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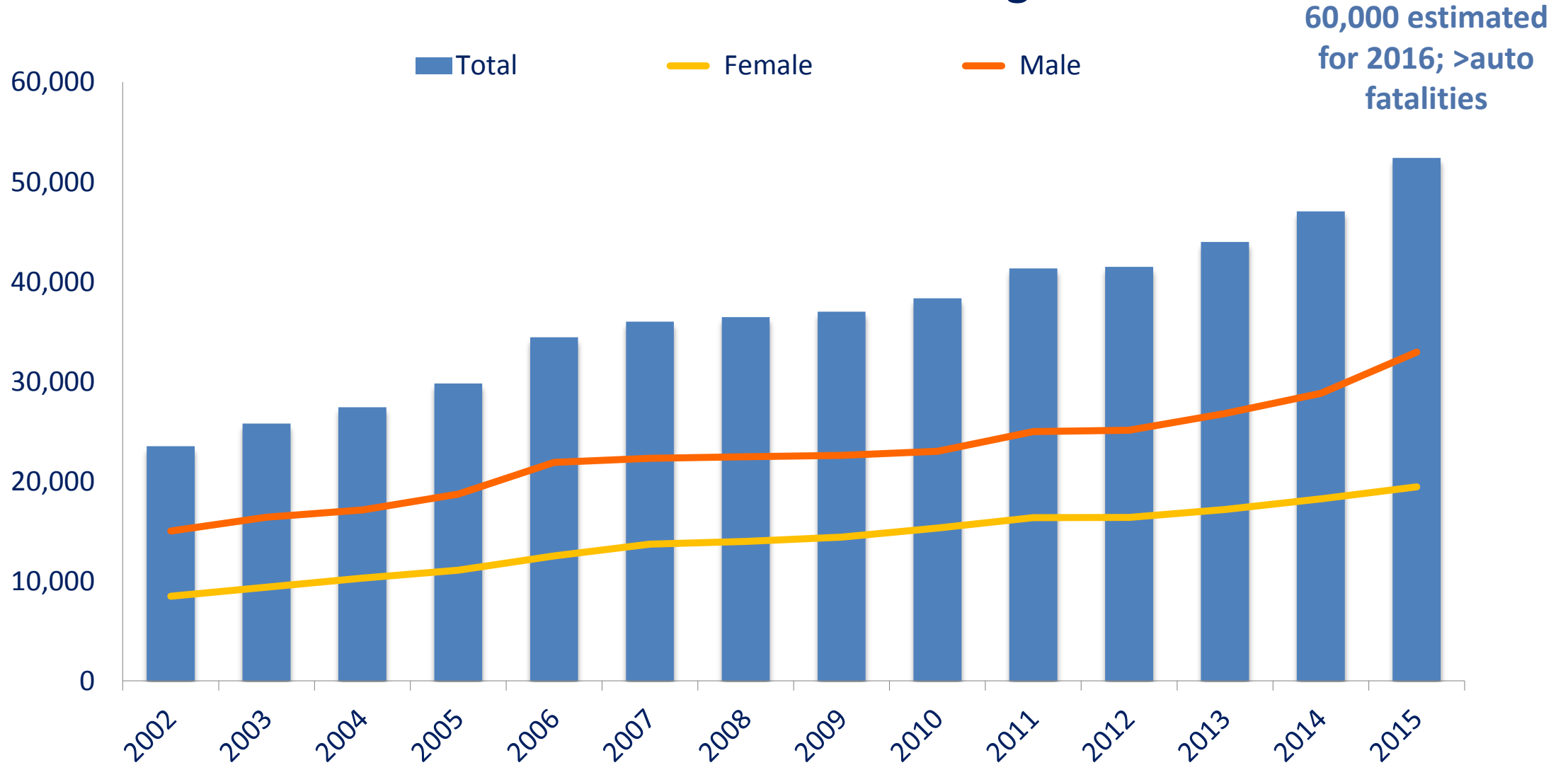
THE OPIOID ABUSE EPIDEMIC HOW CAN OUR PROFESSION HELP?





