

HHE 2018-0015

Evaluation of Potential Occupational Exposures to Opioids in a City Fire and Police Department

Interim Report
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Introduction

The National Institute for Occupational Safety and Health (NIOSH) Health Hazard Evaluation (HHE) Program received a request for an evaluation from a city in Ohio. The request concerned possible unintentional exposure to opioids among police officers and fire fighters during first responder activities. In January 2018, the city provided us with reports from the city's risk management database for eight possible opioid exposure incidents in 2017 involving eight police officers. As of April 25, 2018, there had been no reports of potential opioid exposures among fire fighters. This interim report summarizes our evaluation of these eight reported incidents.

Ohio was one of three states with more than 20 law enforcement encounters involving fentanyl per 100,000 residents in 2015 [Centers for Disease Control and Prevention (CDC) 2016]. At the time of this evaluation, the police department had approximately 1,000 sworn officers and 125 civilian employees.

Methods

During January and February 2018, we interviewed all eight police officers involved in the incidents noted above: one by telephone and seven in person. We discussed incident details, work practices and processes, personal protective equipment (PPE) use, and health information. For two incidents, we also spoke with a co-worker who had been present while the police officer involved was experiencing symptoms.

We reviewed medical records related to the incidents for the seven officers who consented to medical record review. We also reviewed crime laboratory reports for substances submitted for forensic testing from incidents during which drug evidence had been collected. Crime laboratory reports list the substances of abuse detected in the sample or indicates that the sample is "negative for any commonly abused substances." The crime laboratory does not determine the concentrations of detected drugs in the sample. Additionally, the crime laboratory does not have



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information about the lowest concentration at which a substance could be detected. Body camera footage for these incidents was not available.

We abstracted information gathered from the incident reports, interviews, medical records, and crime laboratory reports. We summarized this information using descriptive statistics.

We defined a case of possible work-related opioid toxicity as health effects experienced by a police officer during law enforcement activities where opioids were suspected or known to be present during 2017. A health effect was considered present if a health symptom or sign was mentioned in the incident report, interview, or medical records.

The eight incident reports and interviews provided us with information about activities during which opioids were suspected or known to be present. We assessed the likelihood of exposure to a suspected opioid (including fentanyl and its analogues) by identifying whether there was (1) handling of and/or contact with eyes and mouth with suspected opioid powder and/or (2) close proximity to potentially aerosolized powder suspected to contain opioids.

Results

Of the eight officers, seven met our case definition for possible work-related opioid toxicity. One police officer reported no symptoms but filed an incident report out of concern about a possible inhalational exposure. For that incident, the crime laboratory identified the material to which the officer was exposed as “negative for any commonly abused substances.” This incident was not included in further analyses.

Characteristics of incidents involving possible work-related opioid toxicity

Of the seven police officers meeting our case definition, six were male. The median age was 33 years (range: 27–49). The median years of service was 9 (range: 2–19). Selected characteristics of the seven incidents where the officer met the case definition are summarized in Tables 1 and 2. Five incidents occurred in the field; two incidents occurred at district headquarters. Four officers were assigned to uniform patrol at the time of the incident.

Six of seven officers described seeing or working with a powder or residue that they suspected to be drugs. Samples were submitted to the crime laboratory for analysis in these six incidents. Heroin, fentanyl, or a fentanyl analogue was identified in samples from four of six incidents; samples containing heroin, fentanyl, or an analogue weighed less than 1 gram in three of the incidents. Cocaine was identified in three incidents, and marijuana was found in two. The seventh officer did not see suspected drugs or residue, but found drug paraphernalia during a vehicle search.

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Table 1. Characteristics of incidents in which officers met the case definition for possible work-related opioid toxicity, 2017 (n = 7)

Characteristic	Number
Location	
Field	5
Headquarters	2
Month	
May	2
August	4
October	1
Time of day	
12:01 am to 6:00 am	0
6:01 am to 12:00 pm	1
12:01 pm to 6:00 pm	5
6:00 pm to 12:00 am	1
Crime lab results (n = 6)*	
Heroin	4
Fentanyl	4
Cyclopropyl fentanyl	2
Butyryl fentanyl	1
Carfentanil	1
U-47700	1
No opioid†	2
Cocaine	3
Marijuana	2

* No samples were submitted to the crime laboratory for one incident. Some incidents included multiple substances identified.

