Module 1: Introduction to Opioids and the Opioid Epidemic
Learning Objectives

1. Define opioid and identify examples of natural, semisynthetic, and synthetic opioids

2. Describe the precipitating factors and scope of the opioid epidemic on society
Opioid Definition
What is an opioid?

An opioid is any compound that acts at one of the three opioid receptors: μ (mu), κ (kappa), and δ (delta).

Opioids can be natural or synthetic; prescription medications or illegal drugs.

Opiates are the natural compounds found in opium poppies.

The three main alkaloids in opium (morphine, codeine, and thebaine) can be used as is or modified to synthesize new compounds.

Papaver somniferium: the opium poppy

Opium is made by drying latex from the seed pods of the opium poppy, Papaver somniferum.

Examples of opioids

1. Opiates
   - morphine
   - codeine
   - thebaine

2. Semi-synthetic opioids
   - heroin
   - hydromorphone (Dilaudid)
   - hydrocodone (Vicodin)
   - oxycodone (Percodan)
   - buprenorphine (Suboxone)

3. Synthetic Opioids
   - methadone
   - Meperidine (Demerol)
   - propoxyphene (Darvon)
   - fentanyl (Duragesic)
   - carfentanil
   - tramadol (Ultram)

4. Endogenous Opioid Peptides
What is an opioid?

**Opioid:**
- Any compound that acts at one of the three opioid receptors: µ (mu), κ (kappa), and δ (delta)
- When opioids bind to the various opioid receptors, they can cause various effects

<table>
<thead>
<tr>
<th>Effects of opioids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analgesia</td>
</tr>
<tr>
<td>Sedation</td>
</tr>
<tr>
<td>Miosis</td>
</tr>
<tr>
<td>Respiratory depression</td>
</tr>
<tr>
<td>Cough suppression</td>
</tr>
</tbody>
</table>

- Opioid overdose occurs when an opioid overwhelms a person’s system and impairs his/her ability to breathe
- Have the potential for tolerance, dependence, and addiction
Examples of prescription opioids

- Prescription medications indicated for pain management, cough suppression, and treatment of opioid use disorders

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Brand Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opiates</td>
<td></td>
</tr>
<tr>
<td>Morphine</td>
<td>MS Contin®</td>
</tr>
<tr>
<td></td>
<td>Kadian®</td>
</tr>
<tr>
<td>Codeine</td>
<td>Tylenol 3®</td>
</tr>
<tr>
<td></td>
<td>Tylenol 4®</td>
</tr>
<tr>
<td>Semisynthetic</td>
<td></td>
</tr>
<tr>
<td>Buprenorphine</td>
<td>Suboxone®</td>
</tr>
<tr>
<td></td>
<td>Subutex®</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>OxyContin®</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>Vicodin®</td>
</tr>
<tr>
<td>Synthetic</td>
<td></td>
</tr>
<tr>
<td>Methadone</td>
<td>Dolophine®</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>Actiq®</td>
</tr>
<tr>
<td></td>
<td>Duragesic®</td>
</tr>
<tr>
<td>Tramadol</td>
<td>Ultram®</td>
</tr>
</tbody>
</table>
# Illicit Opioids

## Heroin

- Made from morphine (semisynthetic)
- Can be a black sticky substance, or a white or brown powder
- Can be injected, sniffed, snorted, or smoked; sometimes mixed with crack cocaine, called speed balling
- Slang terms: Big H, Horse, Hell Dust

![Black Tar Heroin](image1)

![Heroin Powder](image2)

![Asian Heroin](image3)

![Heroin Closeup](image4)

## Non-pharmaceutical Fentanyl

- Illicitly produced, synthetic drug
- Pill form package to look like prescription medications
- Powder form looks similar to heroin
- Fentanyl is often mixed with heroin or cocaine
- Unclear what substances are truly in the illicitly manufactured drugs

![Packets of fentanyl laced heroin](image5)

Question 1

A 55-year old female with severe cancer pain comes to the pharmacy to fill fentanyl. The patient is concerned about taking fentanyl because she heard it is the same type of medication as heroin. What is a true statement about opioids?

A. Fentanyl is an opiate because it is a naturally occurring compound in the opium poppy
B. Both fentanyl and heroin are opioids. Because both substances act on the opioid receptor and any compound that acts on opioid receptors is an opioid
C. People only overdose from illicit fentanyl not prescription fentanyl
D. Fentanyl is not an opioid because it is a prescription medication
A 55-year old female with severe cancer pain comes to the pharmacy to fill fentanyl. The patient is concerned about taking fentanyl because she heard it is the same type of medication as heroin. What is a true statement about opioids?