National Overdose Deaths

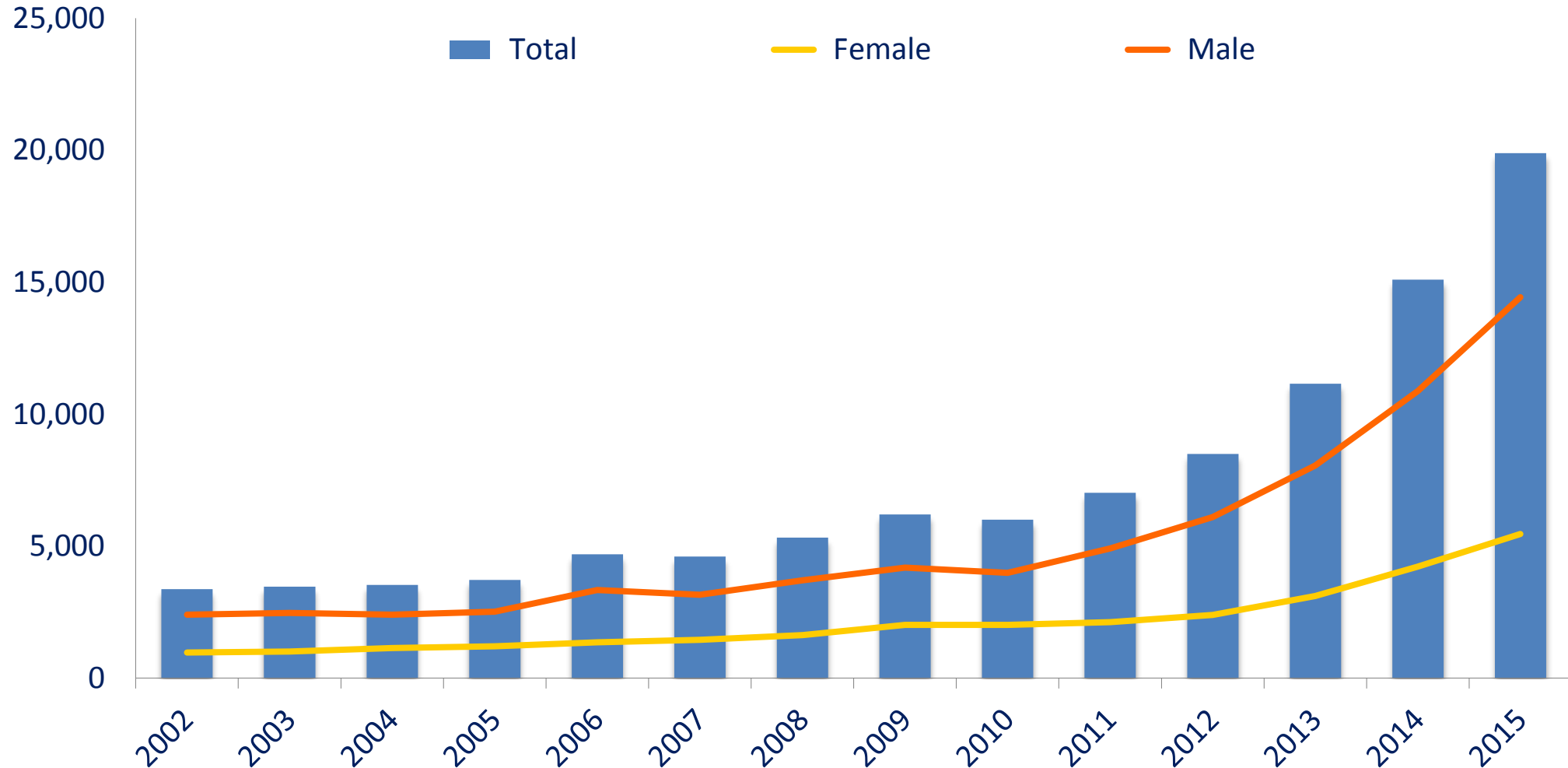
Number of Deaths from All Drugs





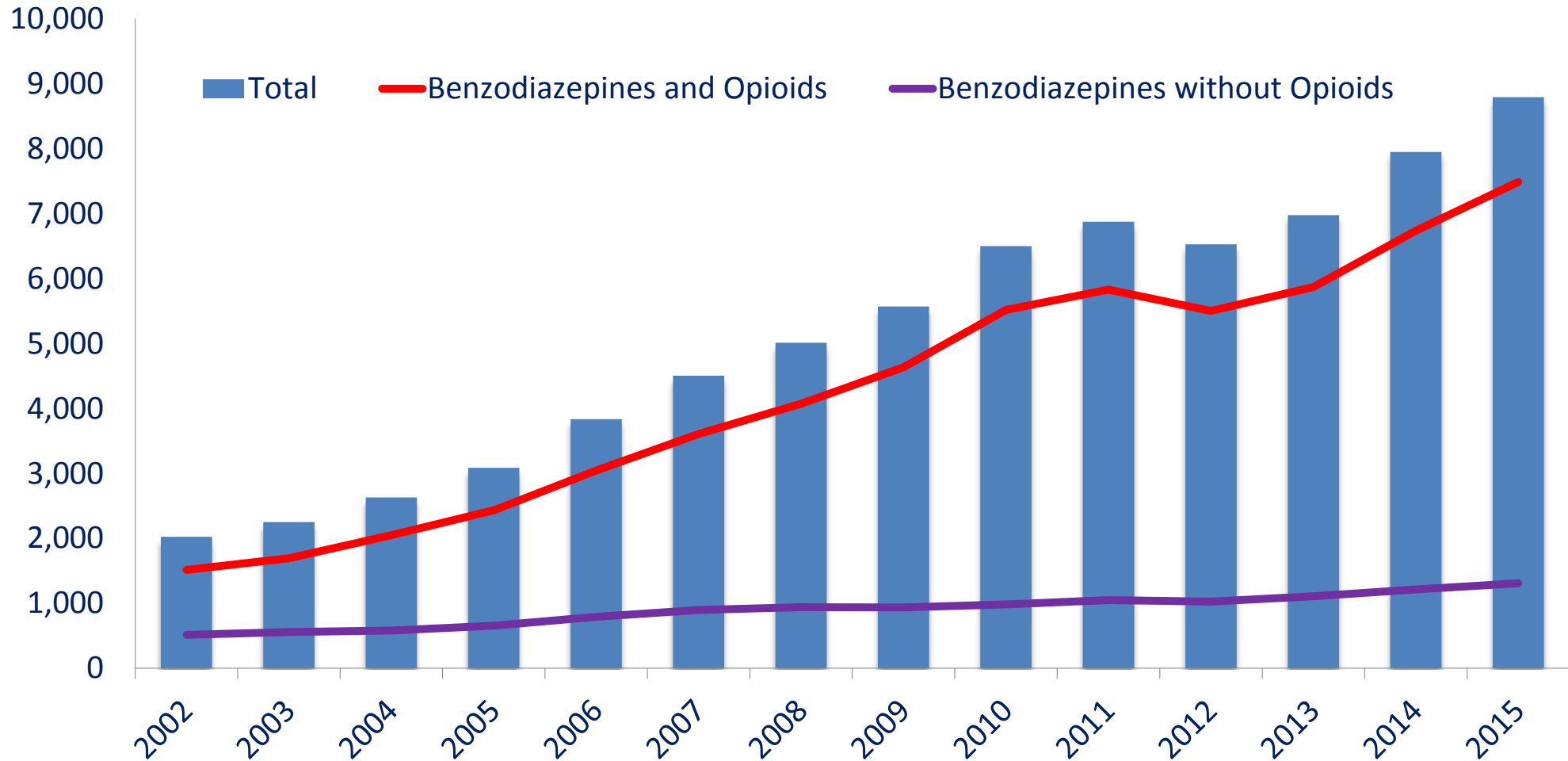
National Overdose Deaths

Number of Deaths from Heroin and Non-Methadone Synthetics (includes illicit opioids)





