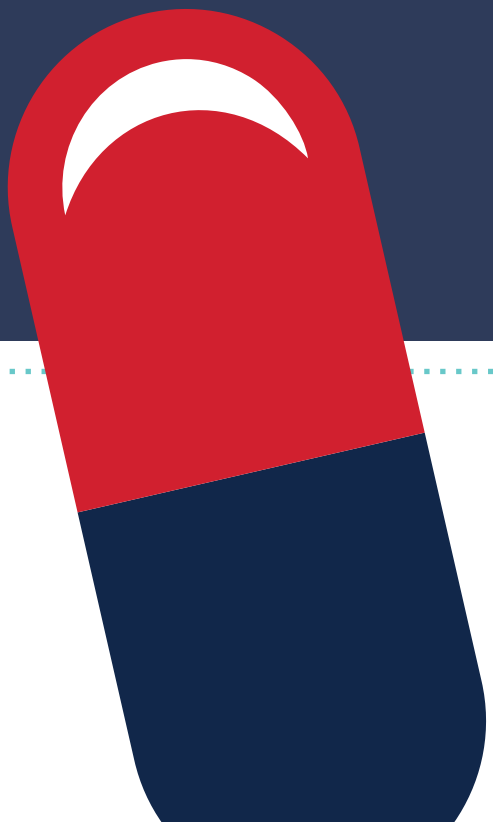
OPERATION PREVENTION

HIGH SCHOOL

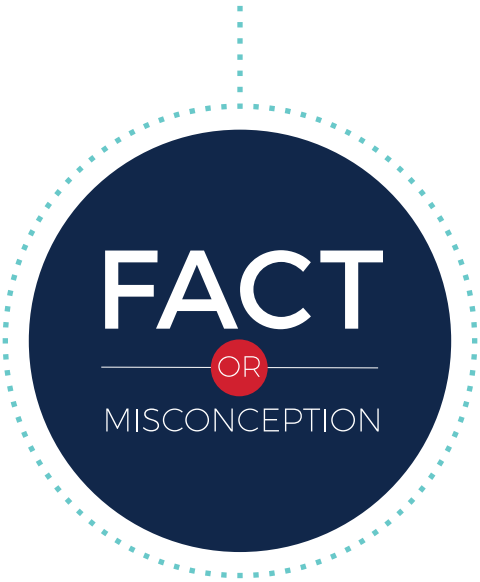
DIGITAL LESSON EDUCATOR GUIDE



U.S. Department of Justice Drug Enforcement Administration

Discovery EDUCATION

LESSON **OVERVIEW**



In this lesson, students will examine misconceptions and facts about opioids. Through a series of investigations, they then will learn the science behind prescription opioid misuse and heroin use, overdose, and withdrawal. Students will discover that opioid use may start off as a choice, but it can become a chemical dependency. They will apply what they learn to explain the science behind authentic stories of prescription opioid misuse and heroin use.

The accompanying presentation was created with PowerPoint so that it can be used in a variety of classrooms. If you are using a laptop with an LCD projector, simply progress through the PowerPoint by clicking to advance. All of the interactive aspects of the presentation are set to occur on click. This includes images, animations, videos, answer keys, and text boxes. The corresponding videos are embedded in the slide. Hover over the video window to reveal the "play arrow" at the bottom. If you are using an interactive whiteboard, tap on each slide with your finger or stylus to activate the interactive aspects of the presentation. It does not matter where you tap, but you can make it appear as if you are making certain things happen by tapping them. In the notes for each slide, there will be instruction on how to proceed and information to support facilitating graphics and statistics.

Content Areas

Life Science, Anatomy and Physiology, Biology, Health and PE, Sports, Exercise, and Health Science

Activity Duration

3-4 class sessions (45 minutes each)

Grade Level

Grades 9–12

Essential Questions

- What are opioids and how do they impact the human body?
- What are neurons and neurotransmitters, and what part do they play when opioids enter the body?
- What are the effects of opioid use on the brain?

Materials

- Note cards
- Chart paper and markers
- Access to the Internet
- Student Activity Sheet: Types of Opioids (one per student)
- Student Activity Sheet: Parts of the Human Nervous System (one per student)
- Student Activity Sheet: Parts of a Neuron (one per student)
- Student Activity Cards: Keeping Balance (one per pair of students)
- Student Activity Sheet: Opioid Misuse Case Studies (one per student)
- Student Activity Sheet: Brain Basics (one per student)

Objectives

- Analyze the misuse of opioids and suggest factors responsible for the progression from misuse to physical dependency.
- Use feedback mechanisms to explain the reinforcement given by chemical processes in opioid misuse.
- Explain information processing by following sensory information through neural transmission.

BACKGROUND INFO

The misuse of opioids such as heroin, morphine, and prescription medications is a serious national problem that affects the health, social, and economic welfare of communities. There are approximately 129 drug overdose deaths per day in the United States with 61% of those deaths related to pharmaceutical opioids or heroin. About 15 million people indicated misusing or abusing prescription painkillers in 2014 while nearly one in five teens say they have used prescription medicine at least once in their lifetimes to get high. To address this complex problem, federal agencies are working to inform patients, parents, teens, pharmacists, and educators about the dangers of opioid misuse.