† Sample submitted to the crime laboratory may be only subset of substances at scene per officers' descriptions.

For Incidents 2 and 3, the officer's account suggested that samples submitted for forensic testing were not necessarily representative of all substances at the scene (Table 2). In Incident 2, the officer scraped powder from the carpet of a vehicle floorboard that tested "negative for any commonly abused substances." However, the officer also performed other activities during the traffic stop that may have resulted in exposure to substances that were not collected (e.g., manually searching obscured locations in the vehicle). In Incident 3, the suspect disposed of a small amount of a powder on a windy day that blew into the officer's face; the powder was not able to be collected for testing. Powder from a wallet or coin purse collected during this incident tested "negative for any commonly abused substances." A hand-rolled cigarette also collected during this incident tested positive for marijuana.

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Five of seven officers reported wearing gloves during the incident; one officer reported putting on gloves after searching the suspect and conducting a preliminary search of a vehicle for weapons. Two officers reported keeping their gloves on after completing tasks such as handling evidence or searching a suspect or vehicle while they performed administrative tasks such as making a phone call or working at a computer station. None of the officers reported wearing a respirator, safety glasses or goggles, or long-sleeved clothing during the incidents.

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Table 2. Summary of potential work-related opioid toxicity cases, 2017 (n = 7)

Case	Task	Activities	Visible suspected opioid powder	Glove use	Reported health effects*	Pertinent physical examination findings in ED	Substances identified by crime laboratory
1	Evidence processing	Handled and looked in plastic bag containing drug paraphernalia with residue	Yes	Yes	Palpitations, difficulty breathing, chest tightness, pinpoint pupils	Pupil size not documented, alert and oriented	Heroin, fentanyl, cyclopropyl fentanyl, carfentanil, cocaine, marijuana
2	Traffic stop	Searched vehicle and suspect, collected evidence sample via scraping vehicle floorboard carpet	Yes	Yes†	Lightheadedness, difficulty breathing, pinpoint pupils	Normal pupil size, alert and oriented	Negative for any commonly abused substances‡
3	Interacting with suspect	Searched suspect and suspect's wallet, wind blew suspected drugs onto officer's face	Yes	Yes	Lightheadedness, palpitations, nausea, tingling around the mouth, pinpoint pupils	Pupil size not documented, alert and oriented	Marijuana‡
4	Search	Handled open box containing drugs in baggies collected during a search	Yes	Yes	Lightheadedness, palpitations, flushing, pinpoint pupils	NA	Heroin, fentanyl, butyryl fentanyl, U-47700, cocaine
5	Interacting with suspect	Searched suspect and opened two small folded paper packages (bindles) containing drugs	Yes	Yes	Lightheadedness, palpitations, nausea, diaphoresis, tingling around the mouth, mental confusion	Pupil size not documented, alert and oriented	Heroin, fentanyl, cyclopropyl fentanyl, cocaine
6	Traffic stop	Searched vehicle and handled drug paraphernalia after K9 indicated presence of drugs	No	No	Lightheaded, palpitations, diaphoresis, nausea, mental confusion	Pupil size normal, alert and oriented	—
7	Evidence processing	Handled folder paper (bundle) containing drugs during evidence processing	Yes	No	Lightheadedness, palpitations, chest tightness, diaphoresis, clammy skin, lower extremity weakness and tingling	Pupil size not documented, alert and oriented	Heroin, fentanyl

ED = emergency department; NA = not available

* A health effect was considered present if its presence was mentioned in the incident report, interview, or medical records.

† Gloves were used during part of a vehicle search

‡ Sample submitted to the crime laboratory were not necessarily representative of all substances at the scene of the incident on the basis of the officer's description of the incident.

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Health effects

Six of the seven police officers who met the case definition were evaluated at the same emergency department immediately after the incident and subsequently at the city’s employee health services clinic. The other police officer underwent evaluation only at the employee health services clinic.