Opioid involvement in benzodiazepine overdose





Opioid involvement in cocaine overdose

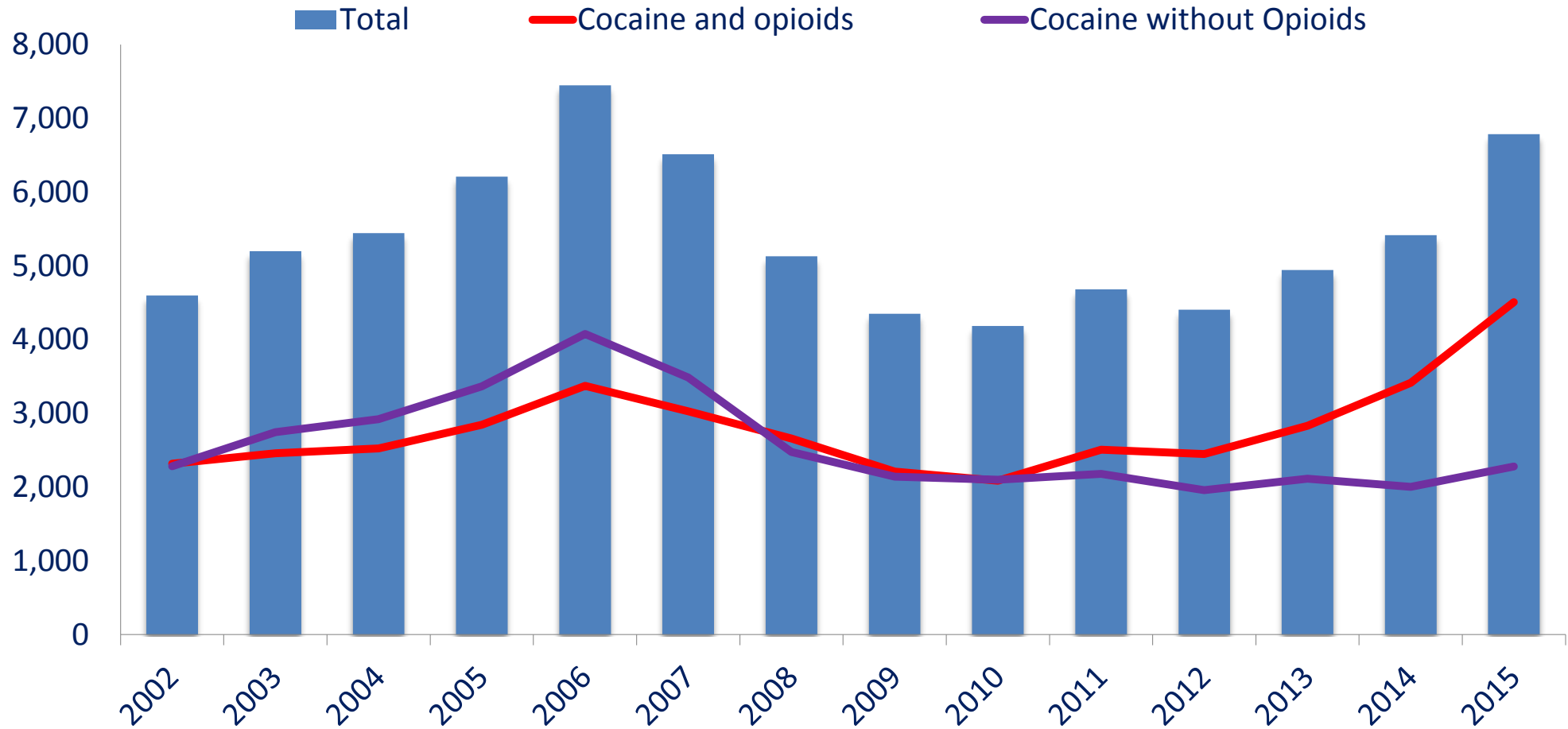
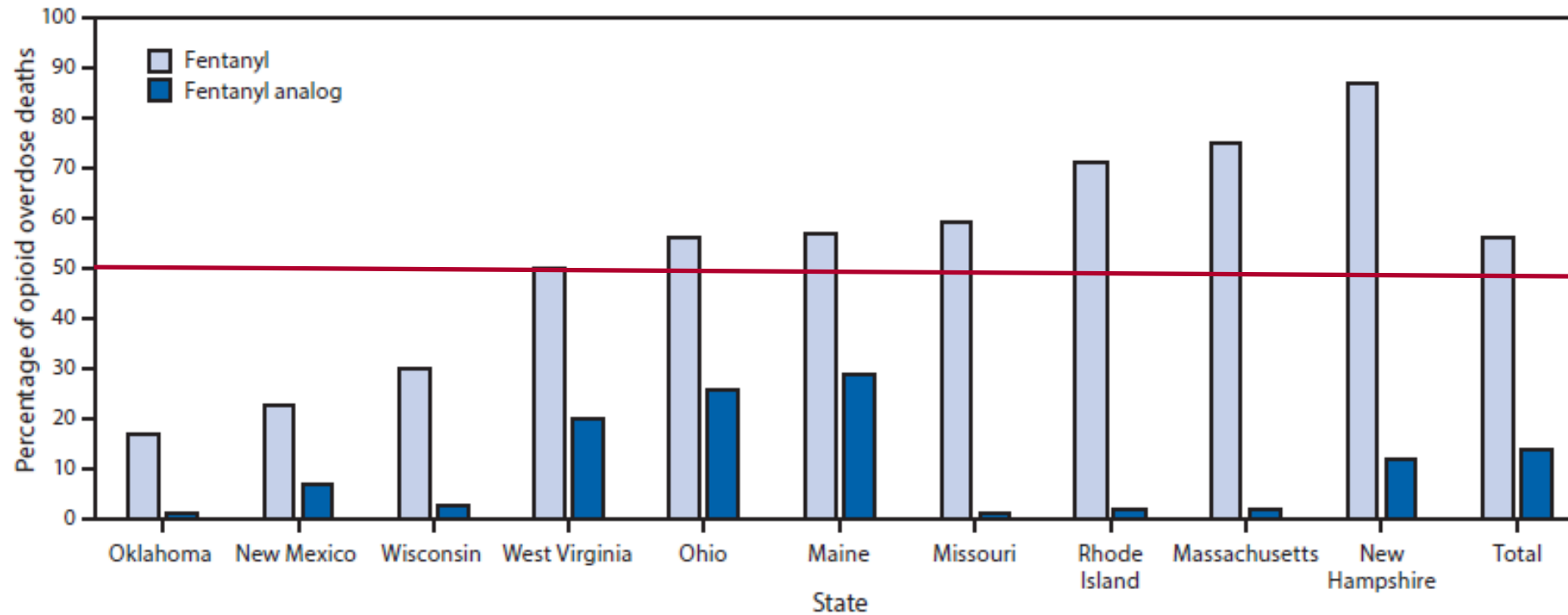