This guide was created to give educators ideas and strategies for presenting the content in the digital lesson. It provides slide-by-slide details for educators to be prepared to engage, explain, discuss, and effectively facilitate the content in the presentation. The presentation is designed to cover three to four 45-minute class sessions, but it is flexible, depending on the student's needs and time available.

During the lesson, students will learn that opioids are drugs that are derived from the opium poppy plant or are synthetic equivalents, such as methadone and fentanyl. Heroin is an illegal opioid, but many opioids are legal. Opioids are commonly prescribed in forms of medications that relieve pain and reduce the intensity of pain signals reaching the brain. Prescription opioid misuse is the use of a medication without a prescription. This may mean taking more than prescribed or for the feeling of being high. Prescription medications that are examples of opioids include hydrocodone (e.g., Vicodin®), oxycodone (e.g., OxyContin®, Percocet®), morphine (e.g., Kadian®, Avinza®), and codeine. Opioids act by attaching to specific opioid receptors. Endorphins are naturally produced in our bodies to help manage pain. When opioid drugs attach to these receptors, they also reduce the awareness of pain.

After considering several facts vs. misconceptions, students will examine the adverse effects of opioids on the nervous system. They will learn that opioids act upon the opioid receptors in our nervous system, and many parts of our nervous system are affected by opioid misuse. Different messages are communicated through our bodies using neurotransmitters. They take the messages across the synaptic gap to the next neuron. When they are released, the body receives a message that inhibits pain messages—we basically do not get the pain messages with as much strength because the endorphins block pain signals. A person's experiences when misusing a drug match to a specific neurotransmitter whose activity it disrupts.

Simply put, when opioids enter the body, they make us feel extremely happy. That positive feeling may make someone want to take the substance again. What is not obvious, is how opioids are hijacking the pleasure center of the brain. This region is normally activated by healthy activities, like eating and sleeping, but it is also activated during the misuse of opioids. Opioids target this part of the brain by flooding it with dopamine, a type of chemical signal that makes people feel good. Long-term misuse can lead the body to produce less dopamine over time, causing cravings.

Students will begin to uncover that, with all these changes in the human nervous system, drug misuse is no longer a choice. When opioids are

BACKGROUND INFO

misused for pleasure they can lead to physical and chemical changes in our bodies. These changes can prevent us from controlling the impulse to continue misusing opioids. The initial decision is typically voluntary but can lead to tolerance and dependence. Students then will apply what they learned by reviewing different case studies and explaining the science behind some of the signs and symptoms of opioid misuse.

Embedded within this lesson are clips from "Chasing the Dragon: The Life of an Opiate Addict," a documentary aimed at educating students and young adults about the dangers of addiction. This video was released by the FBI and DEA in an effort to combat the growing epidemic of prescription drug misuse and heroin use. There are graphic descriptions of the impact opioid misuse can have on the body including bodily fluid (vomiting, blood, open wounds) and violence, as well as strong language. Instructors should watch these clips prior to sharing with students to determine if it is appropriate for the audience.

At different points in the lesson, students may be tempted to share personal information about opioid misuse by themselves or others. As always, be sure to follow school or district policies about the sharing of personal information about minors.

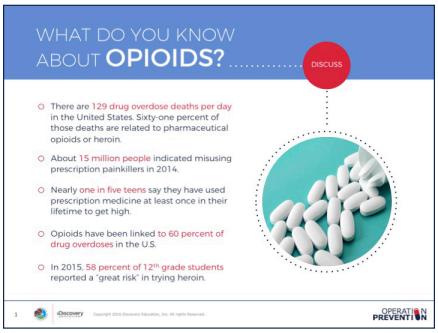
DAY 1

SLIDES 1-6

ENGAGE

Overview: Students will identify and justify their beliefs about a series of facts and misconceptions related to opioid misuse.

Students will be introduced to what an opioid is, the different types of drugs that are classified as opioids, and common reasons why they are taken.



SLIDE 1

Arrange students in small groups, and hang a blank sheet of chart paper for each group in different areas of the room. Ask: "What do you know about opioids?" and instruct student groups to list everything they know or think they know about opioids, using the chart paper to capture their ideas. At set intervals, ask students to rotate and annotate the other groups' chart paper to identify which statements they agree or disagree with.

Introduce the concept of a misconception. A misconception is an idea or opinion that is incorrect because it is based on a mistaken thought or understanding. Invite students to revisit their chart papers and identify what they think the biggest misconceptions are about opioids.

Click on the slide to reveal statistics about America's opioid epidemic. Explain to students that opioids are drugs that influence the nervous system to reduce feelings of pain. Heroin is an illegal opioid, but many opioids are legal. Opioids are commonly prescribed in forms of medications. Students might have heard of Vicodin®, OxyContin®, Percocet®, morphine, and codeine. These are all types of prescription opioids.

http://www.asam.org/docs/default-source/advocacy/opioid-addiction-disease-facts-figures.pdf

DAY 1

SLIDES 2-3

Combine the small groups to form two large groups of students.

Explain that there are many misconceptions about opioid misuse. It is important to be able to separate truth from misconception. Distribute two index cards to each group: one with “Fact” written and one with “Misconception”.

Read aloud the first statement on slide 2 and invite students to discuss their response as a group. Invite each group to hold up the card they think is correct. Reveal the correct answer and explain using slide notes. Repeat these directions for all statements.

