Evaluation of Occupational Exposure to Opioids in a City Police Department

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Disclaimer

The Health Hazard Evaluation Program investigates possible health hazards in the workplace under the authority of the Occupational Safety and Health Act of 1970 [29 USC 669a(6)]. The Health Hazard Evaluation Program also provides, upon request, technical assistance to federal, state, and local agencies to investigate occupational health hazards and to prevent occupational disease or injury. Regulations guiding the Program can be found in Title 42, Code of Federal Regulations, Part 85; Requests for Health Hazard Evaluations [42 CFR Part 85].

Availability of Report

Copies of this report have been sent to the city, police department, and union. The state and local health departments and the Public Employment Risk Reduction Program have also received a copy.

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Introduction

Request

A city in Ohio requested a health hazard evaluation (HHE) concerning possible unintentional exposure to opioids among police officers and firefighters during first responder activities. As one part of the HHE request, city and police department officials were concerned about incidents where police officers developed health symptoms after potential exposure to substances suspected to be opioids during the course of their work.

To learn more about the workplace, go to Section A in the Supporting Technical Information

Our Approach

For each of the 16 incidents of potential unintentional exposure to opioids reported during 2017–2019, we completed the following activities during our evaluation:

- Conducted confidential interviews with the affected police officers about the incidents, work practices and processes, personal protective equipment (PPE) use, and health information.
- Reviewed incident reports, medical records, and forensic laboratory reports when available.
- Reviewed body camera footage recorded during incidents, when available.

Using this information, we categorized the incidents and looked for patterns across incidents. We focused on incidents where a police officer experienced health effects during or after law enforcement activities where (1) opioids were suspected or known to be present and (2) there was no other plausible alternative diagnoses.

We also reviewed police department weekly staff notes, training bulletins, and the department procedure manual for information related to preventing unintentional exposure to opioids at work.

We evaluated the information in the context of scientific publications and guidance about preventing occupational exposure to illicit drugs, including exposure to suspected illicit opioids.

To learn more about our methods, go to Section B in the Supporting Technical Information

Our Key Findings

Most incidents involved multiple substances and happened during law enforcement duties away from police headquarters

- During 2017–2019, 16 officers had unintentional exposure to suspected opioids documented in an incident report. Of these 16 officers, 12 officers had health effects associated with law

enforcement activities where opioids were suspected or known to be present and there were no other plausible explanations for the health effects. We based our evaluation on the 12 incidents involving these officers.

- Of 12 incidents, 11 had samples of the suspected illicit drug submitted for forensic laboratory testing. The most common substance identified was opioids, followed by cocaine and marijuana or its active component tetrahydrocannabinol.
- Multiple substances were identified in 8 of 10 incidents where any substance was identified. Fentanyl was identified in 8 incidents, always along with at least one other substance. Substances co-identified with fentanyl included heroin (75% of the time), cocaine (75% of the time), and fentanyl analogues (50% of the time).
- Of 12 incidents, 9 occurred while officers were performing law enforcement duties away from police headquarters such as searching a person or a location, interacting with suspects, making traffic stops, or processing an admission to the county jail. Two incidents occurred when officers were processing evidence at police headquarters. One incident occurred during other activities at a police location that was not district headquarters.

Officers reported having work-related health effects after they might have been exposed to opioids

- The 12 officers reported a range of symptoms. The most common were lightheadedness, palpitations, and nausea. Four officers reportedly had miosis (small or pinpoint pupils), a sign associated with opioid toxicity.
- Most health effects were brief. Among 11 officers who went to the emergency department, 7 reported that their symptoms had mostly or completely resolved by the time they arrived there.
- None of the officers had objective signs of serious (life-threatening) opioid toxicity. None had signs of respiratory distress or depression. None received naloxone.
- The cause of health effects could not be definitively identified. Nonetheless, the officers' health effects interfered with their ability to carry out important job duties.
- Drugs could have been inhaled in 7 of the 12 incidents; come into contact with eyes, nose, or mouth in 9 of the 12 incidents; and come into contact with skin in 5 of the 12 incidents. Skin contact alone was unlikely to lead to health effects.

Officers did not have or use PPE appropriate for handling unknown powders in an uncontrolled setting and were insufficiently trained on using PPE

- Half of the officers who had suspected exposure incidents wore nitrile gloves, which are recommended, during part of or the entire incident. One of those officers put gloves on midway through the incident.

- A quarter of the officers who had suspected exposure incidents wore long-sleeved clothing that provided wrist and arm protection during the incident.
- None of the officers reported wearing respiratory protection, such as an N95 filtering facepiece respirator. According to the staff notes and training bulletins, respiratory protection was voluntary. Respirators were not standard issue safety equipment for officers at the time of the incidents.
- Only the criminalistics squad in the Criminal Investigation Section was included in the written respiratory protection program.
- Officers received training on handling unknown powders and preventing exposures to suspected fentanyl via attachments to staff notes.
- Officers had to report to their supervisors that they had reviewed training bulletins, but education objectives were not established for this training. It was not clear if training effectiveness was evaluated (e.g., via knowledge checks or post-tests).

To learn more about our results, go to Section B in the Supporting Technical Information

Our Recommendations

Benefits of Improving Workplace Health and Safety:

- ↑ Improved worker health and well-being
- ↑ Better workplace morale
- ↑ Easier employee recruiting and retention
- ↑ Enhanced image and reputation
- ↑ Superior products, processes, and services
- ↑ May generate overall cost savings

The recommendations below are based on the findings of our evaluation. For each recommendation, we list a series of actions you can take to address the issue at your workplace. The actions at the beginning of each list are preferable to the ones listed later. The list order is based on a well-accepted approach called the "hierarchy of controls." The hierarchy of controls groups actions by their likely effectiveness in reducing or removing hazards. In most cases, the preferred approach is to eliminate hazardous materials or processes and install engineering controls to reduce exposure or shield employees. Until such controls are in place, or if they are not effective or practical, administrative measures and PPE might be needed. Read more about the hierarchy of controls at https://www.cdc.gov/niosh/topics/hierarchy/.

We encourage the police department to use a health and safety committee to discuss our recommendations and develop an action plan. Both union representatives and management representatives should be included on the committee. Helpful guidance can be found in "*Recommended Practices for Safety and Health Programs*" at https://www.osha.gov/shpguidelines/index.html.

Recommendation 1: Reduce the potential for unintentional occupational exposures to illicit drugs

Why? Fentanyl and other drugs pose a potential health hazard to emergency responders (such as police officers, firefighters, and emergency medical services personnel) who come into contact with these drugs in the course of their work. Possible exposure routes to illicit drugs can vary based on the source and form of the drug. Responders are most likely to encounter fentanyl and its analogues in powder (including compressed powder), tablet, or liquid form. Potential exposure routes of greatest concern include inhalation, mucous membrane contact, ingestion, and percutaneous exposure (e.g., needlestick). Any of these exposure routes can potentially result in toxic effects. Brief skin contact with powdered fentanyl or its analogues is not expected to lead to toxic effects if any visible contamination is promptly removed.

Police officers experienced health effects that required medical attention, preventing them from continuing to perform essential job duties after exposures to illicit drugs.

How? At your workplace, we recommend these specific actions:

Perform job hazard analyses for the routine and emergency tasks or work responsibilities performed by officers and develop controls according to the risks identified.

