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Strategy to Design Nicotine Vaccines

Cigarette smoking causes a variety of diseases with high morbidities and mortality; however, the addictive properties of nicotine make quitting difficult. Nicotine molecules enter the brain within seconds after use and activate reward pathways, leading to dependence. Despite extensive efforts toward cessation interventions, smoking remains a major public health problem. Nicotine vaccines, many based on hapten-protein conjugates, have emerged as a potentially promising treatment to reduce tobacco dependence. The types of hapten linkage to a carrier protein are critical to the level and spectrum of elicited antibodies. Although linkers with variable lengths and rigidities have been created and tested, few have shown significant improvement in the immunogenicity of targeted chemical compounds. Thus, new ways to design effective nicotine vaccines are needed.

Researchers at the Biodesign Institute of Arizona State University in collaboration with a researcher at the University of Minnesota have developed a robust and simple strategy to design effective nicotine vaccines. This strategy can expedite the selection for high-efficacy vaccine candidates and accelerate the translation of these vaccines for reducing tobacco dependence. Additionally, superior haptens for nicotine vaccine production have been prepared and identified. These haptens have been tested in whole animals and validated for their functional activity in vivo.

This technology will not only expedite the screening of nicotine vaccines for identification of promising candidates, but also provides a rational vaccine design strategy to construct nicotine vaccines.

Potential Applications

- Design of nicotine vaccines
- Promising vaccine candidates

Benefits and Advantages

- Guides the rational design of nicotine vaccines
- Robust system
- Expedited selection of viable candidates
- Smaller/more effective vaccines
- Affinity index between 0.02 and 1, so as to have a balanced influence of the linker effect

For more information about the inventor(s) and their research, please see Dr. Chang's directory webpage Dr. Hecht's directory webpage