After all of the statements have been reviewed, lead a discussion around the following guiding questions:

- Which fact or misconception statement is most surprising?
- What misconception do you think is most common with teens your age, and why?
- Which misconception do you think is most important for teens your age to understand, and why?

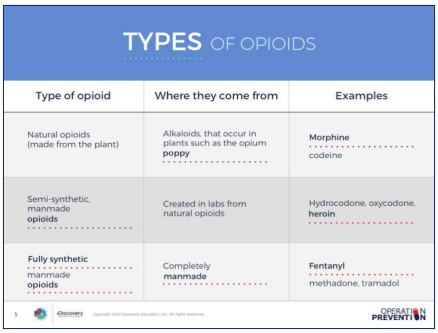
SLIDE 4

Invite students to use the information from their chart papers, and information they obtained from reviewing the statements on slides 2-3, to develop a definition of what an opioid is. Students can capture this information on an index card or on the same chart paper.

Next, showcase some of these ideas on chart paper. Invite students to vote and pick the three answers that best describe what opioids are and where they came from.

Then, click to display the definition of opioids. Compare the definition on the slide to student answers. Ask about potential discrepancies between their definitions and the one provided. Could any of these stem from misconceptions? Have students discuss in what cases someone their age might be prescribed an opioid.

DAY 1



SLIDE 5

It's important for students to know that synthetic and natural opioids work in our bodies the same way. Invite students to discuss the following questions with a partner:

- Do you think there are any differences between synthetic and natural opioids?
- Do you think one is safer than the other?

The table shows the different types of opioids, how they are derived, and examples. But some of the information is missing. Ask students to fill in the chart on the slide using the word bank provided. Students can use the slide or the **Types of Opioids** student activity sheet to complete the chart.

Then, reveal the correct answers by clicking on the slide. Discuss why opioids that are synthetic can be a problem – they are made much stronger than natural opioids, and street manufacturers can put dangerous ingredients into them.

SLIDE 6

Challenge students to close their eyes and create a mental picture of what they think someone who is addicted to opioids might look like. Invite them to describe or sketch their mental image.

Ask students to share their lists and/or pictures.

- Write the descriptions on a whiteboard for all students to see.
- What similarities or differences in the images can students identify?

Review one of the potential misconceptions, "addiction is a choice," with students by watching the video on the slide.

Discuss the descriptions on the whiteboard after viewing the video using the following guiding questions:

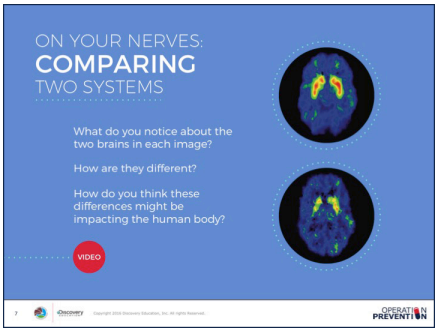
- Would you change your description after viewing the video? If so, why?
- Why might people think that addiction is a choice?

DAY 2

SLIDES 7-15

EXPLORE

Overview: Students will compare and contrast models of a healthy nervous system with the natural release of endorphins to prescription opioid misuse and heroin use. Students will be able to explain the chemical imbalances in each to describe why opioids are prescribed. The neuroscience concepts in this section will be discussed specifically in terms of the effects of opioids on the brain and body.



SLIDE 7

Ask students: Do you know which system of the body helps you learn? Or which system your dreams come from? It is anticipated students will be able to identify the nervous system or the brain.

Invite students to make observations of the two brain scans on the slide. At least one of which has been influenced by drugs. Instruct students to note the differences between the brains in the image. Then, challenge them to answer the three questions that appear on the slide:

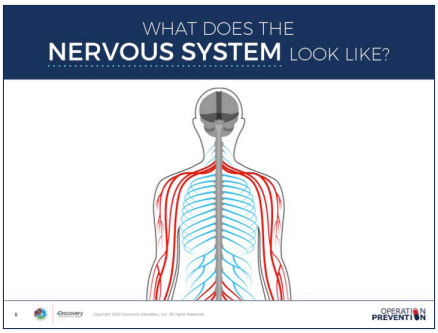
- What do you notice about the two brains?
- How are they different?
- How do you think these differences might be impacting the human body?

Invite students to share their observations, and discuss as a class.

Next, play the video "The Reward Circuit: How the Brain Responds": https://www.drugabuse.gov/videos/reward-circuit-how-brain-responds-to-natural-rewards-drugs

Ask students: What role did the nervous system likely play in drug addiction in this video? It is anticipated students will identify the brain as part of the nervous system. Clarify with students that when opioids enter the body, they make us feel extremely happy. That positive feeling may make someone want to take the substance again.

DAY **2**



SLIDE 8

Clarify with students that our nervous system is very complicated because it helps us control so much of what we do every day. A diagram identifies the parts of the human nervous system. The image is color-coded but not labeled.

Provide small groups of students a set of descriptions of the nervous system using the **Parts of the Human Nervous System** student activity sheet. Invite students to match each part of the nervous system to the color they think it corresponds with on the slide.

Clarify with students that opioids act upon the opioid receptors in our nervous system. This is important because of all the different parts of the body they just learned our nervous system controls. Ask students to identify parts of the nervous system that could be affected by opioid misuse and to explain their reasoning. It is anticipated students will be able to conclude that all parts of the nervous system could be disrupted by opioid misuse.