Consider working with occupational safety and health experts or persons with expertise on both PPE and police work on these job hazard analyses. Specific topics to address include the following:

- How to provide PPE and other equipment that are easily and safely cleaned or disposed of after responding to illicit drug incidents.
- How to maintain clear and effective communication while wearing PPE, particularly over radios or similar devices.
- Including officers in a written respiratory protection program if department procedures require or encourage respiratory protection for officers. The written program should include medical evaluations, annual fit testing, and respiratory protection training.
- How to coordinate proper respirator use, including topics such as
    - Using respirators properly, along with the other equipment carried by police officers, such as duty belts, body cameras, and radios
    - Timing for putting on PPE in unsecured or unsafe conditions when illicit drugs might be present
- Procedures for when to change gloves and how to dispose of used gloves after tasks with a potential for illicit drug contamination. These tasks include handling illicit drugs, performing searches, and handcuffing subjects who might have recently handled them.

For additional information on job hazard analyses, refer to the Occupational Safety and Health Administration's document at https://www.osha.gov/sites/default/files/publications/osha3071.pdf.

Develop new or modify existing policies and procedures for emergency response work involving illicit drugs for situations where the anticipated level of exposure is "moderate" or greater.

- "Moderate" refers to situations where small amounts of illicit drugs in powder or liquid form are visible.
- Follow guidance in the NIOSH Topic Page entitled "Preventing Emergency Responders' Exposures to Illicit Drugs" at https://www.cdc.gov/niosh/topics/fentanyl/risk.html.

Review and update safety policies and procedures regularly.

- Include city and police department management in the review process, in discussion with employees and their representatives.
- Review policies and procedures to determine if safety protocols should be expanded from "fentanyl" to "unknown illicit drugs" or "unknown suspected opioid" given the evolving nature of the drug supply.
- Update the department's safety data sheet management process. The department can refer to or rely on the city's hazard communication program if it includes police department employees.

Provide training to officers to prevent potential exposure to unknown powders.

- Resources related to training are available in the *Illicit Drug Tool-Kit for First Responders* at https://www.cdc.gov/niosh/topics/fentanyl/toolkit.html.
- Ensure training has clear objectives, uses a variety of methods, and is evaluated for effectiveness using methods such as pre- and post-tests or safety audits in the field and in evidence storage and processing areas.
- Provide officers with training on these topics:
    - How to conduct an on-site risk assessment
    - How to use PPE that is recommended based on the risk assessment
    - How to appropriately don (put on) and doff (take off) gloves. Make sure officers know to remove gloves after handling suspected drugs and to wash their hands immediately after removal.

- Train officers annually on respirator use, donning and doffing, maintenance, storage before use, and disposal after use.
    - How to handle and collect evidence safely (e.g., avoiding scraping samples that may contain hazardous drugs from furniture or vehicle floors; instead, rely on another method such as tape sampling)
    - When to use the ventilated cabinet ("fume hood")
    - When and how to decontaminate work surfaces, hands, or other areas of the body that have been in contact with unknown drugs
- Be clear and specific about what actions are expected from officers through policies and procedures and during training. For example, the procedures for using the ventilated cabinet suggest that the officer should handle unknown powders in the centrally located ventilated cabinet. Give officers more information about the amount of drugs that is too small to be handled in the cabinet and the amount that is too large to be handled by one officer alone.
- Ensure previous training bulletins are available to and reviewed by new officers.

Ensure officers can access recommended PPE and are trained to use it.

- All recommended PPE should be made available to officers, and they should be trained on its use. For example, staff notes and training bulletins specifically mention eye protection and N95 filtering facepiece respirators; therefore, this PPE should be readily available and officers must know how and when to use it.
- Officers who might handle unknown powders should be medically cleared and fit tested to wear an N95 filtering facepiece respirator appropriately and safely to protect themselves during those job tasks.

Recommendation 2: Continue to evaluate new exposure incidents involving unintentional workplace exposures to suspected illicit drugs

Why? Continuing to evaluate exposure incidents can help identify any gaps in policies and procedures or training meant to protect police officers from exposure to illicit drugs. It can also ensure that policies and procedures remain effective for preventing exposure to new illicit drugs that emerge over time.

How? At your workplace, we recommend these specific actions:

Encourage officers to report when they might have had illicit drug exposure, or a near miss, to their supervisors. Remind them to also report any possible health effects that result from those potential exposures.

Collect and analyze any suspected drugs that officers may have been exposed to, when safe and feasible.

- Train officers on procedures for sample collection by a nonaffected officer according to written exposure incident response procedures. Include sample collection in training bulletins on preventing exposures to illicit drugs.
- Ensure sample and evidence collection procedures include exposure controls such as minimal handling, avoiding actions that may aerosolize loose powders (e.g., pressing evidence bags to remove air, collecting powder from porous surfaces), and wearing appropriate PPE.

Review reported exposure incident summaries and follow up with affected officers.

- Consider conducting interviews with officers who have been exposed to help inform if policies and procedures or training can be modified to prevent future exposure incidents.
- Retain and review body camera video footage of the incidents, when available, as part of the incident review.

Supporting Technical Information

Evaluation of Occupational Exposure to Opioids in a City Police Department

HHE Report No. 2018-0015-3383

August 2021

Section A: Workplace Information

At the time of the evaluation, the police department had approximately 1,000 sworn officers. The police department was organized into three bureaus: Patrol, Investigations, and Support. Geographically, the police department was organized into six districts. Officers assigned to districts for uniform patrol duty were generally divided into three shifts. Shift start and end times varied by district. Sworn officers were covered by a collective bargaining agreement between the police union and the city.

History of Issue at Workplace

City government managers submitted an HHE request concerning unintentional occupational exposures to opioids among police staff. City government and police department managers were concerned about possible exposures among police officers who encountered illicit drugs, including opioids, when completing their work duties. At the time of the request, several police officers had reported health effects after possible exposure to suspected opioids at work. City government managers requested assistance in assessing these exposures with the goal of preventing additional incidents.

Workplace and Process Description

Police officers worked in a variety of settings over the course of their shift. For example, officers can spend time in their district headquarters, outdoors (such as roadside or on bicycle patrol), public or private indoor locations (such as when responding to a residential call or when serving a warrant), patrol vehicles (such as a motor vehicle or bicycle), and other city and county law enforcement buildings (such as the local jail and evidence or property buildings), among others. Some officers were assigned to a single location. Most officers were uniformed officers and were assigned to serve a particular geographical portion, or district, of the police department's jurisdiction. Some officers had specialized assignments, which included being on teams that address crimes related to drugs and vice (e.g., alcohol, prostitution, gambling, pornography, and regulatory violation), or in special weapons and tactics (SWAT) and canine units. Some officers were plain-clothed, or nonuniformed, such as when working undercover or as a detective.

Section B: Methods, Results, and Discussion

Our evaluation objectives consisted of the following:

- Characterize incidents in which police officers experienced unintentional occupational exposure to suspected opioids and developed health effects.
- Review records about the health effects experienced by police officers.
- Review materials provided to police officers on workplace procedures to prevent occupational exposure to opioids.
- Make recommendations on how to prevent exposures to illicit drugs among police officers.

Methods: Incident Characterization

The city provided the police department's Investigation of Employee Injury form (incident report) for all incidents that the city or police department identified as involving police officers and exposure to suspected opioids from 2017 through 2019. The incident reports contained information about the officer and the incident.

We conducted voluntary, confidential interviews in person or by telephone with officers for whom an incident report was filed. During the interviews, we discussed details about the incident, work practices and processes, PPE use, and health information. For two incidents, we also spoke with a coworker who was present during the incident.

In addition, we reviewed the following information when available:

- Forensic laboratory results for evidence collected during the incident to which the officer may have been exposed.
- Video footage from body cameras worn by officers who were present during the incident.
- Medical records related to the incident.

