professor of psychiatry at the University of Washington in Seattle and an inventor of the oxycodone vaccine being tested in clinical trials at Columbia University. “He’s done tremendous work in this area.”

Cessation Therapeutics, a California-based company founded in 2017 where Janda serves as scientific advisor and board member, is continuing to develop the combination heroin and fentanyl vaccine created by Janda’s group, says Cessation research and development director Paul Bremer, who is one of Janda’s former graduate students. But for now, the company is prioritizing an anti-fentanyl monoclonal antibody (mAb), an approach also being pursued by a handful of other groups, including Pravetoni’s. These antibodies are generated in the lab by giving animals an anti-fentanyl vaccine, and researchers involved in their development say the treatment has the potential not only to treat OUD and protect against overdose, but to reverse an overdose in progress. (See “Monoclonal Antibodies as a Shortcut to Vaccination” on page 18.) Bremer says the company is aiming to move its monoclonal antibody into Phase 1 clinical trials in the near future with NIDA funds as part of the National Institutes of Health’s Helping to End Addiction Long-term (HEAL) Initiative.

“We’ll be submitting the IND later this year, and soon after that, we’ll be clear to start our Phase I clinical trials,” Bremer forecasts, adding that while the opioid vaccines “are further behind . . . we believe getting the IND on the mAb will help pave the way for us to move the vaccines toward the clinic more quickly.”

Testing opioid vaccines in humans

For Carl Alving, emeritus senior scientist in the Laboratory of Adjuvant and Antigen Research at the Walter Reed Army Institute of Research (WRAIR), the concept of immunizing people against substance abuse and overdose wasn’t on his radar until he had NIDA’s Volkow over for a dinner party in 2010. She told Alving that the agency had been sponsoring research on vaccines against drugs of abuse and mentioned the nicotine and cocaine vaccines that had failed in clinical trials despite showing promise in preclinical studies. She says that she believed researchers needed stronger vaccine adjuvants to elicit a more robust immune response.

“That’s where I came in,” says Alving, who is now retired and notes that he is speaking for himself and not on behalf of the US government. “At Walter Reed, we specialize in making strong and safe adjuvants” along with other vaccine components. He was working as a researcher with the US Military HIV Research Program (MHRP) in the division of retrovirology at WRAIR, attempting to develop a vaccine against HIV, when Volkow encouraged him to apply for NIDA grants to fund research on heroin vaccines. “NIDA became more interested in opioid vaccines because there was, and still is, a need to expand the available treatment options for opioid use disorder,” says Volkow. “There was also a need to stem the transmission of HIV among people who inject drugs during this time, and treating opioid use disorder is an important strategy for reducing risk behaviors associated with acquiring and transmitting HIV.” Volkow’s and Alving’s labs struck up a collaboration, initially aiming to create a dual vaccine that would prevent HIV infection while treating heroin dependence and reducing the risk of overdose, but ultimately moving forward with a more narrowly focused heroin vaccine, which performed well in mice and rats in the mid-2010s. “The Army and the Department of Health and Human Services, which houses NIH, patented the technology; Alving is named as an inventor.

If current manufacturing and testing efforts are successful, that heroin vaccine will proceed to human testing with support from a NIDA grant, according to Gary Matyas, chief of the Adjuvants and Formulations section at WRAIR who worked with Alving on the vaccine and who is also named as an inventor on the patent. “Although overdose deaths due to heroin have plateaued over the last year, heroin overdose deaths remain a problem, so there may still be a therapeutic role for the heroin vaccine,” he says. Matyas and NIDA colleagues have since developed candidate fentanyl vaccines, for which they have a patent pending, as well as a combination fentanyl-heroin vaccine. Most recently, they developed monoclonal anti-