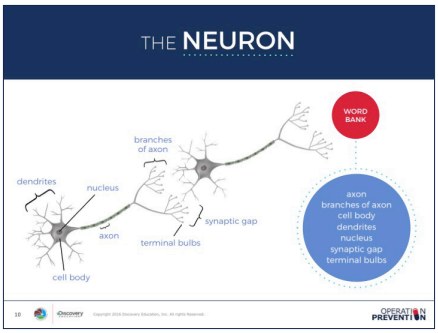
SLIDE 9

This slide introduces the biological messages, sent through the nervous system, that can cause a person to misuse prescription drugs.

Begin by asking students: "How do you think disruptions or changes in the nervous system might impact our behavior?" Students may want to revisit slide 8. Discuss their responses as a class.

Click the embedded link in the slide to watch a clip of the "Chasing the Dragon" documentary. The video discusses how many individuals begin with prescription drugs prescribed by doctors, only to find they cannot stop using the drugs. This begins the discussion on the biological processes that cause opioid misuse. NOTE: There are graphic descriptions of the impact opioid misuse can have on the body including bodily fluid and violence. Instructors should watch this clip prior to sharing with students to determine if it is appropriate for the audience.

When students finish watching, ask: "How do you think what we learned about the nervous system can help explain the challenges faced by the people in this video?" When opioids enter the body, they hijack the pleasure center of the brain. This region is normally activated by healthy activities, like eating and sleeping, but it is also activated during the misuse of opioids.



SLIDE 10

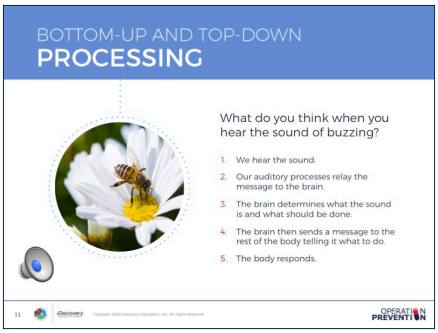
Invite students to take a look deeper inside the nervous system to learn how pain and pleasure messages travel to and from the brain. Remind students that they saw how the brain is impacted by opioid misuse and that our brain is part of a larger system in our bodies: the nervous system. We also know the nervous system helps us communicate information throughout our bodies.

- Ask students: "How are messages sent throughout our bodies?" and invite students to share out their ideas. The slide shows a diagram of two neurons. Remind students there are millions of neurons in our bodies communicating information through a vast network.

- Distribute the **Parts of a Neuron** student activity sheet. Explain that each term in the word bank completes one of the blanks in the diagram. Challenge students to identify where in the diagram to place the corresponding labels. Answers will be revealed with click of slide.

- Point out that the two neurons are not touching each other in the image. But, messages (like pain or pleasure messages) still have to get from one neuron to another to be able to travel to and from the brain. Ask: How do you think that happens?

- The answer? The synaptic gap (synapse). This is the small space between neurons, which the message must cross as it makes its way to and from the brain. The synaptic gap is where our body has receptors to transfer the messages of pain and pleasure throughout our bodies.



SLIDE 11

Now, let's apply how neurons actually work in our bodies to send and receive messages.

The slide will automatically start with the sound of an insect buzzing. Ask students to break down what is happening into three parts:

- How are you detecting the noise? (the stimuli)
- What is the noise and where is it coming from? (interpretation)
- How did you respond? (response)

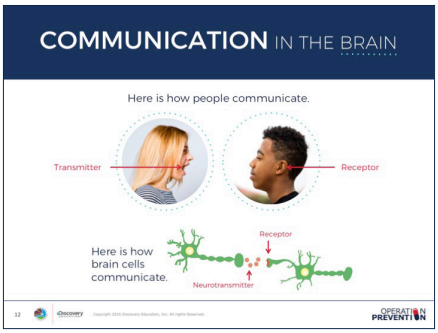
Click slide for an image of a bee to appear and click again for text to appear. It is anticipated that students will identify their ears hearing the sound of buzzing, that it is coming from an insect, and they swatted at it or moved away.

Now, invite students to think about which parts of this series are being relayed from the stimulus to the brain (bottom-up) and from the brain to the rest of the body (top-down).

- The ears pick up the sound of buzzing. The message is relayed to the brain from the senses through bottom-up processing.
- The brain, in turn, determines what the buzzing means and relays messages to the rest of the body to move away from the buzzing; this is top-down processing.

Clarify with students that sensory neurons help us transmit information about sight, sound and feelings (such as feelings of pain and pleasure). Have students brainstorm additional examples of "sending" a message from a sensory organ to the brain, where the message is processed.

DAY **2**

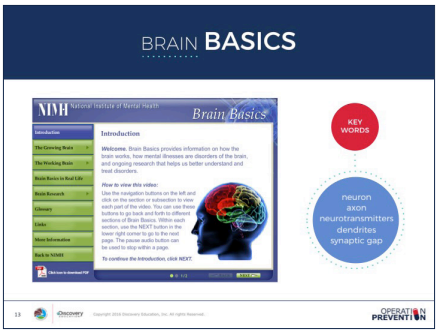


SLIDE 12

Ask students to compare and contrast the diagram of the people talking with how neurons are communicating. Point out that neurotransmitters are like the words we use to talk to another person and give them instructions. The neurotransmitter that moves from one neuron to the next is specific to certain messages, the strength of these messages, and how long these messages continue to be conveyed.