Forensic laboratory reports included a weight and description of the evidence exhibit analyzed. They either listed the scheduled substances identified during analysis or indicated the exhibit was "negative for any commonly abused substances." The forensic laboratory did not determine the concentrations of substances identified in the sample. The forensic laboratory reports did not include the lowest concentration at which a substance could be detected.

We abstracted information from the incident reports, interviews, forensic laboratory reports, and medical records. 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 that was associated with law enforcement activities during 2017–2019 where (1) opioids were suspected or known to be present and (2) no other plausible alternative diagnoses were present. A health effect was considered present if it was mentioned in the incident report, interview, or medical records. Opioids were considered suspected or known to be present if either (1) a forensic laboratory

report indicated that a substance present at the location of the incident contained one or more opioids or (2) if the officer involved described a substance that their experience suggested was likely to contain an opioid but the substance was not collected for analysis.

For each incident, we categorized the job activities at the time of the suspected exposure into one or more categories: traffic stop, search, interaction with suspect, evidence processing, or other. We established these categories based on interview responses. We determined whether suspected exposure occurred based on when there was (1) handling of or contact with eyes and mouth with suspected opioid powder or (2) close proximity to potentially aerosolized powder suspected to contain opioids in information from incident reports, interviews, and video footage or medical records if available. We evaluated patterns in job activity categories visually with Euler diagrams [Wilkinson 2012].

We asked officers whether they handled the suspected opioid. We also inquired about what physical form the substance was in, if it was in a closed container or an open container, and if they saw any of the material released. We reviewed the body camera footage available for five incidents to identify any additional characteristics about possible exposure pathway or routes. Using this data, we established by consensus the routes by which the officers could possibly have been exposed from the following possibilities: inhalation, dermal, ingestion, mucous membrane contact, or percutaneous exposure (e.g., needlestick).

Results: Incident Characterization

Incident Characteristics

The city and police department identified 16 incidents involving 16 police officers with exposure to suspected opioids. Among the 16 police officers, 12 met the case definition for possible work-related opioid toxicity. The four incidents not included in the analysis included two incidents where no symptoms occurred, one incident where the officer's symptoms were attributed to another medical diagnosis, and one incident where the officer did not have symptoms until several hours after the incident, which is incompatible with the onset of action of opioids [Suzuki and El-Haddad 2017]. In the two incidents where no symptoms occurred, the officers filed an incident report out of concern about a possible inhalational exposure. For those two incidents, the forensics laboratory did not identify any opioids in the material submitted as evidence.

Characteristics of the 12 incidents are summarized in Table C1. Most incidents (n = 7; 58%) occurred in the field. Uniform patrol was the most common assignment (n = 8; 67%). The first incident identified during the period of interest occurred in May 2017. Most incidents occurred in 2017 (n = 7; 58%) (Figure B1).

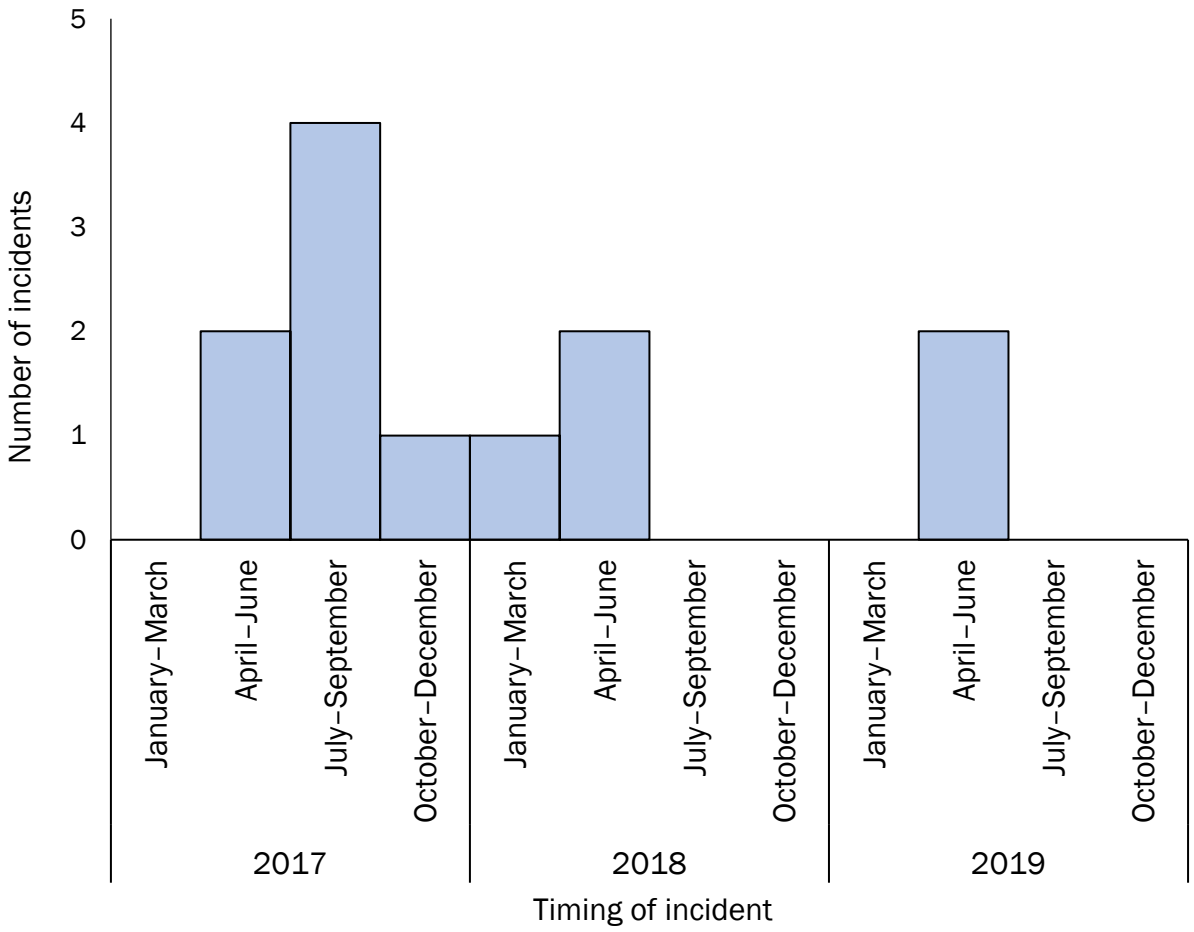

Figure B1. Timing of incidents involving possible work-related opioid toxicity, 2017–2019 (n = 12).

Job Activities

Job activities at the time of the suspected exposure for each incident are shown in Figure B2. Some incidents involved multiple job activities. Search was the most common job activity category (n = 8; 67%). The search involved a location, for example, a residence or vehicle, in four incidents (50%), a person in three incidents (38%), and both a location and a person in one incident (12%). Three incidents involving searching a location also included evidence gathering. There was overlap between search and interaction with a suspect (n = 5, 42%), and traffic stop (n = 2, 17%). Evidence processing at police headquarters was a separate category involving two incidents (17%). Officers reported that powders suspected to be illicit drugs were visible in 11 incidents (92%).