Table 2 shows the health effects mentioned in the incident report, interview, or medical records and findings from the medical evaluation. Four police officers reported either having been told they had miosis (small or pinpoint pupils) or observing miosis in a mirror. Miosis is a sign associated with opioid toxicity. Lightheadedness and palpitations (sensation of rapid or irregular heartbeat) were the most frequently reported health effects, reported by six officers each (Figure 1).

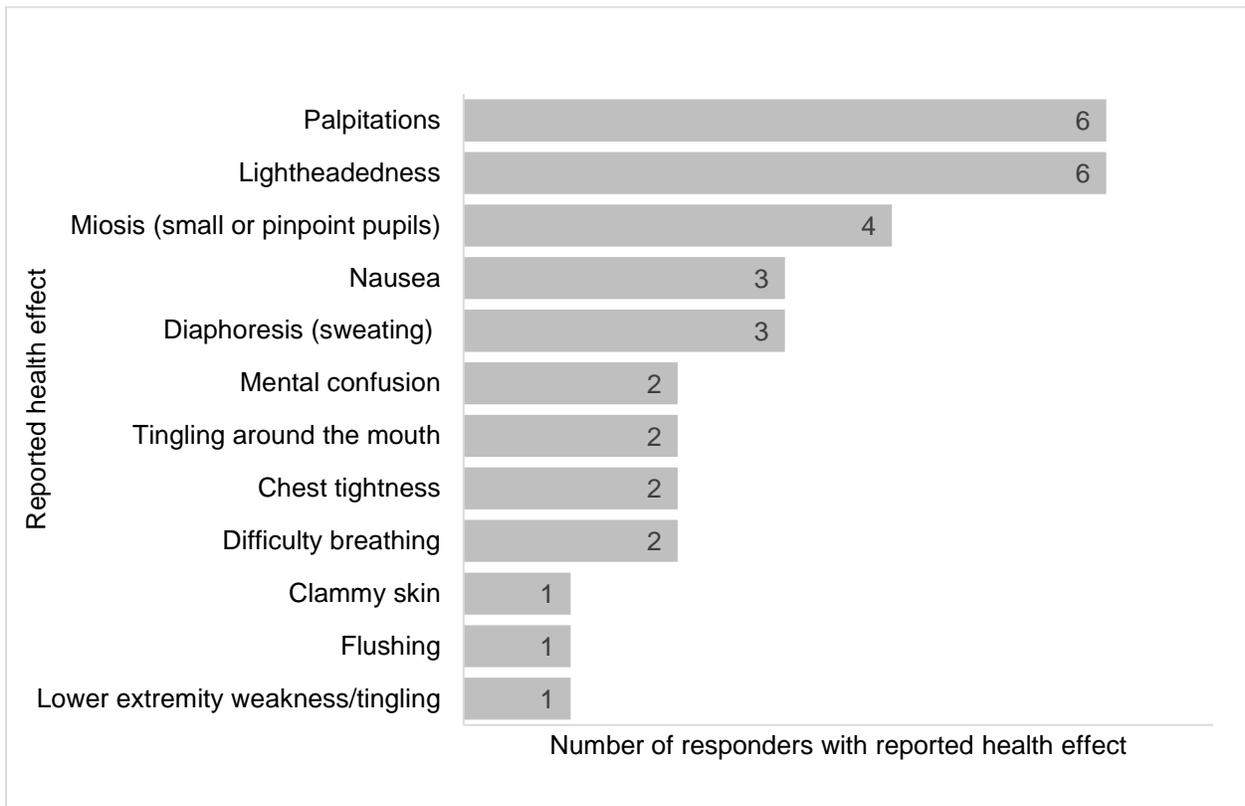


Figure 1. Health effects reported among police officers meeting case definition for possible work-related opioid toxicity (n = 7). A health effect was considered present if its presence was mentioned in the incident report, interview, or medical records.

