Immunotherapy inhibits heroin effects in research animals

January 20 2015

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Immunotherapy could have a place in the treatment of substance abuse in the future. A specific antibody can reduce the acute effects of heroin, according to a new experimental study at the Norwegian Institute of Public Health.

Researchers investigated whether a monoclonal antibody can block heroin's effects. It is known that heroin itself has a minor intoxicant effect but it is the conversion products that are formed when heroin is metabolized by the body that cause the intoxicant effect.

"Designing a vaccine against heroin is particularly challenging since heroin is converted rapidly to several substances," says researcher Inger Lise Bogen at the Department of Drug Research and Method Development.

Previous studies in the research group indicate that heroin`s first metabolite, 6-MAM (6-monoacetylmorphine), causes the rapid and intense heroin effects. Furthermore, researchers have found that the conversion of heroin to 6-MAM occurs primarily in the bloodstream, before the drug enters the brain. Based on this, the researchers wanted to investigate whether binding antibodies to 6-MAM could prevent heroin's intoxicant effects.

Immunotherapy against drugs

The blocking potential of immunotherapy was investigated in the 1970s, but not pursued because methadone and buprenorphine became available. In recent years, interest in drug vaccines has increased, partly due to increasing concerns about the possible adverse effects of these substitutes. Attempts have been made to create vaccines against heroin, morphine, cocaine, methamphetamine, nicotine and oxycodone but only the vaccines against cocaine and nicotine have been tested on humans.

Drug vaccines can be divided into passive vaccines (using pre-formed antibodies) and active vaccines (stimulating the immune system to produce antibodies). The antibodies circulate in the blood and bind to the drug after intake. Since the antibody is too big to cross the blood-brain barrier, the bound substance will not reach the brain, thereby limiting the drug's effect. It is also shown that an antibody given after intake of a drug could reduce the risk of death from overdose.

Results

In animal studies, researchers could confirm a clear correlation between the amount of 6-MAM antibody supplied, the inhibited transmission of 6-MAM to the brain and reduced heroin effects.

"Our study shows that an antibody against 6-MAM effectively blocks the acute heroin effects and that passive immunisation against drugs is feasible," says researcher Jannike Mørch Andersen.

Andersen explains that the study confirms that 6-MAM is responsible for heroin's acute intoxicant effects, and that future vaccines against heroin must be targeted towards 6-MAM.

Future treatment?

Immunotherapy could therefore have a place in the treatment of substance abuse in the future. This would be particularly useful as adjunctive therapy for specific patient groups, for example for pregnant drug abusers and during vulnerable periods after detoxification, where the risk of relapse is great.

"Drug vaccines will not be a simple solution to treat substance abuse but can be a useful supplement to existing treatment," says Bogen.

The results from experimental studies in laboratory animals are promising, but extensive research and development is needed before the effect of drug vaccines in humans can be evaluated.

More information: Inger Lise Bogen, Fernando Boix, Elisabeth Nerem, Jørg Mørland og Jannike Mørch Andersen. *Journal of Pharmacology and Experimental Therapeutics* 2014 Jun;349(3):568-576. www.pubfacts.com/detail/247008 … roin-effects-in-mice

Provided by Norwegian Institute of Public Health