Hyperbaric chamber eases drug withdrawal symptoms

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By Eric Sorensen, WSU science writer

PULLMAN, Wash. – Washington State University researchers have found that treatments of pure oxygen in a high-pressure chamber can relieve the symptoms of opiate withdrawal.

Ray Quock – a pharmacologist and WSU psychology professor – gave morphine-addicted mice pure pressurized oxygen before they began withdrawal from the drug. The mice had far less severe withdrawal symptoms than addicted mice that did not receive the treatment.

Outwardly, said Quock, the treated mice appeared "much calmer. You can tell the difference."

Initial effort toward FDA approval for fighting epidemic

Writing this month in the journal Brain Research, Quock and his colleagues say implications of the discovery are of "profound importance." While current therapies for treating heroin addiction can provide relief from withdrawal, they themselves can be addictive.

Moreover, the finding comes amid a national heroin epidemic in which use of the drug has doubled among young adults over the past decade, according to the U.S. Centers for Disease Control. Meanwhile, withdrawal symptoms can be so severe that some addicts will continue taking the drug to avoid the process, said Quock.

But while the U.S. Food and Drug Administration has approved using hyperbaric oxygen therapy for 14 specific indications – including carbon monoxide poisoning, decompression sickness and wound healing – it is not approved for drug withdrawal. A physician could administer the therapy for such an off-label use, said Quock, but it would not be covered by medical insurance. "Our research and work that we hope to do in the future should stimulate some clinical researchers to come up with clinical evidence to convince the FDA that this should be an approved indication," he said.

Pain relief discovery finds opioid connection

Quock first saw patients in withdrawal four decades ago as a volunteer at the University of California, San Francisco Medical Center. More recently, he has been studying the effectiveness of hyperbaric oxygen therapy on a range of conditions, including how it can bring relief from chronic pain for three to four weeks, "which is longer than any drug would work," he said.

Part of the therapy's pain-relief mechanism appears to involve the brain's opioid system. This got Quock to thinking, "If hyperbaric oxygen can activate the body's internal opioid systems, it should be able to alleviate opioid withdrawal."

He had also come across a paper, published in 1995 and translated from Russian for him by WSU math professor Sergey Lapin, reporting that the therapy alleviated opiate withdrawal in what the paper called "opium narcomaniacs."

The WSU researchers gave mice morphine sulfate, a drug similar to heroin, twice a day for four days. On the fifth day, the scientists induced withdrawal with an injection of naloxone, which quickly blocks the effects of opioids. They then monitored the mice for the withdrawal signs of

jumping, shaking forepaws, shaking like a wet dog, rising up on their hind legs and increased defecation.

Before the naloxone, some groups of mice were given 30- or 60-minute treatments in a hyperbaric chamber with pure oxygen at 3.5 times atmospheric pressure.

Withdrawal symptoms cut in half

Treated mice demonstrated the withdrawal symptoms far less than the untreated mice. Jumps and tremors dropped by half and wet-dog shakes even more. The numbers of fecal pellets – yes, the researchers counted them – also dropped in half for mice that had been in the chamber.

Quock and his colleagues write that their study is "the first to demonstrate this phenomenon in an animal model of opiate dependence."

The lead author of the paper is Daniel Nicoara, a recent WSU graduate in biochemistry. Other authors are Yangmiao Zhang, a WSU Ph.D. graduate at Oregon Health and Science University; Jordan Nelson, an undergraduate studying pharmacy at WSU Spokane; Abigail Brewer, WSU psychology lab manager and Ph.D. student; Prianka Maharaj, a WSU undergraduate studying neuroscience; Shea DeWald, a WSU undergraduate in engineering; and Donald Shirachi, professor emeritus at the University of the Pacific School of Pharmacy and director of research at the Chico Hyperbaric Center in California.

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The research is in keeping with WSU's Grand Challenges, a suite of research initiatives aimed at large societal issues. It is particularly relevant to the challenge of sustaining health and its themes of changing the course of disease and interventions to sustain public health.

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http://www.castlecraig.co.uk/treatment/complementary-therapies/hyperbaric-oxygen-therapy

http://www.castlecraig.co.uk/blog/11/2016/new-us-study-findings-hbot-profound-importance-opiate-detox

https://news.wsu.edu/2016/08/31/hyperbaric-chamber-eases-drug-withdrawal-symptoms/