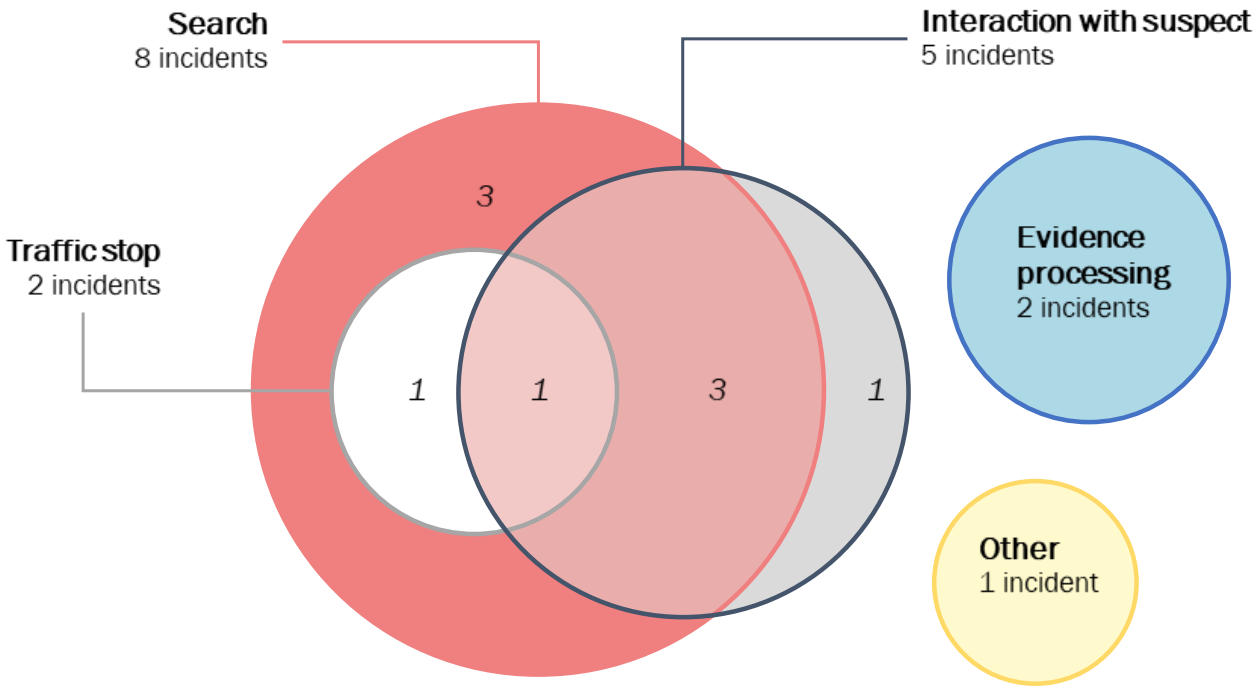

Figure B2. Job activities during the time of suspected exposure in incidents involving possible work-related opioid toxicity, 2017–2019 (n = 12). Numbers in italics indicate the number of incidents in a job activity category or job activity category combinations.

Substances Identified

Figure B3 summarizes the forensic laboratory testing results for specimens collected at the scene of the incident. Of the 12 incidents, specimens were submitted for testing for 11 (92%) incidents. For one incident, no commonly used substances were identified in the submitted specimen. Opioids were the most common type of substance identified (n = 8; 67%), followed by cocaine (n = 7; 58%) and marijuana or tetrahydrocannabinol (THC) (n = 2, 17%). Among opioids, fentanyl or a fentanyl analogue was the most commonly identified substance (n = 8; 100%), followed by heroin (n = 6; 75%). Within the fentanyl or fentanyl analogue category, fentanyl was the most commonly identified substance (n = 8, 100%). Carfentanil was identified in one incident (13%).

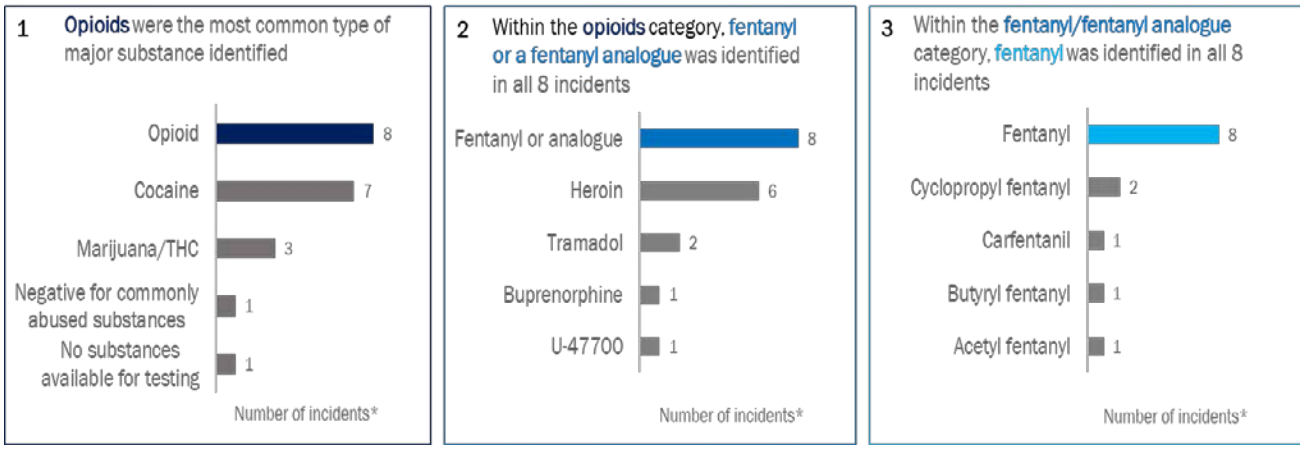

Figure B3. Forensic testing results for specimens at the scene of incidents involving possible work-related opioid toxicity (n = 12). The graph on the left shows the major substances identified in specimens from 11 incidents. The middle graph shows the types of opioids found in the 8 incidents with opioids. The graph on the right shows the types of fentanyl or fentanyl analogue found in the 8 incidents with a fentanyl or fentanyl analogue.

* More than one substance was identified for some incidents. Samples submitted to the forensic laboratory might be only a subset of substances at the scene per the officers' descriptions.

Multiple substances were identified in 8 of 10 (80%) incidents where any substance was identified. In two incidents, only cocaine or marijuana was identified. When fentanyl was identified, it was always along with at least one other substance. In the eight incidents where fentanyl was identified, a fentanyl analogue was co-identified in four (50%) incidents. Heroin and cocaine were each co-identified with fentanyl in six (75%) incidents (Figure B4).

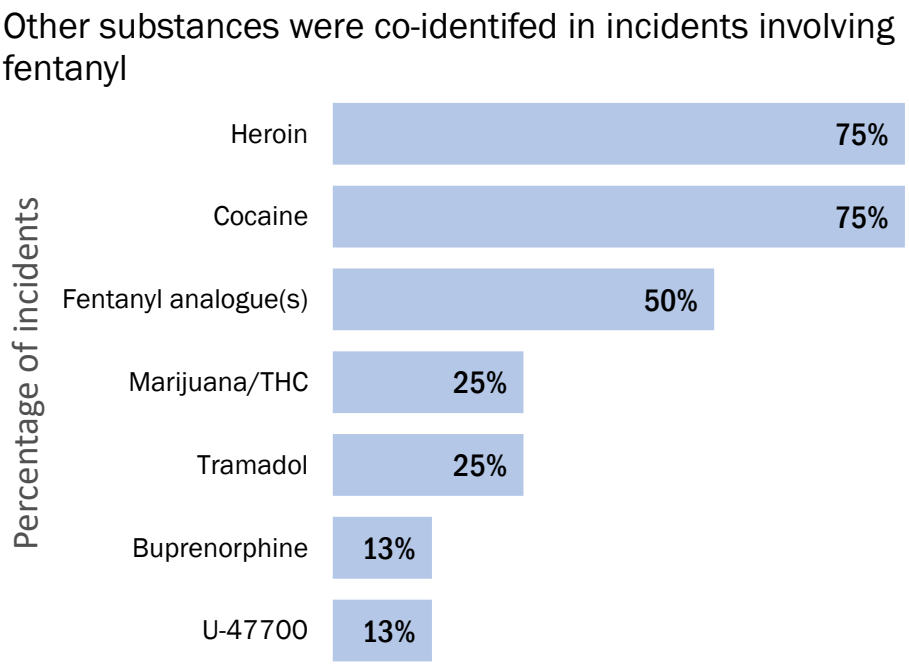

Figure B4. Co-identification of fentanyl with other substances in incidents involving possible work-related opioid toxicity (n = 8).