FIGURE. Percentage of opioid overdose deaths testing positive for fentanyl and fentanyl analogs, by state — 10 states, July–December 2016



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OVERVIEW OF THE OPIOID ADDICTION CRISIS

- ▶ CDC estimates U.S. deaths from drug overdose exceeded 60,000 in 2016
 - More fatalities than car crashes
- ▶ Overdose deaths from fentanyl and other synthetic opioids jumped to 20,145 (1/31/16 – 1/31/17) from 9,945 in the year-earlier period
- ▶ Fentanyl was detected in 56.3% of 5,152 opioid overdose deaths in the 10 states during July–December 2016
- ▶ Carfentanil is driving soaring overdose deaths in some parts of the country, including Ohio, Michigan and Florida.
- ▶ Most synthetic opioid deaths result from illicit, black market drugs
- ▶ CDC estimates the economic impacts at \$75.8 billion per year



OPIOIDS AND ILLICIT DRUGS

- ▶ Opioids are mixed with heroin and other illicit drugs
- ▶ Opioids are formulated into tablets that look like therapeutic drugs



WHAT'S AN OPIOID?

- ▶ Used medically to relieve pain
- ▶ Also cause euphoria
- ▶ Opiates, derived from opium, e.g. morphine
- ▶ Synthetic and semi-synthetic drugs
 - Oxycodone
 - Hydrocodone
 - Fentanyl
 - Lowest therapeutic dose 0.002 mg/kg