Alt text: Bar graph showing the number of police officers reporting a health effect among the seven meeting the case definition for possible work-related opioid toxicity. Palpitations and lightheadedness were the most commonly reported

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Medical record review

Medical records were available for six officers. On the basis of the incident report and medical records, the six officers arrived in the emergency department approximately 25 to 90 minutes after potential exposure. Officers' symptoms had mostly or completely resolved by arrival in the emergency department; one officer had an elevated heart rate upon arrival. All six police officers had normal temperature and respiratory rate and all had elevated blood pressure. Two officers (Officers 2 and 6) were documented to have normal pupil size at the time of physical examination in the emergency department. Pupil size was not documented for the remaining four officers. None had signs of respiratory distress or depression.

Blood samples were obtained in two officers; tests for electrolytes, complete blood count, and troponin (to assess for damage to heart muscle) were normal. Electrocardiograms performed for three officers did not reveal any electrocardiographic abnormalities.

Urine collected from one officer (Officer 5) approximately 3 hours after the start of symptoms tested negative in a screen for 11 types of drugs: amphetamine, barbiturates, buprenorphine, benzodiazepines, cocaine, methadone, opiates, oxycodone, tricyclic antidepressants, tetrahydrocannabinol, and fentanyl. Forensic samples collected during this incident tested positive for heroin, fentanyl, cyclopropyl fentanyl, and cocaine in the crime laboratory.

The six police officers underwent observation in the emergency department for approximately 40 minutes to 2 hours and 15 minutes. None of the officers received naloxone at any point. One police officer received an anti-nausea medication from emergency medical services providers en route to the emergency department. One police officer received intravenous fluids in the emergency department. The most common clinical impression of the emergency department physician was "chemical exposure," provided for three officers. For another officer, the clinical impression was "accidental poisoning by heroin." Upon subsequent evaluation, the six police officers were returned to full duty by a clinician at the city's employee health services clinic. Five officers were cleared to return to full duty by the next weekday and one officer was cleared to return to duty within 1 week.

Detailed description of Incident 1

At police district headquarters, Officer 1 was assisting with the processing of evidence obtained during the execution of a search warrant. Officer 1 did not participate in the execution of the search warrant. Officer 1 moved a plastic bag containing seized money into a safe with gloved hands. Next, Officer 1 looked inside another plastic bag containing a measuring cup and spatula, and moved this bag from the floor onto a table to place it near other evidence collected during the search warrant execution. Officer 1 reported seeing a residue on the measuring cup in the plastic bag. Shortly after moving the bags, Officer 1 began to experience palpitations, difficulty breathing, and chest tightness while logging in evidence at a computer terminal in the same room. A colleague pointed out that Officer 1's pupils were pinpoint. Officer 1 was taken to the emergency department by another police officer.

Subsequently, another police officer put on a disposable coverall, a fullface respirator (unknown type), and two pairs of gloves to complete evidence processing. This officer noted that the drug evidence was not contained and the exterior of the plastic bags had powder on them. According to the crime laboratory reports, the evidence collected during this search warrant execution tested positive for heroin, fentanyl, cyclopropyl fentanyl, carfentanil, cocaine, and marijuana. The samples containing heroin, fentanyl, and fentanyl analogues had a combined weight of over 8 grams, and were distinct from other samples from this incident that tested positive for cocaine and marijuana. Among all the incidents with samples collected and tested, this was the highest combined weight of opioid-containing samples.

According to the emergency department physician's notes, Officer 1's symptoms began approximately 30 minutes before arriving in the emergency department. The physician noted that Officer 1's respiratory symptoms lasted approximately 5 minutes before resolving spontaneously and Officer 1 was no longer symptomatic by the time of the medical evaluation. Other than an elevated blood pressure, Officer 1's vital signs were within normal limits. Pupil size and respiratory distress were not documented in the emergency department medical records; Officer 1 appeared alert and oriented on physical examination. An electrocardiogram was normal. Officer 1 did not receive naloxone. Officer 1 was discharged after approximately 80 minutes of monitoring in the emergency department. The clinical impression was "chemical exposure."