The officers' descriptions of the incidents suggested that samples submitted for forensic testing were not necessarily representative of all substances at a scene. For three incidents, the amount of some substances might have been too small to be collected for testing. For example, in one incident a suspect disposed of a small amount of a powder on a windy day that blew into the officer's face; the powder could not be collected for testing. In a fourth incident, the sample was collected from an impounded car where an overdose death occurred prior to the officer's interaction with the car.

Exposure Pathways and Routes

We used the officers' accounts of the incidents and body camera footage when available to retrospectively identify possible routes of exposure. Of the 12 police officers involved in suspected exposure incidents, 4 (33%) described a suspected or confirmed opioid becoming aerosolized. For example, a suspect dropped an item from which a powder was dispersed by the wind, or powder was released into the air when a container was opened during a search. Of these four incidents, three officers (25% of 12 incidents) said the material blew into their faces, describing probable inhalational exposure, mucous membrane exposure, or both. Inhalational exposures were possible in an additional 3 of 12 incidents (25%) where the officer was either handling suspected opioid in an open container (n = 2) or was scraping confirmed opioid from a surface during evidence collection (n = 1). These activities may also result in mucous membrane exposure.

Officers reported other activities that pose risk of mucous membrane exposures, such as handling evidence without gloves and lack of handwashing before touching the face. In 9 of 12 (75%) incidents,

mucous membrane exposure was possible: material was visibly aerosolized, there was lack of handwashing or glove removal after handling suspected illicit drugs, or material was observed on an officer's face. In two incidents, a very small amount of powder was observed on the officer's lip or finger and exposures through both inhalation and mucous membranes were possible. The officers described aerosolization or work practices that could contribute to mucous membrane exposure. Dermal exposure was possible in 5 of 12 incidents, but the small amount and powder form involved was unlikely to lead to health effects through dermal exposure.

PPE Use

Of the 12 officers involved in suspected exposure incidents, 5 (42%) reported wearing nitrile gloves during the incident and 1 (8%) reported putting on gloves after searching a suspect and conducting a preliminary search of a vehicle for weapons. The remaining six officers reported not wearing gloves during the incident. Regarding wrist and arm protection, three (25%) officers reported wearing long-sleeved clothing. The remaining nine (75%) officers reported wearing short-sleeved clothing or had sleeves rolled up during the incident. Officers reported not wearing N95 filtering facepiece respirators or using eye protection (e.g., safety glasses or goggles) during incidents. However, we did not ask all officers specifically if they were wearing eye protection during incidents. Both N95 filtering facepiece respirators and eye protection were recommended to officers in health and safety information contained in staff notes from May 2018. According to police department managers, goggles and N95 filtering facepiece respirators were made available to officers through their supervisors starting in early 2017. During 2017–2019, only police officers in the criminalistics squad were fit tested for N95 filtering facepiece respirators. Since 2020, police officers outside the criminalistics squad have been fit tested and provided with N95 filtering facepiece respirators for use against infectious disease exposure.

Employee Health Assessment

Of the 12 police officers meeting our case definition, 10 (83%) were male. The median age was 35.5 years (range: 27–55 years). Officers who met the case definition served in this police department for a median of 8.5 years (range: 1–32 years).

Figure B5 shows the health effects mentioned in the incident report, interview, or medical records among officers who met the case definition. Lightheadedness was the most common (n = 11), followed by palpitations (sensation of rapid or irregular heartbeat) (n = 7) and nausea (n = 5). Four police officers reported either having been told by another person present during the incident that they had miosis (small or pinpoint pupils) or observing miosis in a mirror. Miosis is a sign associated with opioid toxicity.

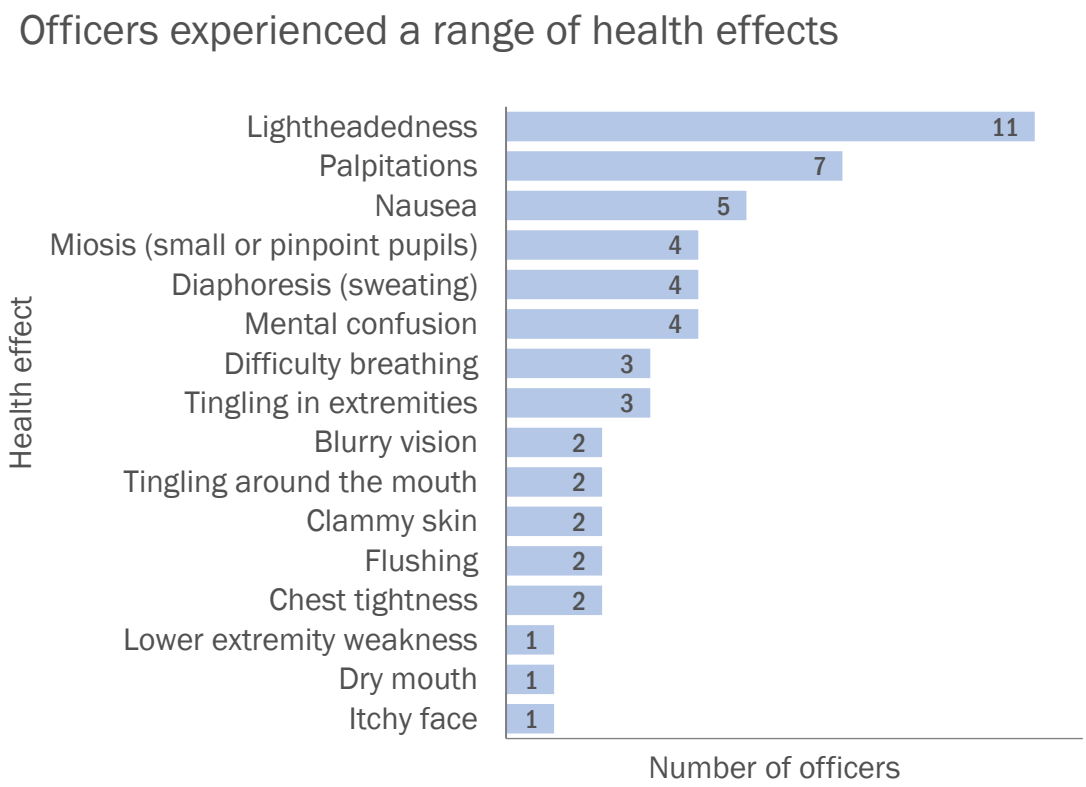

Figure B5. Health effects experienced by police officers meeting the case definition for possible work-related opioid toxicity (n = 12)

Medical records were available for 11 officers. On the basis of the incident report and interviews with officers, 11 officers were evaluated in the emergency department (ED). They arrived in the ED approximately 20 to 90 minutes after potential exposure. At the time of ED arrival, all officers were alert and oriented and seven (64%) reported that their symptoms had mostly or completely resolved.

Upon arrival at the ED, 10 (91%) officers had elevated blood pressure, defined as blood pressure greater than 120/80 millimeters of mercury. One (9%) officer had an elevated heart rate. All had a normal temperature. None had respiratory rate of 12 breaths or less per minute, which, if present, suggests acute opioid intoxication in a nonsleeping person [Boyer 2012]. In three officers for whom pupil size was documented at the time of physical examination in the ED, pupil size was normal. Otherwise, pupil size was not documented. None had signs of respiratory distress or depression.