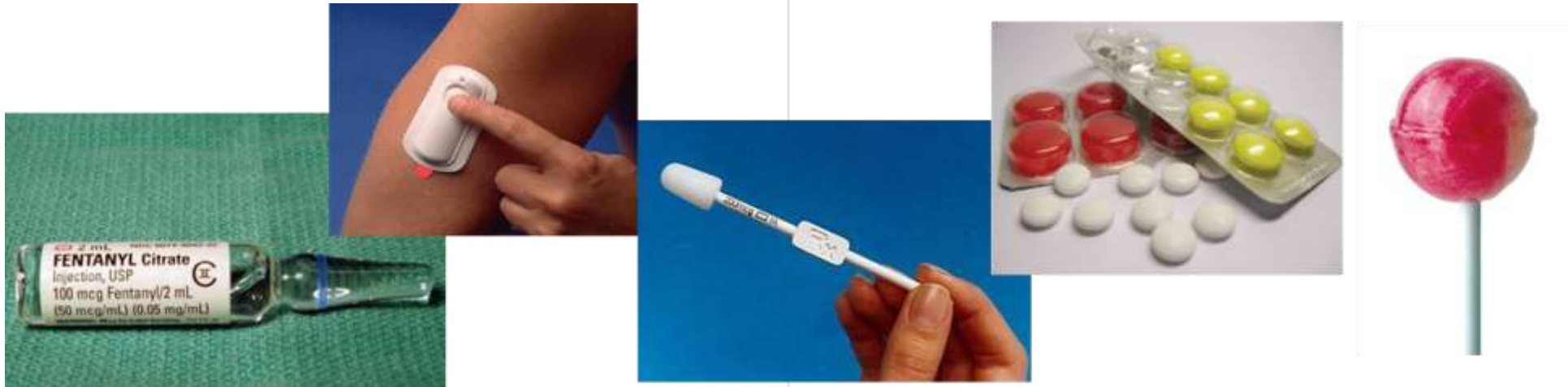
FENTANYL AND FENTANYL ANALOGUES

- ▶ Fentanyl
- ▶ Carfentanil (10,000 times more potent than morphine)
 - Large animal tranquilizer, including elephants
 - Not tested in or approved for use by humans
- ▶ α -methylfentanyl
 - Mixed with heroin as China White
- ▶ 3-methylfentanyl
 - 10 – 15x the potency of fentanyl due to increased binding affinity



HOW IS FENTANYL ADMINISTERED THERAPEUTICALLY?

- ▶ Intravenously (IV)
- ▶ Injection into the muscle (IM)
- ▶ Oral, through lozenges and candy
- ▶ Across the skin (transdermal)
- ▶ Under the tongue (sublingual)
- ▶ Oral spray



HOW POTENT ARE FENTANYL AND CARFENTANIL?



Fatal dose is ~ 20 µg and is 100 times more potent than fentanyl.

Fatal dose is 2 – 3 mg, hundreds of times more potent than heroin.

Fatal dose is 30 mg.



WHAT ARE THE ROUTES OF OCCUPATIONAL EXPOSURE?

- ▶ Inhalation of powders and micro-aerosols
- ▶ Skin, eye and mucous membrane absorption
- ▶ Incidental ingestion (hand to mouth)
- ▶ Accidental inoculation with sharps or needles

Opioid antagonist naloxone should always be at hand



NEED TO CORRECT THE BELIEF THERE ARE NOT OELS

- ▶ Permissible Exposure Limits (OSHA), Recommended Exposure Limits (NIOSH), or Threshold Limit Values (ACGIH) have not been established but...
- ▶ Pharmaceutical companies have developed internal OELs (available on SDSs)

Drug	8-hour TWA $\mu\text{g}/\text{m}^3$	STEL $\mu\text{g}/\text{m}^3$	Acceptable Surface Limit (ASL) $\mu\text{g}/100 \text{ cm}^2$
Morphine Sulfate and HCl	5 – 180	10 - 600	
Hydrocodone base and Bitartrate	5 – 190	60 - 600	
Oxycodone and HCl	40 – 150	500	
Alfentanil	1		
Fentanyl Citrate and HCl	0.10	0.30	1.0
Sufentanil Citrate	0.07	0.20	7
Carfentanil Citrate	0.024		2.4



NEED TO CORRECT THE BELIEVE THAT SAMPLING AND ANALYTICAL METHODS HAVE NOT BEEN DEVELOPED

- ▶ LC-MS/MS methods are available
- ▶ Full shift and STEL
- ▶ Surface sampling



SURFACE SAMPLING

Maxxam has validated a surface sampling method for this opioid mix, using TX7 14A alpha wipe swabs, to 1 ng/swab.

Carfentanil	Hydromorphone	Naltrexone	Remifentanil
Cis-3-methylfentanyl	Meperidine	Norfentanyl	Sufentanil
Codeine	Methadone	Noroxymorphone	Tramadol
Fentanyl	Morphine	Oxycodone	
Hydrocodone	Naloxone	Oxymorphone	



WHAT ARE THE SIGNS / SYMPTOMS OF EXPOSURE?

- ▶ Pinpoint pupils that may later become dilated
- ▶ Reduced level of consciousness
- ▶ Slow, shallow breathing
- ▶ Rigidity of the chest muscles, also called “wooden chest syndrome”
- ▶ Coma
- ▶ Cessation of breathing
- ▶ Death



OK—BUT HOW DOES THIS RELATE TO OPIOID ABUSE EPIDEMIC?