A. Fentanyl is an opiate because it is a naturally occurring compound in the opium poppy.
B. Both fentanyl and heroin are opioids. Because both substances act on the opioid receptor and any compound that acts on opioid receptors is an opioid.
C. People only overdose from illicit fentanyl not prescription fentanyl
D. Fentanyl is not an opioid because it is a prescription medication
Key Points

• An opioid is any compound that acts on one of the three opioid receptors

• Opioids can be categorized as (1) **opiates** - compounds that occur naturally in opium (morphine, codeine), (2) **semisynthetics** - chemical modified natural compounds (buprenorphine, oxycodone, hydrocodone), and (3) **synthetics** – completely artificial compounds (methadone, fentanyl, tramadol)

• Opioids can be prescription medications or illicit substances

• All opioids can lead to deadly overdoses

• Fentanyl is 50 to 100x more potent than morphine and is not detectable by opiate toxicology screens. This increases the risk for overdose when produced on the street and mixed with heroin or other drugs.
Opioid Epidemic
CDC Injury Center: Opioid Overdose Data Analysis

- CDC identifies and classifies which types of drugs are involved in an overdose and how that changes overtime

Rx OPIOIDS
Include natural, semi-synthetic, and methadone and can be prescribed by doctors

Around 46 PEOPLE
die every day from overdoses involving prescription opioids.

From 1999 to 2017, more than 399,000 people have died from a opioid overdose

Three Waves in the Rise of Opioid Overdose Deaths

**Wave 1:** Began in the 1990s with an increase in the opioid overdose deaths from prescription opioids.

**Wave 2:** Began in 2010 with increase in the number of overdose deaths involving heroin

**Wave 3:** Began in 2013 with increases in overdose deaths involving synthetic opioids, particularly illegally manufactured fentanyl.

- Rudd RA, Aleshire N, Zibbell JE, Gladden RM. Increases in Drug and Opioid Overdose Deaths – United States, 2000-2014. MMWR 2016, 64(50); 1378-82.
Since 1999, the death rate has consistently been above the average, ranging from roughly 1.5 to 3 times the rate.

In 2016, nearly **30 deaths per 100,000 persons** were related to opioids in Maryland compared to a national average of **13.3 deaths per 100,000 persons**.
Total Number of Drug- and Alcohol-Related Intoxication Deaths in Maryland, 2007 - 2017

- **Maryland Department of Health. Unintentional Drug and Alcohol-Related Intoxication Deaths in Maryland Annual Report. 2017.**
Which of the following is a true statement about the opioid epidemic.

A. Maryland is a state with one of the lowest rates of opioid overdose in the country
B. The opioid epidemic is starting to cause less deaths than it has in previous years
C. A majority of deaths from the opioid epidemic in the US and Maryland are driven by overdoses from synthetic opioids, including illicitly manufactured fentanyl
D. Illicitly manufactured fentanyl is expensive and difficult to make; therefore, it is not contributing to the opioid epidemic
Question 2

Which of the following is a true statement about the opioid epidemic.

A. Maryland is a state with one of the lowest rates of opioid overdose in the country
B. The opioid epidemic is starting to cause less deaths than it has in previous years
C. A majority of deaths from the opioid epidemic in the US and Maryland are driven by overdoses from synthetic opioids, including illicitly manufactured fentanyl
D. Illicitly manufactured fentanyl is expensive and difficult to make; therefore, it is not contributing to the opioid epidemic
Key Points

• The opioid epidemic is a serious problem

• Maryland is one of the top-five states with the highest rate of opioid overdose

• Since 2013, there has been a rise in the increase of opioid overdoses due to fentanyl, often which is illicitly manufactured
You have completed Module 1: Opioids and the Opioid Epidemic
Key Points

• An opioid is any compound that acts on one of the three opioid receptors
• Opioids can be categorized as (1) *opiates* - compounds that occur naturally in opium (morphine, codeine), (2) semisynthetics - chemical modified natural compounds (buprenorphine, oxycodone, hydrocodone), and (3) synthetics – completely artificial compounds (methadone, fentanyl, tramadol)
• Opioids can be prescription medications or illicit substances
• All opioids can lead to deadly overdoses
• Fentanyl is 50 to 100x more potent than morphine and is not detectable by opiate toxicology screens. This increases the risk for overdose when produced on the street and mixed with heroin or other drugs.
• The opioid epidemic is a serious problem
• Maryland is one of the top-five states with the highest rate of opioid overdose
• Since 2013, there has been a rise in the increase of opioid overdoses due to fentanyl, often which is illicitly manufactured