

## Toward opioid vaccines that can help prevent overdose fatalities

December 7 2016



Credit: American Chemical Society

In 2014, the number of deaths from opioid overdoses in the U.S. jumped to its highest level on record. The spike brought national attention to the epidemic and the awareness that new interventions are needed. Now researchers are developing opioid vaccines that could one day help protect people from dying of overdoses. Their study, which tested the vaccines on mice, appears in the journal *ACS Chemical Biology*.

The Drug Abuse Warning Network has reported that the prescription opioid pain-killers oxycodone and hydrocodone are associated with more than 200,000 emergency-room visits per year. Since 1999, more than 165,000 people have died from prescription opioid <u>overdoses</u>, according to the U.S. Department of Health and Human Services. To help prevent opioid-related fatalities, <u>public health officials</u> and practitioners have



turned to naloxone, a drug that can be injected right after an overdose to reverse or block the opioid's effects. But naloxone—and someone trained to administer it—need to be on hand. Kim D. Janda and colleagues wanted to devise a prophylactic approach to counter opioidrelated deaths.

The researchers developed two compounds as potential <u>vaccine</u> candidates. They work by preventing opioids from entering the central nervous system, where the molecules induce their addictive euphoric and pain-relieving effects. Testing showed that oxycodone and hydrocodone remained in the bloodstream of mice given the vaccines, suggesting that the medicine effectively blocked the opioids from migrating into the central nervous system. Additionally, mice who received the vaccines survived oxycodone and hydrocodone overdoses at higher rates than unvaccinated mice.

**More information:** Atsushi Kimishima et al. An Advance in Prescription Opioid Vaccines: Overdose Mortality Reduction and Extraordinary Alteration of Drug Half-Life, *ACS Chemical Biology* (2016). <u>DOI: 10.1021/acschembio.6b00977</u>

## Abstract

Prescription opioids (POs) such as oxycodone and hydrocodone are highly effective medications for pain management, yet they also present a substantial risk for abuse and addiction. The consumption of POs has been escalating worldwide, resulting in tens of thousands of deaths due to overdose each year. Pharmacokinetic strategies based upon vaccination present an attractive avenue to suppress PO abuse. Herein, the preparation of two active PO vaccines is described that were found to elicit high-affinity antiopioid antibodies through a structurally congruent drug-hapten design. Administration of these vaccines resulted in a significant blockade of opioid analgesic activity, along with an unprecedented increase in drug serum half-life and protection against



lethal overdose.

## Provided by American Chemical Society

Citation: Toward opioid vaccines that can help prevent overdose fatalities (2016, December 7) retrieved 3 May 2024 from https://phys.org/news/2016-12-opioid-vaccines-overdose-fatalities.html

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