Officers were mostly just observed in the ED. None required hospital admission. Blood samples were obtained in four officers. Tests for electrolytes performed in four officers, complete blood count performed in three officers, and troponin (to assess for damage to heart muscle) in two officers were unremarkable. Electrocardiograms performed for five officers did not reveal any acute electrocardiographic abnormalities. A chest radiograph obtained for one officer was normal.

Urine testing was performed in three officers approximately 1.25–3 hours after symptoms began. All testing was negative. Cutoff values were only available for some tests. The substances included in the urine testing panel varied slightly. For all three officers, the panel included amphetamine, barbiturates,

benzodiazepines, cocaine, methadone, opiates, oxycodone, and THC. For two officers, the panel also included buprenorphine, tricyclic antidepressants, and fentanyl. For the third officer, the panel also included phencyclidine (PCP) and propoxyphene. For incidents where officers underwent urine drug testing, forensic testing identified heroin, fentanyl and a fentanyl analogue, tramadol, and cocaine in the materials collected at the scene of the incident.

Regarding treatment, 2 of 11 (18%) officers received an antinausea medication: one from emergency medical services providers on the way to the ED and the other in the ED. Three (27%) officers received intravenous fluids in the ED. None of the officers received naloxone at any point.

Upon subsequent evaluation, all 12 police officers were returned to full duty by a clinician at the city's employee health services clinic. For 11 officers with available information on the date of return to work, 6 (55%) officers were cleared to return to full duty by the next day. The remaining five (45%) officers were cleared to return to duty in 2–14 days.

Methods: Review of Staff Notes, Training Bulletins, and Sections of the Police Handbook and Standard Operating Procedures

We reviewed the weekly staff notes that were distributed to police officers via the department's intranet during 2017–2019. Some staff notes contained attached training bulletins, which police officers were required to read. When supervisors had to check off that the officers they supervised had reviewed the training bulletins, that requirement was stated in the staff notes. We downloaded the staff notes that were available on the police department's website in December 2019. We searched these staff notes and their attachments, such as training bulletins, for seven keywords related to opioid exposure: opioid, opiate, fentanyl, heroin, respirator, naloxone, and Narcan®. We reviewed staff notes that contained one or more keywords for content related to unintentional occupational exposure to opioids and their attached training bulletins.

We also reviewed the following documents from the police department:

- Safety and Health Management Program [dated 02/27/2017]
- Standard Operating Procedure for the criminalistics squad respiratory protection program [dated 01/05/2015] and the Respiratory Hazard Assessment and Selection form [undated]
- Training Bulletin 2017-03 Safe Handling and Processing of Potential Fentanyl-Related Substances [dated 12/2017] and an Addendum [dated 05/2018]
- Sections of the police department's procedure manual
    - Property and Evidence: Confiscation, Accountability, Processing, Storage, and Release [dated 8/27/2020]
    - Sick/Injured with Pay, Occupational Exposures, and Special Leaves [dated 06/11/2020]
    - Evidence: Submitting for Physical Analysis [dated 08/15/2013]
    - Uniforms, Related Equipment, and Grooming [dated 11/19/2020]
    - Responding to and Investigating Opioid Overdoses [dated 12/15/2016]

- Clandestine Lab Team [dated 03/20/2007]
- Waste and Medical Debris Used at Crime Scenes and Traffic Accidents [dated 5/1996]
- Training Memos and Videos [dated 10/1995]
- Material Safety Data Sheets [dated 11/1994]

Results: Review of Staff Notes, Training Bulletins, and Sections of the Police Handbook and Standard Operating Procedures

The weekly staff notes and attached training bulletins were used to refresh officers on department policy and training. These informed officers on policy or procedure changes. Starting in March 2017, the staff notes periodically included instructions to officers about existing and updated policies on topics related to unintentional occupational exposure to opioids, including safe handling and processing of evidence (including evidence that may contain fentanyl or other opioids), reporting workplace exposures, and record keeping.

Weekly Staff Notes and Training Bulletins

- In 2017, 52 weekly staff notes were distributed. Seven contained one or more of the keywords and three included new information, policies, or training bulletins regarding preventing occupational exposure to opioids.
- In 2018, 49 weekly staff notes were distributed. Seven contained one or more of the keywords and three included information regarding preventing occupational exposure to opioids.
- In 2019, 52 weekly staff notes were distributed. Four contained one or more of the keywords and three included information regarding preventing occupational exposure to opioids.
- A summary of these notes is in Table C2.

The stated purpose of Training Bulletin 2017-03 was to provide officers with information on the safe handling and processing of potential fentanyl and fentanyl-related substances. This training bulletin had sections on exposure routes, scenarios, risks, control measures, precautions, and PPE. Summarized procedures for handling unknown drugs, and what to do if exposed to unknown drugs that could contain fentanyl, were also included.

The May 2018 addendum to Training Bulletin 2017-03 mentioned N95 filtering facepiece respirators and goggles. The training bulletin update included the following expectations about when officers should wear them: when officers handled potential fentanyl that was loose or uncontained; when handling items that contained visible, trace amounts of potential fentanyl; and any time N95 filtering facepiece respirator, eye protection, and nitrile glove use would mitigate risk associated with handling fentanyl.

Standard Operating Procedure Manual

The procedure for Property and Evidence includes instructions for using the ventilated cabinet ("fume hood") located at the evidence storage facility and a warning against using the cabinet to process "small amounts of an uncontained substance." A "small amount" was not defined in the procedure. The

procedure also specified that a supervisor will determine if the amount of evidence that was "potential fentanyl" was larger than typically handled, which would indicate assistance was required to process the evidence. "Larger than is typically handled" was not defined. This procedure describes hazardous material as material that is possibly contaminated by blood, body fluid, fentanyl, or fentanyl-related substances.

The procedure for Sick/Injured Pay with Occupational Exposure described procedures for officers and their supervisors if an officer has occupational exposure to opioids. The procedure specifically addressed exposure to a "fentanyl-related substance" and did not address exposure to non-fentanyl opioids or non-opioid illicit drugs. The procedure for employees described actions to take for immediate removal of the affected employee from the hazard categorized by suspected exposure route. The supervisor's responsibilities outlined in the procedure included ensuring the affected officer obtained medical care, the substance was recovered for analysis, the incident was reported and recorded, and the occupational health clinic for city employees was notified.

The written respiratory protection program provided by the police department covered officers in the criminalistics squad who underwent medical evaluation (frequency unspecified) and annual fit testing and training. Other police officers were provided optional access to N95 filtering facepiece respirators per staff notes and a May 2018 training bulletin. They were not included in a department or city respiratory protection program and did not undergo medical evaluation or fit testing. Fit testing was introduced in 2020, but not specifically to address potential exposures to illicit drugs.

The procedures we reviewed were last updated from 1 to 26 years before our review. The Material Safety Data Sheets section of the procedure manual was last updated in 1994. Processes for revising or retiring Safety Data Sheets, known as Material Safety Data Sheets before 2012, did not appear to have been in place.

Discussion

Background

Ohio, where this city and police department are located, has been severely impacted by the recent opioid overdose epidemic. In 2017, Ohio had the second highest number of law enforcement encounters with fentanyl per population. There were 4,506 law enforcement encounters with carfentanil, a potent synthetic opioid, which was the highest number of carfentanil reports among all states in 2017. The U.S. Drug Enforcement Administration (DEA) reported that in Ohio, carfentanil reports increased 300% from 2016 to 2017 [U.S. DEA 2019]. From 2018 to 2019, the number of fentanyl encounters continued to increase in the Midwest [U.S. DEA 2020]. These trends have raised concerns about the possibility of unintentional work-related opioid exposure among police officers. Indeed, incident reports have continued to be filed by this city's police officers since an interim report for this HHE was released in May 2018, prompting this updated report.

