

The fentanyl crisis: Death at the end of the rainbow

Chelsea Unkel, Ryan Hogans, & Pamela Lein from the University of California, Davis, analyse the fentanyl crisis responsible for increases in drug overdose across the US

Skittles, the rainbow candy adored by children, is the name of the most recent fentanyl-laced pills seized by the United States (U.S.) government in an illicit drug raid. Rainbow fentanyl comes in multiple shapes, forms and colors with wide appeal to children.

However, these candy look-a-likes are not innocuous. In California alone, there was a 625% increase from 2018 to 2020 in the number of deaths from fentanyl overdose among persons aged 10 to 19. In 2020, synthetic opioids, primarily fentanyl, were responsible for more than 60% of total U.S. deaths from a drug overdose – and the fentanyl crisis is still growing.

It is currently estimated that in the U.S., 136 people die every day from an overdose of prescribed or illicit opioids, with fentanyl representing the predominant drug involved in these cases. As stated by U.S. Drug Enforcement Agency (DEA) Administrator Anne Milgram, “Fentanyl is the single deadliest drug threat our nation has ever encountered”. And this public health crisis has spread well beyond the U.S.

Fentanyl and its role in the illegal drug market

Fentanyl is a synthetic opioid typically used to treat patients with severe pain, either chronic or following an acute injury or surgery. Fentanyl is similar to the natural opioids, morphine and heroin, which are derived from opium poppies, but about 100 times more potent than morphine and 50 times more potent than heroin. Like morphine and heroin, fentanyl has a very high abuse potential because it rapidly enters the brain to cause euphoria. This euphoric sensation results from fentanyl activation of mu-opioid receptors in the brain, which triggers the release of dopamine, the “feel good” neurotransmitter.

Because of its significant abuse potential, high potency, and low cost of synthesis, fentanyl is an extremely profitable product on the illegal drug market. One kilogram of fentanyl is 20 times more profitable than one kilogram of heroin. While fentanyl synthesized for medical purposes is predominantly manufactured in China and India under strict regulations and oversight, illicit fentanyl is manufactured in clandestine labs worldwide with no official oversight or quality control. Fentanyl is sold on the black market as nasal sprays, powders or pills, including pills made to look like legitimate prescription opioids or candy. In addition, because of its potency and low production cost, drug dealers will often mix fentanyl with other illicit substances to increase the addictive properties of these other drugs.

Thus, it is possible for someone to consume an illicit drug without knowing it contains fentanyl, or to knowingly take a pill containing fentanyl, but be unaware of the actual dose of fentanyl in the pill. The risk of overdosing on one pill is high. Just 2 milligrams (mg) of fentanyl can be lethal depending on the drug user's body size, tolerance and past usage. A recent analysis of pills seized by legal authorities found that the amount of fentanyl in counterfeit pills ranged from 0.02 to 5 mg. In a recent public safety alert posted to the U.S. DEA website, DEA Laboratory Testing reported that six out of 10 fentanyl-laced counterfeit pills contained a lethal dose of fentanyl. Three grams (g) of fentanyl, which is equivalent to the amount of sweetener in a small packet of sweetener, contains 2,464 lethal doses of fentanyl, while one kilogram (kg) of fentanyl, which is the unit of distribution often used by drug trafficking organizations, has the potential to kill 500,000 people.

Fentanyl: Overdose & occupational risk

A fentanyl overdose can cause stupor, decreased size of the pupils, cold and clammy skin, cyanosis or blue discoloration of the skin, coma and respiratory failure, which is the typical cause of death in opioid overdose. Emergency medical personnel often diagnose poisoning with fentanyl and other opioids if a patient presents with the classic "opioid triad" of symptoms: coma, pinpoint pupils and respiratory depression. The symptoms of fentanyl overdose can be rapidly reversed by naloxone, which can be administered as a nasal spray or injected into the muscle, under the skin, or into the veins. Naloxone is an opioid antagonist that works by binding to the mu-opioid receptors to block the binding of fentanyl, but unlike fentanyl, naloxone binding to the mu receptors does not activate them. Importantly, naloxone is effective in reversing opioid overdose for 30-90 minutes; however, fentanyl, and many other opioids, can remain in the body longer than 90 minutes. So, a person can re-experience the effects of a fentanyl overdose after the naloxone wears off.

Fentanyl is odorless, tasteless, and comes in many forms, making it impossible to detect without testing. Thus, fentanyl poses a significant occupational risk to those investigating opioid drug exposures. The U.S. Centers for Disease Control and Prevention (CDC) developed specific standards of personal protective equipment, such as wearing gloves and respirators when the powder is present, to protect those who may be exposed on the job. Another concern is environmental contamination. The U.S. Army Combat Capabilities Development Command Chemical Biological Center recently demonstrated that fentanyl is stable for weeks in surface waters and moist soils. The consequences of fentanyl's environmental persistence on human and wildlife health have yet to be determined.

Global actions needed for the fentanyl crisis

The fentanyl crisis is a global crisis, management of which will require significant resources and collaborative global actions. Progress made to date includes the designation of August 21st as Fentanyl Awareness Day to honour those who have lost their lives to fentanyl overdose and to educate the public about the dangers of fentanyl. The U.S. and

China have developed policies to regulate all aspects of fentanyl production, which was only partially regulated up to 2019. Infrastructure is being built within North America, Europe and Asia to increase access to not only naloxone, but also fentanyl test strips that can be used to determine whether drug supplies contain fentanyl.

The scientific community is actively researching alternatives to fentanyl that offer similar therapeutic benefits while minimizing the toxic risks. A sustained, coordinated effort across many countries and sectors of society will be required to ensure that the numbers of us who know someone negatively impacted by fentanyl does not continue to grow exponentially.

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