VACCINE-INDUCED BLOCK

Due to their small molecular size, opioids can cross the blood-brain barrier (BBB) to cause both the euphoria that makes such drugs so addictive and the adverse effects including the respiratory depression that can cause fatal overdose via inhibition of neural networks that regulate breathing (left panel). To fight opioid use disorder (OUD) and reduce overdose deaths, scientists have designed a handful of experimental vaccines, which are just beginning to enter human testing. These experimental vaccines involve a carrier protein studded with analogs of the opioid, called haptens, combined with adjuvants that strengthen the overall immune response (middle panel). Antibodies generated against haptens will bind to the opioid, blocking it from crossing the BBB due to the antibodies' large size (right panel). The hope is that if people recovering from OUD receive a vaccine targeting their drug of abuse and then relapse, they will not experience respiratory depression that can lead to overdose or the euphoric effects that reinforce the drug-seeking behavior.