and the problems that were associated with the memories – which is vital from a therapeutic perspective,” says Milton.

“What this treatment will do is to remove the unconscious trigger to relapse that stems from the learnt emotional cue-drug memory – freeing the patient from the years of conditioning which has built up in their memory as a consequence of alcohol addiction.”

“Alcoholism, like other addictions, is not a case of self-control, but a

disease of the brain for which there is currently no neurological cure. We hope our research and its potential application can contribute in some way to a better understanding of how alcoholism can be treated to greater effect."

Provided by University of Cambridge