Ask: "Based on what you have learned; how do you think drugs affect this process of messaging in the brain?"

The messages that are sent from one neuron to the next are altered by the actions of the drugs on the neurotransmitters. The drugs act on the messengers to change the message. Students learned earlier that opioids could attach to the same receptors as endorphins.

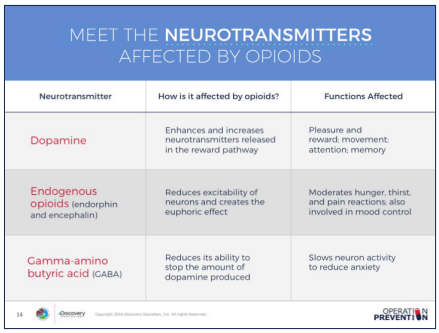


SLIDE 13

The video on this slide shows how neurons transmit messages and what is actually happening in the synaptic gap. This is important because the synaptic gap is where the opioid receptors are located. http://www.nimh.nih.gov/brainbasics/index.html

- Watch the video.
- Guide students to create a simple flow chart illustrating the process by which neurons and neurotransmitters send messages through the body using the following keywords as a guide: neuron, neurotransmitters, axon, dendrites, and synaptic gap.
- When they finish, ask students to share and explain their flow charts, either to the class or in small groups.

DAY 2



SLIDE 14

The messages that travel across a synaptic gap are called neurotransmitters. Different neurotransmitters are specific to different types of messages. Explain to students that opioids mimic neurotransmitters and either excite or inhibit a response like euphoria or moodiness in the body.

This slide displays a chart that identifies and describes the neurotransmitters most often affected by prescription opioids, which functions they normally affect, and how they are affected by opioids.

Invite students to consider how each of the neurotransmitters, affected by opioids, could impact the human body by reviewing the chart and answering the following guiding questions:

Answers are in red:

- Which neurotransmitter could cause dry mouth or an irritable mood? endogenous opioids
- Which neurotransmitter is responsible for overstimulating the nervous system creating a euphoric effect? dopamine
- Which neurotransmitter could cause sleepiness? gamma-aminobutyric acid

SLIDE 15

This activity will reinforce what students have learned about how neurons transmit and receive messages.

Present four statements using the slide. Explain to students that three of the statements are true while one is false. Guide students to identify the false statement and correct it. False statement will reveal with click.

True statements:

- Everything we do relies on neurons communicating with one another.
- Opioids mimic neurotransmitters by binding to the same receptors as endorphins.
- Opioids can alter the brain and affect emotions, memory, and pain reactions.

False statement:

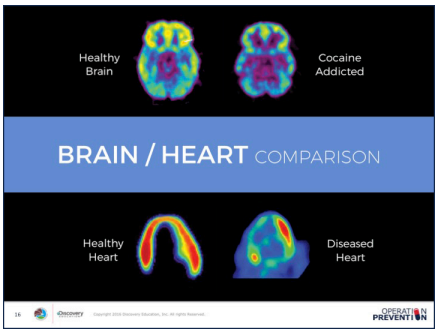
- At the end of the axon, most neurons release a neurotransmitter across the dendrites. (correct answer: At the end of the axon, most neurons release a neurotransmitter across the synapses)

DAY 3

SLIDES 16-19

EXPLAIN

Overview: Students will analyze images produced by brain mapping to explain how opioid misuse can cause changes in areas of the brain related to judgment, decision making, learning and memory, and behavior control. Students will construct an explanation of how this is evidence of a brain disease. Students will learn and be able to explain how brain development during adolescence leads to additional risks on their bodies.

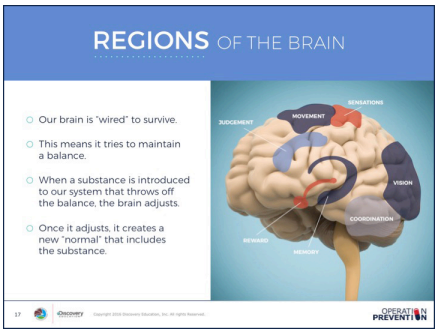


SLIDE 16

Ask students to consider how addiction is a disease by comparing the brain and heart images.

As students view the images on the slide, ask: "How are the diseased heart and the diseased brain similar?"

(In each case, disease reduces the ability of the organ to use energy, making it less effective in the body.)



SLIDE 17

Distribute the **Brain Basics** student activity sheet to provide students with information about the different parts of the brain.

Invite students to use this information to review the diagram in the slide and identify which parts of the brain are responsible for the highlighted processes. (For example, the highlighted parts labeled "judgment" and "sensations" are both controlled by the frontal lobe.)

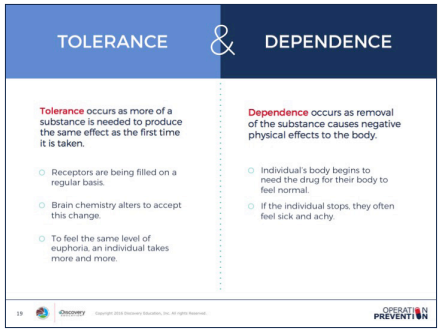
DAY 3

SLIDE 18

Divide the class into pairs of students.