Health Effects

In this evaluation, we summarized 12 cases of possible work-related opioid toxicity reported from 2017 through 2019. None of the officers experienced severe, life-threatening opioid toxicity. Classic signs and symptoms of severe opioid toxicity include lethargy or other indications of central nervous system

depression, shallow or slow breathing, miosis (small or "pinpoint" pupils), slow heart rate, and low body temperature [Boyer 2012; Ropper et al. 2014]. The continuum of signs and symptoms experienced upon opioid exposure can include nausea and lightheadedness [Lynch et al. 2018; Suzuki and El-Haddad 2017]. However, not all persons with opioid intoxication consistently experience all of these components [Boyer 2012]. Low-dose exposure to opioids might result in milder symptomology; a continuum of signs and symptoms upon exposure to opioids has been described [Lynch et al. 2018; Suzuki and El-Haddad 2017]. Nonspecific symptoms such as lightheadedness were reported by 11 of 12 officers. Four officers had noted miosis, a sign of opioid toxicity. Almost all officers had to stop performing essential job duties and seek medical attention in the ED during incidents with suspected exposure to opioids.

In our evaluation, it was not possible to conclude whether other factors including perceived risk might have impacted the observed health effects. The concept of "perceived risk," or the subjective judgment that individuals make about the type and severity of any risk, has been associated with increased anxiety and symptom reporting separate from physical exposure to a hazard [Gallacher et al. 2007]. This evaluation was not intended to assess the possible relationships between perceived risk, exposures, and the clinical status of the officers discussed in this report.

The identity of substances suspected to contain illicit drugs often cannot be determined without laboratory analysis [Liu et al. 2018]. As a result, there are challenges in characterizing the exposure either during incidents or retrospectively and relating exposures to health effects. Forensic laboratory testing identified multiple substances in most incidents.

NIOSH has broadened recommendations to protect emergency responders such as police officers from a variety of illicit drugs that can be encountered during their job duties, not just fentanyl. In the eight incidents when fentanyl was identified, it was always along with at least one other substance, most commonly cocaine or heroin. This is consistent with reports that illicit fentanyl and its analogues are increasingly being mixed with other drugs, particularly cocaine [CDC 2018]. Exposure to a combination of opioids and stimulants such as cocaine might produce health effects not characteristic of a pure opioid or a pure stimulant exposure. For example, toxicity from cocaine involves elevated heart rate and blood pressure, sweating, nausea and vomiting, and local anesthetic effects such as numbness and tingling [Aronson 2015; Brody et al. 1990]. Additionally, nonpharmaceutical grade or illicit drugs might contain adulterants or contaminants that might, by themselves or in combination, lead to a variety of health effects in exposed individuals [Behrman 2008; Cole et al. 2011].

Exposure Pathways and Routes

In general, inhalation, mucous membrane contact, ingestion, and percutaneous exposure (e.g., needlestick) are potential work-related routes of unintentional exposure to illicit drugs among first responders. Our evaluation determined that the incidents might have involved inhalation, mucous membrane contact, or skin contact. In some incidents, the substance suspected to contain illicit drugs became aerosolized in uncontrolled circumstances, such as wind blowing into the officer's face. Brief skin contact with small amounts of powdered fentanyl or its analogues by itself is not expected to cause symptoms [Interagency Board 2017; Lynch et al. 2018; Moss et al. 2018], but subsequent hand-to-face contact leading to mucous membrane contact or inhalation is another possible route of exposure.

Most incidents occurred during law enforcement activities away from police headquarters, such as searches, traffic stops, and interacting with a suspect. These patterns suggest that it is important to provide officers with training on how to assess their potential for exposure to illicit drugs during common law enforcement activities and implement safer work practices. Having recommended PPE available when warranted and using it correctly can also reduce potential for exposure. Evidence processing at police headquarters was a separate category of exposure incidents. Engineering controls such as the ventilated cabinet can be employed to further protect officers in this more controlled environment.

Exposure assessments in this evaluation were limited to retrospective analysis of reported incidents. The materials that officers were possibly exposed to were collected as evidence and subsequently analyzed in most but not all the incidents. As of 2019, comprehensive peer-reviewed and gray literature searches (information or research made available outside of traditional peer-reviewed journals) have yielded no evaluations or studies of occupational exposure to illicit opioids among police officers. There were several evaluations of exposure for two other occupational groups: pharmaceutical workers and forensic chemists [NIOSH 2020a,b; Van Nimmen and Veulemans 2004; Van Nimmen et al. 2006].

Exposure monitoring could be used to assess current exposure controls and inform changes, particularly during routine law enforcement activities, such as evidence processing in a central location. However, the unpredictable nature of police work and the identities of drugs to which officers might be exposed are barriers to establishing an effective exposure assessment component in a health and safety program. Furthermore, occupational exposure limits have not been established for the myriad drugs officers may encounter at work.

The negative urine drug screen results for the three officers tested do not rule out the possibility of exposure. The ability to detect synthetic opioids such as fentanyl in blood (or serum) and urine is an area of active investigation with known limitations [Armenian et al. 2017; Suzuki and El-Haddad 2017]. Only two officers underwent urine testing specifically for fentanyl because current opiate screens do not detect synthetic opioids such as fentanyl [Suzuki and El-Haddad 2017]. While the timing of urine collection was within the window of detection [NIOSH 2020a], the urine drug screening tests might not have sufficient sensitivity to detect relatively low exposure. For example, in a recent NIOSH HHE report evaluating potential illicit drug exposures among forensic science laboratory staff, levels detected in staff urine samples at the end of a shift were below the federal initial drug test cutoff concentrations [NIOSH 2020a]. Established cutoff levels for urine drug screening tests, such as those used in the EDs that evaluated the officers, take into consideration the desirability of avoiding false-positive tests [Moeller et al. 2017]; therefore, results lower than established cutoff levels are reported as negative.

Policies, Procedures, and Training

We reviewed the procedures manual and training bulletins that guided officers' work tasks, including several procedures that could contain pertinent guidance regarding exposure to suspected drugs. These materials could be clearer in establishing expectations for (1) how officers should evaluate the environment for risk of exposure to suspected illicit drugs, including fentanyl and (2) what work practices, including PPE use, officers should use based on that risk assessment.

In particular, one bulletin stated the purpose of the Property and Evidence: Confiscation, Accountability, Processing, Storage, and Release procedure was to minimize hazardous drug exposure (among other agents). This document, along with Training Bulletin 2017-03, Safe Handling and Processing of Potential Fentanyl-Related Substances, act as the main tools for communicating safe handling of suspected fentanyl to officers. The definition of hazardous material in the standard operating procedures manual (Property and Evidence) is narrow compared to the many potentially hazardous substances, such as illicit drugs, that officers may encounter at work as the illicit drug supply changes in the future. The Sick/Injured Pay with Occupational Exposure procedure only referred to opioids in the title and only to "fentanyl-related substances" in the procedure specifics; it would be good practice for this procedure to be expanded to apply to exposures to any suspected illicit drug. This procedure required supervisors to ensure the substance the affected officer was possibly exposed to was collected. The identity of the substance is an important piece of information when evaluating exposure incidents. The sample collection requirement could also be included in other procedures and officer trainings and training bulletins for situations when the supervisor is not on site to ensure collection.