- ▶ Professions that respond to, medically treat, and investigate illicit drug use and exposures are at risk
- ▶ Workers using opioids, either therapeutically or illicitly, can affect their personal safety and those with whom they work
- ▶ Officers that confiscate and process evidence and crime lab analysts can potentially be exposed
- Q1 2017: DEA laboratory system had 230 identifications of fentanyl or fentanyl-related substances
 - Heroin was found in combination with fentanyl in 61% of the identifications
 - U-4700, alprazolam, ketamine and cocaine were found in varying degrees



Images from the DEA *Fentanyl – A Briefing Guide for First Responders*



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WHAT PROFESSIONS ARE AT RISK?



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MORE PROFESSIONALS THAT MAY BE AT RISK

- ▶ Environmental services
 - Contracted in some states to do clean up of hazardous materials
- ▶ Public employees
 - Highway clean up (needles and drug paraphernalia)
- ▶ Park workers



AND IN ALL WORKPLACES

- ▶ Princeton economist Alan Krueger links ~25% of the five-point drop in labor force participation (1999 – 2015) with opioid prescriptions
 - Washington Post reported nearly 1 million people were not working because of opioid addiction in 2015
- ▶ Less emphasis on pre-employment drug screening
- ▶ Opioid addiction in workers often begins with treatments for occupational injuries
 - Ohio construction workers are seven times more likely to die of an opioid overdose than workers in other professions
 - In Ohio, 73 percent of construction workers injured in 2016 were prescribed a narcotic painkiller
- ▶ Therapeutic and illicit opioid use can increase risk for injuries



HAVE THERE BEEN EXPOSURE EVENTS?

- ▶ Police officers / fire fighters
- ▶ EMTs
- ▶ Emergency room staff
- ▶ Crime lab analysts
- ▶ “Sniffer” dogs
- ▶ The specific routes of exposure were not reported
- ▶ All were administered naloxone; all have recovered

Naloxone should always be at hand



SO WHAT DO WE KNOW?

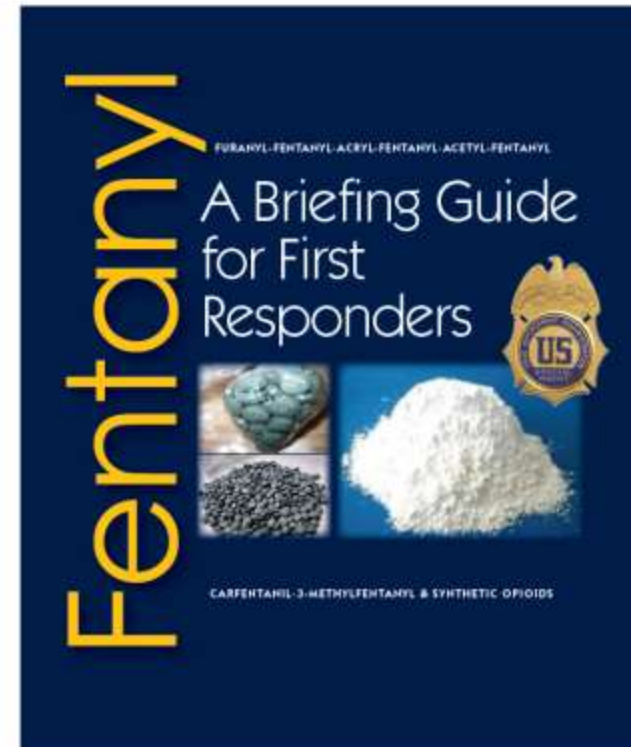
- ▶ Well studied hazard – human data (not carfentanil)
- ▶ First responders, DEA agents, inspectors and crime lab analysts are potentially at risk for exposure
- ▶ Job tasks vary significantly
- ▶ Opioid forms that they may contact can vary significantly
- ▶ Opioid amounts that they may contact can vary significantly
- ▶ No published exposure assessment data
- ▶ Significant reliance on work practices
- ▶ Limited availability and use of personal protective equipment (gloves are available)
- ▶ Naloxone not always available



DRUG ENFORCEMENT ADMINISTRATION GUIDANCE

- ▶ Current best practices for first responders
- ▶ Interim guidance intended for educational and awareness purposes
- ▶ Not “technical guidance”