Invite students to use their completed **Brain Basics** student activity sheet as a reference and have each pair look at the information on the slide. Guide students to come up with as many factors that might influence risk based on adolescent brain development. Anticipated responses include difficulty controlling emotions, poor planning and judgment, and risky, impulsive behavior.

Ask students to share their lists with the whole class. Capture student ideas using chart paper or the provided space on the slide. Have students rank them in order from "most influential" to "least influential," giving reasons for their rankings.



SLIDE 19

Share with students that we have learned opioids can have many different impacts to our bodies. When opioids are misused they can lead to physical and chemical changes in our bodies. These changes can lead to a lack of impulse control resulting in the continued misuse of opioids. The initial decision is typically voluntary but can lead to tolerance and dependence.

Invite students to use the text and image on the slide to identify similarities and differences in a person that has developed a tolerance to one that is dependent on the misuse of opioids. It is anticipated students will identify that when the body adapts to the drug, and requires more of it to achieve a certain feeling, an individual has developed a tolerance. A person that is dependent on a drug will experience withdrawal symptoms when use of the drug is suddenly reduced or stopped.

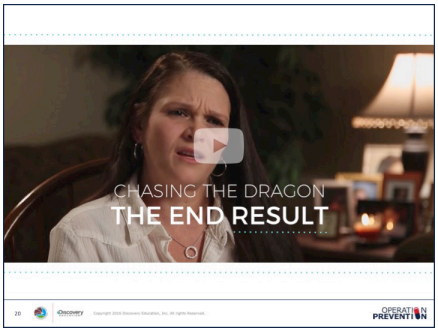
Revisit the people that shared their stories in Chasing the Dragon. Ask students: "How could you now explain their challenges with withdrawal?" Remind students that opioids flood the brain with dopamine, a type of signal that makes people feel good. Long-term misuse can lead the body to produce less dopamine over time, causing cravings that can lead to tolerance or physical dependency.

DAY 4

SLIDES 20-22

ELABORATE

Overview: In this section, students will apply the information they obtained to compare and contrast homeostasis and allostasis during opioid misuse and to explain withdrawal cycles and overdose. Students will uncover how we can become physically dependence to opioids.

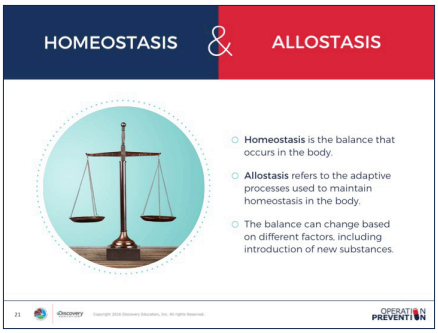


SLIDE 20

Click the embedded link in the slide to watch part of the "Chasing the Dragon" documentary.

- This segment shows the end result of one of the cases presented in the video. The video examines the big picture: the change to a new homeostatic system that leads to psychological changes in judgment and the perception of need.
- NOTE: There are graphic descriptions of the impact opioid misuse can have on the body including bodily fluid and violence, as well as strong language. Instructors should watch these clips prior to sharing with students to determine if it is appropriate for the audience.

Discuss the video with students. Ask them what they think about this case and the end result. Encourage students to express their thoughts about what happened and why, based on brain mechanisms.



SLIDE 21

Review the terms homeostasis and allostasis with students by showing the slide. Allostasis refers to the adaptive processes used to maintain homeostasis in the body. This occurs as neurotransmitters mediate changes and deal with stressors. They seek to help the body adapt.

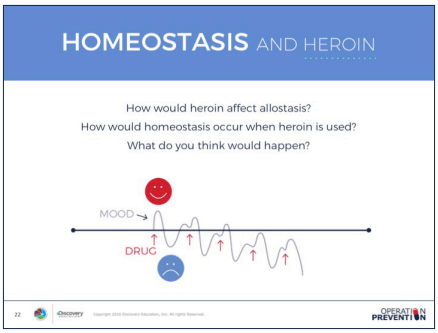
Explain how stress to our body systems can lead to adaptation. When a stressor or change occurs, such as ingesting opioids, the body seeks to adapt and create stability through change. When someone overuses a substance, the body changes to balance out with the presence of the substance. As it changes, tolerance and dependence occur.

Divide the class into pairs or groups of three. Distribute one set of the **Keeping Balance** student activity cards to each pair/group.

Direct students to work together to put the cards in the correct order of how our bodies can change to balance out the presence of an opioid. The correct order should be:

- An outside agent is introduced through regular or prolonged use.
- The body system becomes stressed.
- The system stability is upset.
- Changes occur in system based on allostasis.
- Tolerance and physical dependence occur.
- Homeostasis is restored with a new “normal.”

Ask a volunteer pair/group to present their card order to the class and explain why they put the steps in this order. Survey the other groups to see if any groups put them in a different order and reach consensus as a class.



SLIDE 22

Invite students to apply the processes of homeostasis and allostasis to developing a physical dependency on heroin.

Distribute six blank note cards to the same pairs/groups of students. Alternatively, students can write on the back of the previous set.

Instruct students to create a set of notecards that explain how an individual could become physically dependent on heroin. They can use the previous set of cards as guidance.

Anticipated response:

- A person takes heroin. At first, the person feels good.
- Then, the body system becomes stressed.
- The system stability is upset.
- Changes occur in system based on allostasis.
- A tolerance of physical dependence develops.
- Homeostasis is restored with a new “normal.” This normal is a less “happy” feeling than the first use.