Discussion

Background

From 2015 to 2016, there has been a 100% increase in the rate of overdose deaths involving synthetic opioids (which includes fentanyl and its analogues) in the United States [CDC 2018]. This has raised concerns about the potential for exposure to opioids among emergency responders (e.g., law enforcement officers, fire fighter-emergency medical service workers), who might come into contact with opioids in the course of their work. Inhalation, mucous membrane contact, ingestion, and percutaneous exposure (e.g., needlestick) are important potential routes of exposure. Brief skin contact with fentanyl or its analogues is not expected to lead to toxic effects if visible contamination is promptly removed [Interagency Board 2017; Moss et al. 2017; NIOSH 2017].

Issues related to health effects

Classic signs and symptoms of severe opioid toxicity include lethargy or other indications of central nervous system depression, shallow or slow breathing, miosis, slow heart rate, and low body temperature [Boyer 2012; Ropper et al. 2014]. However, not all patients experiencing opioid intoxication consistently experience all of these components [Boyer 2012]. Symptoms of mild opioid toxicity (compared to severe toxicity that includes respiratory depression) may include nausea and lightheadedness [Lynch et al. 2018; Suzuki and El-Haddad 2017].

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We described seven cases of possible work-related opioid toxicity. The health effects experienced by the police officers were not consistent with severe opioid toxicity described above. None had respiratory depression that required treatment with naloxone. Four police officers reported either being told they had miosis or observing miosis in a mirror, including Officer 1, who also briefly experienced non-specific respiratory symptoms. Nonspecific symptoms, which could be consistent with mild opioid toxicity, were reported by officers who met the case definition. Two police officers reported mental confusion following exposure, which might be consistent with central nervous system depression. Most officers' symptoms had resolved by the time they arrived in the emergency department. Most officers did not receive any treatment in the emergency department beyond evaluation and monitoring. All of the police officers for whom medical records were available were discharged from the emergency department within several hours and subsequently cleared for full duty. Taken together, the officers who met the case definition for possible work-related opioid toxicity appeared to have experienced health effects that were not life-threatening and resolved quickly.

Issues related to potential exposures among officers

Evidence collected and tested for four of seven incidents contained heroin and fentanyl. In three of these four incidents, the evidence tested also contained fentanyl analogues. Samples collected during two incidents did not contain opioids, but the samples tested represented only a subset of material present at the scene according to interviews with the officers involved. Cocaine was identified in forensic samples from three incidents where opioids were also identified. Cocaine intoxication can result in symptoms such as nausea and vomiting, dizziness, palpitations, sweating, and chest pain, and signs such as elevated heart rate, elevated blood pressure, and dilated pupils. Cocaine also has local anesthetic effects such as numbness and tingling [Aronson 2016]. Because these nonspecific health effects associated with cocaine toxicity overlap with health effects associated with mild opioid toxicity, it might not be possible to distinguish whether health effects resulted from a specific drug or a combination of drugs when multiple exposures are involved.

In some incidents, inhalation and mucous membrane contact were likely, for example, when a powder blew into an officer's face. In other incidents, possible contamination of hands or gloves with subsequent hand-to-face contact could have led to inhalation, mucous membrane contact, or ingestion.

The forensic testing of evidence samples in Incident 5 revealed heroin, fentanyl, cyclopropyl fentanyl, and cocaine. Urine collected from Officer 5 tested negative for opiates, cocaine, and fentanyl. The ability to detect synthetic opioids in blood (or serum) and urine is an area of active investigation, with known limitations [Armenian et al. 2017, Suzuki and El-Haddad 2017]. For example, current opiate screens will not detect any of the synthetic opioids such as fentanyl [Suzuki and El-Haddad 2017]. Other uncertainties include the timing of testing relative to potential exposure and the sensitivity of any tests performed.

We described Incident 1 in greater detail to illustrate how we considered the various sources of information and to highlight an important work activity that could be associated with work-

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related exposure to opioids. Officer 1 developed symptoms after handling items that later tested positive for heroin, fentanyl, and fentanyl analogues, including carfentanil, a synthetic opioid that is 10,000 times more potent than morphine [George et al. 2010]. Health effects occurred during evidence processing and involved the largest amount of confirmed opioids among all seven incidents. Prior NIOSH HHEs have examined workplace exposures among criminalists [NIOSH 2009] and forensic laboratory workers [NIOSH 2016], but not police officers, who handle evidence earlier in the chain of custody in non-dedicated work areas. This incident highlights that handling evidence is a work activity that increases the potential for work-related exposure to opioids.