U.S. Department of Justice
Drug Enforcement Administration



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INTERAGENCY BOARD GUIDANCE

- ▶ Best practices to minimize exposure to first responders
- ▶ PPE based on potential for exposure and wearer's operational response function
- ▶ Skin decontamination
- ▶ Medical countermeasures, including naloxone



IAB RECOMMENDED BEST PRACTICES

Exposure Risk	Operational Functions	Minimum Recommended PPE	Decon Recommendations
Minimal (no visible product or product contained within syringe or other package)	Response to a person with suspected overdose	Standard duty uniform and nitrile gloves (NFPA 1999)	<ul style="list-style-type: none"> • People: Wash with soap and water • Surfaces: Peracetic acid, hydrogen peroxide, or dichloroisocyanuric acid solutions
Moderate (small volume [grams] of material visible and not contained within a package)	Response to one or more persons with suspected overdose; response to a localized seizure (e.g., traffic stop)	Standard duty uniform; nitrile gloves (NFPA 1999); P100 filtering facepiece respirator; safety glasses	<ul style="list-style-type: none"> • People: Wash with soap and water • Surfaces: Peracetic acid, hydrogen peroxide, or dichloroisocyanuric acid solutions
Moderate (large volume [kilograms] of material)	Response to a bulk storage or distribution facility	Standard duty uniform with long sleeves or sleeve covers; nitrile gloves (NFPA 1999); P100 filtering facepiece respirator; non-vented or indirect vented goggles	<ul style="list-style-type: none"> • People: Wash with soap and water • PPE and Sensitive Equipment: Peracetic acid solutions (pH ≤ 7) • Surfaces: Peracetic acid, hydrogen peroxide, or dichloroisocyanuric acid solutions
High (milling lab with particulates present)	Response to a suspected opioid milling operation that mixes synthetic opioids with binders or other illicit materials to produce a street-level product	NFPA 1999 multi-use ensemble or NPFA 1994 Class 4 or 4R ensemble; full face air-purifying respirator (APR) with P100 filters	<ul style="list-style-type: none"> • People: Wash with soap and water • PPE and Sensitive Equipment: Peracetic acid solutions (pH ≤ 7) • Surfaces: Peracetic acid, hydrogen peroxide, or dichloroisocyanuric acid solutions
High (production lab with bulk chemicals present)	Response to a suspected opioid production laboratory, potentially including a milling operation, that produces illicit materials using any combination of chemical precursors	NFPA 1994 Class 3 or 3R ensemble or higher; full face CBRN APR or higher	<ul style="list-style-type: none"> • People: Wash with soap and water • PPE and Sensitive Equipment: Peracetic acid solutions (pH ≤ 7) • Surfaces: Peracetic acid, hydrogen peroxide, or dichloroisocyanuric acid solutions

Is there more that is urgently needed?



WHAT CAN WE LEARN FROM PHARMACEUTICAL IHs?

- ▶ Fentanyl exposure events have occurred when handling gram quantities in laboratory settings
- ▶ Multiple doses of naloxone have been required for significant exposure events
 - ▶ Serum half-life is shorter than half life of some opioids
- ▶ Surface decontamination methods and verification
- ▶ Work practices to avoid release of drug aerosols
- ▶ How PPE is worn and how it is removed are essential skills to control exposures to finely divided powders
 - ▶ Potential to disperse powders on protective clothing during doffing
 - ▶ Clean gloves required to remove respirators
 - ▶ Personal clothing is always protected with disposable sleeves, coats or jumpsuits
- ▶ PPE donning and doffing must be practiced





WHAT CAN INDUSTRIAL HYGIENISTS CONTRIBUTE?

- ▶ Qualitative exposure assessments
- ▶ Support personal, area, and surface sampling
- ▶ Identify engineering controls
- ▶ Select PPE and respirators; train in proper selection and use
- ▶ Develop written programs
- ▶ Develop training programs
- ▶ Participate in governmental and community forums, programs, task forces, etc...



OUR PATH FORWARD

AIHA's approach

- ▶ Get informed
 - Law enforcement and EMTs field activities
 - How evidence is collected, tested and packaged in the field
- ▶ Controls that have been effective
- ▶ Knowledge transfer
- ▶ Specific guidance and training, using the methods and media that these professions use
- ▶ Broad dissemination
- ▶ Additional research





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Move Forward with Confidence