Ask a volunteer pair/group to present their notecards and explain how heroin affects allostasis and how homeostasis would occur. Discuss as a class what they think would happen if the person continued to use heroin over an extended period of time. Students should understand how adaptation leads to heroin addiction as the body seeks to create a “new normal,” or a homeostatic system.

DAY 4

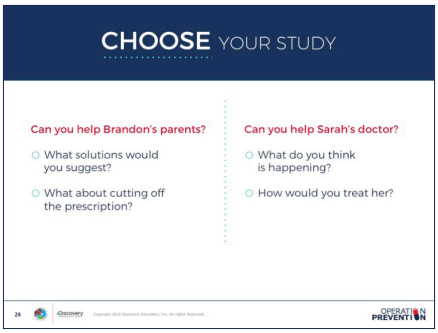
SLIDES 23-24

EVALUATE

Overview: In this section, students will examine case studies modeled after real-world stories of prescription opioid misuse and heroin use and apply what they learned throughout the lesson to explain the science behind one of them. Their explanation will include at least one fact or misconception from the beginning of the lesson.

SLIDE 23

Revisit the discussion on facts and misconceptions by reviewing slides 1–4. Invite students to return to their original groups to reevaluate their earlier charted facts and misconceptions. Ask student groups to discuss changes to their list and add at least three big takeaways they would want other teens to know.



SLIDE 24

Invite students to read the two case studies using the **Opioid Misuse Case Studies** student activity sheet.

Have students select one case study to analyze in groups of 2-3. Guide students to review the case studies and apply what they learned from the lesson to explain the signs and symptoms described. Students should be encouraged to include at least one fact or misconception in their explanation.

Teacher notes:
In the first case study, students will help Brandon's parents understand what has been happening to Brandon. They will use facts from the lesson to explain why cutting off the prescription might not solve the problem and suggest a better solution.

Anticipated responses include:

- Relied on drugs to help him move: His body changed chemically to balance out the presence of an opioid through allostasis.
- Gradually increased the number: His opioid misuse went from tolerance to dependency.
- Mood changed: The endogenous opioids neurotransmitter was impacted by opioid misuse. Opioids reduce excitability of neurons impacting mood.

In the second case study, students will help the doctor determine why Sarah is in the hospital. They will use facts from the lesson to explain what might be happening to Sarah and suggest how to treat her.

Anticipated responses include:

- Shaking and vomiting: Signs of overdose or withdrawal.
- Lost consciousness and her breathing fell: Signs of overdose or withdrawal.
- Used the bathroom frequently: The dopamine neurotransmitter was impacted by opioid misuse. Opioids overstimulate the system creating a euphoric effect. She was likely taking opioids when she was in the bathroom.
- Wanted a refill on her medication: She developed a dependency to opioids.
- Invite students to present their analyses using presentation software or an online platform.

TYPES OF OPIOIDS

Directions:
The table below shows the different types of opioids, how they are derived, and examples. But some of the information is missing. Using the word bank, complete the chart with the correct answers.

Word bank:

- poppy
- Morphine
- opioids
- heroin
- fully synthetic
- opioids
- man-made
- fentanyl

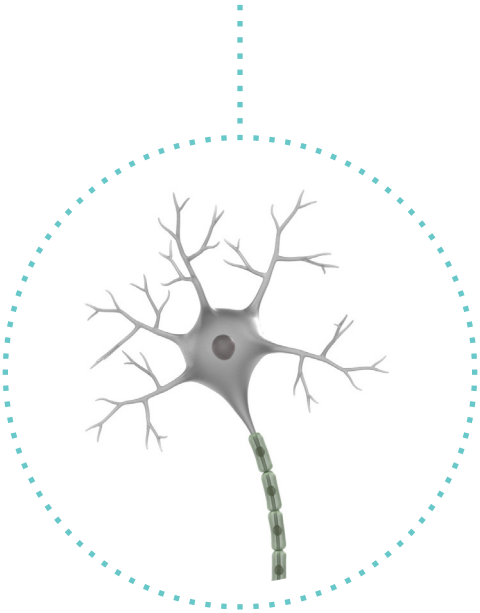
Type of opioid	Where they come from	Examples
Natural opioids (made from the plant)	Alkaloids, that occur in plants such as the opium	..... codeine
Semi-synthetic, man-made	Created in labs from natural opioids	Hydrocodone, oxycodone, ...
..... man-made	Completely	..... methadone, tramadol

PARTS OF THE HUMAN NERVOUS SYSTEM

Directions:
Listed below are descriptions of the nervous system. Match each part of the nervous system to the color it corresponds with on the slide.

Description	Color
The central nervous system consists of the brain and spinal cord. The systems in the brain regulate certain functions that are affected by drugs.	
The peripheral nervous system consists of everything other than the brain and spinal cord. The peripheral nervous system regulates voluntary and involuntary responses, including sensory input.	
The somatic nervous system within the peripheral nervous system deals with voluntary responses, including input from sensory organs.	
The autonomic nervous system regulates involuntary responses, such as muscle and gland operation.	
The autonomic nervous system contains the sympathetic motor system that puts a person into a state of high alert when a threat is present.	
The parasympathetic motor system, also in the autonomic nervous system, calms the body by releasing neurochemicals that relax the system.	