This is an interim report for this HHE. The case definition we used to define possible work-related opioid toxicity was broad, in order to help gather information that will be used to inform our remaining activities in this HHE. For example, the information from these incidents will help us identify if some tasks or scenarios present a greater risk of exposure to suspected opioids than other tasks. As next steps, we plan to use a survey to evaluate work practices, use of PPE, and prevalence of exposures among police officers to suspected opioids and associated health effects. We also plan to assess surface contamination in evidence handling areas and common areas in a subset of district offices.

Preliminary conclusions

Seven of eight incidents involving police officers met our case definition for possible work-related opioid toxicity. The incidents occurred during law enforcement duties in the field and evidence processing at police headquarters. Most cases involved samples of illicit drugs that tested positive for opioids. Officers reported a range of health effects, including miosis, a sign suggestive of opioid toxicity, along with non-specific symptoms. Most health effects were brief and had resolved by the time officers were evaluated at the emergency department. None were consistent with severe opioid toxicity and none required naloxone for respiratory depression. The exact route(s) of exposure could not be determined for each incident. Evidence handling, especially processing high volumes or highly concentrated drug evidence, might be associated with a higher potential for unintentional exposure resulting in symptoms.

Preliminary recommendations

NIOSH has issued interim guidance on how to protect emergency responders from exposures to fentanyl and its analogues [NIOSH 2017]. We believe that this current NIOSH guidance is applicable to these incidents, even though fentanyl or its analogues were not necessarily involved in all the incidents.

On the basis of our findings to date, we recommend the actions listed below. We encourage the City and Police Department to use an employee-employer health and safety committee or working group to discuss our recommendations and develop an action plan. Those involved in the work can best set priorities and assess the feasibility of our recommendations for the specific situation at the police department.

1. Provide training to officers on how to prevent occupational exposure to fentanyl and its analogues, including standard safe operating procedures specific to police work, training, PPE, and decontamination. These topics are addressed in the NIOSH Topic Page “Fentanyl: Preventing Occupational Exposure to Emergency Responders” (<https://www.cdc.gov/niosh/topics/fentanyl/risk.html>). In addition to established work practices, responders should follow the following recommendations when fentanyl or its analogues are known or suspected to be present:
 - a. Do not eat, drink, smoke, or use the bathroom while working in an area with known or suspected fentanyl.
 - b. Do not touch the eyes, mouth, and nose after touching any surface potentially contaminated with fentanyl.
 - c. Avoid performing tasks or operations that may aerosolize fentanyl due to increased exposure risks.
 - d. Wash hands with soap and water immediately after a potential exposure and after leaving a scene where fentanyl is known or suspected to be present to avoid potential exposure and to avoid cross contamination. Do not use hand sanitizers or bleach solutions to clean contaminated skin.
2. Collect samples of substances to which symptomatic officers may have been exposed for forensic testing. If possible, retain any body camera video of potential opioid exposure incidents going forward. Both types of information can be periodically reviewed to identify any trends affecting the risk of work-related exposure to opioids and any associated health effects. Use this information to help determine whether changes in current procedures may be needed.
3. Encourage officers to report possible work-related drug exposures through inhalation, mucous membrane contact, ingestion, and percutaneous routes and any resulting health effects to their supervisors and healthcare providers.
4. Encourage officers to wear nitrile gloves during tasks when fentanyl or its analogues are suspected to be present. When fentanyl is not visible, but suspected to be present, exposure level can be considered “minimal” according to NIOSH guidance for first responders. Train officers (1) on how to remove gloves safely and (2) to remove gloves after completing their work task and before working in an area where fentanyl is not suspected to be present.
 - a. For example, when processing evidence, an officer should remove gloves after handling suspected opioids or unknown drugs before using a computer in a common space for record keeping.

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