Vaccine against cocaine addiction

Technology #2621

According to the 2013 National Survey on Drug Use and Health, there were 1.5 million cocaine users over the age of 12 in the United States, and among those 855,000 were dependent. One promising approach to treating cocaine and other chemical dependences is to use a vaccine to provoke an immune response to a substance that prevents its reward effects on the central nervous system. All current anti-cocaine vaccine technologies suffer from lack of specificity and may require multiple rounds of booster vaccinations to maintain their effect. This technology is a cocaine-protein conjugate that provokes an immune response only to cocaine and not its protein host. This anti-cocaine vaccine generates only cocaine-specific antibodies, and may obviate the need for booster vaccinations.

Self-proteins prevent immune response caused by foreign proteins and may produce “self-boosting” immune response in patients who continue to use cocaine

This technology relies on non-immunogenic proteins of the type that are already present in a patient’s bloodstream (“self-proteins,” e.g. serum albumin) that are directly bound to cocaine through a lysine on the protein. Current anti-cocaine vaccines use a linker to attach cocaine to foreign proteins, such as cholera toxin B. Such conjugates elicit strong immune responses to the foreign protein and the linker region, producing antibodies against irrelevant molecules and limiting the production of cocaine-specific antibodies. Additionally, with current vaccines, the population of any anti-cocaine antibodies that are produced declines substantially over time in most subjects, necessitating repeated booster immunizations. Because this technology utilizes cocaine coupled to self-proteins, an immune response is only provoked by cocaine itself. Furthermore, these cocaine-protein conjugates form spontaneously in humans chronically exposed to cocaine. Thus, continued ingestion by cocaine abusers may boost the immune response to cocaine, preventing the need for booster vaccinations.

The technology elicited an immune response in a murine model in response to the vaccine.
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Applications:
- Treatment of cocaine addiction
- Design of other vaccines for substance abuse treatment

Advantages:
- Produces antibodies against cocaine only, preventing the drug from entering the brain
- Couples cocaine to self-proteins without a linker, limiting irrelevant immune response
- Produces immune response against complex that occurs in cocaine-abusing patients, boosting immune response and preventing the need for additional vaccinations
- May be applied to other addictive substances, such as nicotine and heroin

Patent Information:
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Related Publications:

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