PARTS OF A NEURON



Directions:
Each term in the word bank completes one of the blanks in the diagram on the slide. Using the following definitions, identify where in the diagram to place the corresponding labels.

Word bank:

- Axon
- Branches of axon
- Cell body
- Dendrites
- Nucleus
- Terminal bulbs
- Synaptic gap

Definitions:

- The cell body contains the nucleus, which determines whether the message will continue down the axon to be sent to another neuron.
- Dendrites receive the impulse, or message, from another neuron and send it to the cell body.
- The axon is the long part of the neuron that takes the message from the cell body to the terminal bulbs.
- The terminal bulbs are at the sending end of the neuron. They release the neurotransmitters into the synaptic gap.

BRAIN BASICS

Directions:
Listed below are descriptions of different parts of the brain. Using this information and the image on the slide, identify which parts of the brain are impacted by opioid misuse.

Description	Does this system appear to be impacted by opioid misuse? Why or why not? Use evidence from the brain scan in your response.
The brainstem controls basic functions that humans need to survive. These include breathing, sleeping, and maintaining a heart rate. These functions are involuntary, which means they happen without our thinking about them.	
The cerebral cortex is divided into several areas. Different areas control different functions. For example: ○ Thinking happens in the front part of the cortex (also called the prefrontal cortex, or forebrain). Processes in the frontal cortex allow us to plan, make decisions, and solve problems. ○ Other areas in the cerebral cortex process sensory information. These processes allow us to see, feel, hear, taste, and touch.	
The limbic system consists of many different brain structures. Together, they control and regulate how we experience pleasure. When a behavior causes us to feel pleasure, we are likely to repeat that behavior. This "reward circuit" in the brain reinforces behaviors that are necessary to our survival. Processes in the limbic system also shape how we experience positive and negative emotions. ○ Eating, socializing, and other healthy behaviors activate the limbic system and give us pleasure. However, misusing and abusing drugs also activate the limbic system. ○ Using drugs can also affect our moods by changing processes in the limbic system that shape emotions.	

KEEPING BALANCE

Teacher preparation:
Cut a set of six notecards for each pair of students.

An outside agent is introduced through regular or prolonged use.	Changes occur in system based on allostasis.
The body system becomes stressed.	Tolerance and physical dependence occur.
The system stability is upset.	Homeostasis is restored with a new “normal.”

OPIOID MISUSE CASE STUDIES

Directions:
Select one of the case studies below that shares the story of a teen who misused prescription opioids. Use scientific knowledge gained from the lesson to explain what is happening to the student in the case study. Provide an explanation that includes at least one fact or misconception from the beginning of the lesson to explain the science behind the signs and symptoms described. Plan to present your analysis using presentation software or an online platform.

CASE STUDY #1: BRANDON

Brandon is a 17-year-old student in high school who enjoys dancing. Several months ago, he fell while performing a dance move and hurt his back. He could not move without feeling sharp twinges of pain, and he could not bend over. He was in a lot of pain, and the doctor gave him hydrocodone to help ease the pain. Brandon began to rely on the drugs to help him move, and he gradually increased the number of pills he used daily. He requested refills on the prescription, and he became anxious when his medication was almost gone. His mood varied: he would be happy when he took the pills, but he became angry and upset when the pills began to wear off. Recently his parents and doctor caught onto this and they have taken Brandon off of the prescription.

CASE STUDY #2: SARAH

Sarah is a 17-year-old girl who was rushed to the hospital, via ambulance, after she began shaking and vomiting in class at school. She lost consciousness and her breathing fell to a dangerously low rate. The doctors have been trying to piece the facts together so they can treat her. Her friends told the emergency workers that Sarah had recently been in treatment with her doctor for severe pain in her back after a fall during soccer practice. The fall occurred about one month ago, and Sarah began acting differently about two weeks ago. One friend said that Sarah had a lot of pain while sitting in class at school and had recently begun going to the lavatory for longer periods of time more frequently during the day. When she would come back from the lavatory, she seemed to feel better and was in a better mood. Her parents reported similar behaviors, and noted that she asked the doctor for a refill on her medication two times in the last month.

NATIONAL STANDARDS

This lesson plan has been developed based on the following national standards:

Next Generation Science Standards

LS1.A: Structure and Function
Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

PS1.B: Chemical Reactions
Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4),(HS-PS1-5)

LS1.D: Information Processing, Grade Band Endpoints
By the end of grade 12: In complex animals, the brain is divided into several distinct regions and circuits, each of which primarily serves dedicated functions, such as visual perception, auditory perception, interpretation of perceptual information, guidance of motor movement, and decision making about actions to take in the event of certain inputs. In addition, some circuits give rise to emotions and memories that motivate organisms to seek rewards, avoid punishments, develop fears, or form attachments to members of their own species and, in some cases, to individuals of other species (e.g., mixed herds of mammals, mixed flocks of birds). The integrated functioning of all parts of the brain is important for successful interpretation of inputs and generation of behaviors in response to them.

National Health Education Standards Addressed

8.12.3 Work cooperatively as an advocate for improving personal, family, and community health.

1.12.9 Analyze the potential severity of injury or illness if engaging in unhealthy behaviors.

CCSS.ELA-LITERACY

CCSS.ELA-LITERACY.RST.11-12.1
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

CCSS.ELA-LITERACY.RST.11-12.7
Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-LITERACY.RST.11-12.9
Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.