Training Bulletin 2017-03 discussed hazard recognition and appropriate PPE use as important to the safe handling of unknown substances but did not provide procedures on these topics. The Training Bulletin included a table from the Interagency Board's "Recommendations on Selection and Use of Personal Protective Equipment for First Responders Against Exposure Hazards to Synthetic Opioids" [dated August 2017], which describes recommended PPE by response function [Interagency Board 2017]. However, the recommended PPE descriptions specify respiratory protection that is not available to these officers, such as P100 filtering facepiece respirators and full-facepiece air purifying respirators with P100 filters. A visual aid like this table can be an appropriate training tool to show officers the proper precautions and PPE to use for a potential anticipated exposure if tailored to the officers' work tasks and to PPE they can access and are trained to use.

The procedure for Property and Evidence indicates using "PPE appropriate to the hazard." The procedure requires a minimum of nitrile gloves when processing evidence that contains potential fentanyl and fentanyl-related substances. This procedure is consistent with NIOSH recommendations for preventing illicit drug exposures among emergency responders [NIOSH 2020c]. Recently, empirical data supported these recommendations; experiments demonstrated that a fentanyl or carfentanil solution did not permeate commercially available nitrile gloves with a minimum thickness of 5 ± 2 mil [Greenawald et al. 2020]. However, the procedure does not clearly state that all unknown drug substances can potentially contain fentanyl or another opioid. Additionally, the procedure could include instructions for identifying hazards and additional appropriate PPE, other than nitrile gloves, to protect officers from these hazards. Inhalation and mucous membrane exposures are thought to be routes with higher risk of health effects compared to dermal exposure, but PPE to control these exposures, such as respiratory protection, were not required by department policy.

We found opportunities to better integrate health and safety training and expectations into department procedures and training. The guidance found in Training Bulletin 2017-03 on handling and processing fentanyl is not found in the standard operating procedures manual. Introducing health and safety practices into the procedures manual or creating a required supplement that is included in the in-person training would benefit both officer trainees and established officers. Integrating health and safety

information into department procedures serves several purposes. First, the procedure can serve as a single source of information for officers on how to safely conduct their work while preventing and reducing exposure to illicit drugs. Second, management's commitment to the Safety and Health Management Program [dated 02/27/2017] would be reflected by the inclusion of health and safety information in some department materials. Current procedures could be expanded to include all unknown substances that are suspected to be hazardous, so the procedure is not limited to being protective from fentanyl exposure but rather all unknown or suspected illicit drugs. Broadening the scope of the procedure manual is particularly important because new hazardous drugs or mixtures of existing drugs will continue to be introduced into the illicit drug trade [United Nations Office on Drugs and Crime 2020].

A consensus standard recommends health and safety training be based on a needs assessment, contain learning objectives, be delivered in a method appropriate to the stated learning objectives, and include information needed to achieve the learning objectives [ANSI/ASSP 2016]. Training is one piece of an effective health and safety program that can reduce and prevent occupational injuries and illnesses [ANSI/ASSP 2016; Robson et al. 2010]. Although more research is needed on training impact, training has been found to improve occupational health and safety-related behaviors [Robson et al. 2010]. Some research supports the inclusion of behavioral modeling in training as more effective than other types of training [Burke et al. 2006]. Behavioral modeling is a hands-on training method that can be used in a field or classroom setting. A trainee observes a role model performing a task in a safe manner, practices the task, and then receives and incorporates feedback designed to improve safety when performing the task. These elements of training can be incorporated into efforts to prevent work-related unintentional exposure to illicit drugs among police officers.

Limitations

Our evaluation had some limitations. First, we were only able to evaluate the incidents where an incident report form was filed with the city and police department. There may have been other incidents where an incident report was not filed. For example, when we posed a general question to officers about whether they would have done anything differently during these incidents, several reported that they might not have reported the incident if they had known about the amount of attention they would receive after reporting the incident. We do not know how many other police officers might have experienced similar incidents, had similar concerns, and did not report them. Second, the evaluation was retrospective in nature and the amount of time between the incident and interviewing the officer involved varied. This might have resulted in decreased recall of incident details. Third, substances to which officers might have been exposed are incompletely characterized. Forensic laboratory testing was primarily conducted for law enforcement purposes, not as a component of fully characterizing the occupational safety and health risks associated with exposure. In addition, not all substances were submitted for forensic laboratory testing. Fourth, although we reviewed the ED records for the officers when available, we cannot completely rule out the possibility that unrecognized medical conditions might have contributed to the health effects observed.

Conclusions

During 2017–2019, 12 police officers in a city police department developed health effects shortly after law enforcement activities where opioids were suspected or known to be present. None of the officers experienced severe, life-threatening opioid toxicity. The symptoms they experienced could be consistent with milder toxicity related to drug exposure or other, unidentified causes. The symptoms were severe enough that officers required medical attention and were not able to continue performing their essential job duties. Incidents occurred during law enforcement activities away from police headquarters or during evidence processing. Most incidents involved multiple types of substances whose identities were unknown at the time, highlighting the need to implement training and ensure safe work practices to prevent future exposures to illicit drugs.

Section C: Tables

Table C1. Characteristics of incidents involving possible work-related opioid toxicity, 2017–2019 (n = 12)

Characteristic	Number (%)
Location	
Field	7 (58)
Headquarters	2 (17)
County jail	2 (17)
Other	1 (8)
Assignment	
Uniform patrol	8 (67)
Other	4 (33)
Time of day	
12:01 am to 6:00 am	0 (0)
6:01 am to 12:00 pm	1 (8)
12:01 pm to 6:00 pm	8 (67)
6:01 pm to 12:00 am	3 (25)

Table C2. Summary of staff notes and training bulletin content related to unintentional occupational exposure to drugs, 2017–2019

Month	Topic(s)
March 2017	Included the written police department Health and Safety Management Program as an attachment, which references procedures for responding to a heroin or opiate overdose and implementation of a respiratory protection program for personnel who were exposed to respiratory hazards
August 2017	First mention of avoiding contact with fentanyl and its analogues. The listed protective measures included double gloving, using soap and water, avoiding hand sanitizer, handling unknown substances only when around another officer, and avoiding pressing on baggies (burping). Included a brief summary and attachment of a DEA publication.
December 2017	New training bulletin on safe handling and processing of potential fentanyl-related substances was included in the staff notes. Training bulletin referenced the police department's procedures and documents by the DEA, the American College of Medical Toxicology and American Academy of Clinical Toxicology, the Interagency Board, and NIOSH.
May 2018	Updated training bulletin on the safe handling and processing of suspected fentanyl. Updates included implementation of optional N95 filtering facepiece respirator and eye protection use in the field. A link to a training video for N95 filtering facepiece respirators was included.
July 2018	Revision to procedures for sickness or injury with pay to include the process for employee exposures to opioids. Revisions included instructions to avoid alcohol-based hand sanitizer and ensure any associated evidence is collected.
November 2018	Revised procedure for evidence processing to include information about labeling suspect fentanyl and disposal of potentially contaminated PPE.
January 2019	Revised Property and Evidence procedure to include procedures to use a ductless ventilated cabinet ("fume hood") at a central location for evidence processing with permission from the supervisor. Officers were advised not to process small amounts of uncontained substances in the fume hood because it could be drawn into the hood.
May 2019	Unspecified revision to sickness or injury with pay procedures. The procedure for employees and supervisors after an occupational exposure to opioids was included in this procedure and the full text was included in the staff notes.
July 2019	Reminder about narcotic handling procedures, training bulletins, and information from a local commission on opioid overdoses. Only gloves are mentioned as appropriate PPE when handling suspected fentanyl.

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