

Drugs and Neurotransmission

<i>Document Overview</i>
Students work in groups on a webquest designed to help them understand the reward pathway in the brain, roles of neurotransmitters and how drugs interfere with those neurotransmitters and then create an ad campaign designed to prevent drug use in youth.
<i>Standards</i>
<p><u><i>Minnesota State Academic Science Standards</i></u></p> <ul style="list-style-type: none"> ○ 7.4.1.1.1 Recognize that all cells do not look alike and that specialized cells in multi-cellular organisms are organized into tissues and organs that perform specialized functions. ○ 7.4.1.1.2 Describe how the organs in the respiratory, circulatory, digestive, nervous, skin and urinary systems interact to serve the needs of vertebrate organisms. ○ 7.4.3.2.2 Use internal and external anatomical structures to compare and infer relationships ○ 9.4.1.1 Organisms use the interaction of cellular processes as well as tissues and organ systems to maintain homeostasis.
<p><u><i>Next Generation Science Standards</i></u></p> <ul style="list-style-type: none"> ○ MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. ○ MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
<p><u><i>Other Standards: National Health Education Standards</i></u></p> <ul style="list-style-type: none"> ○ Students will comprehend concepts related to health promotion and disease prevention ○ Students will demonstrate the ability to advocate for personal, family, and community health.
<i>Objective</i>
<p>Students will understand:</p> <ul style="list-style-type: none"> - the basics reward pathway in the human brain -the affects of the main neurotransmitters -how drugs of abuse affect neurotransmission -what long term changes occur in the brain due to drug use
<i>Type of Activity</i>
Webquest

<i>Suggested Duration</i>
2-5 50 minute class periods
<i>Connection to Nobel Speakers</i>
Marc Lewis; Sheigla Murphy
<i>Concepts/Keywords/Appropriate Classes</i>
neurotransmitters, reward pathway, drugs of abuse Appropriate for Human Anatomy and Health and Biology classes
<i>Description of Activity</i>
Webquest teaching about the reward pathway, neurotransmitters and drugs of abuse and how those drugs affect neurotransmission and create long term changes in the brain.
<i>Materials</i>
Internet access
<i>Teacher Tips</i>
You may decide to have student groups that work through the entire activity as a group or you could assign students to become the “expert” for one part of the activity and then join other “experts” from the other parts to collaborate and create their campaigns. There is a wide range of reading complexity in the links so it may be beneficial to preview them and assign readings/links based on ability.

Activity

Drugs and Neurotransmission Webquest

Part 1: The Reward System

[The Reward Pathway Reinforces Behavior](#)

[Neuroanatomy and Physiology of the "Brain Reward System"](#) (Parts I and II)

[Limbic System](#)

Students will use the links above to begin to understand the brain's reward system by focusing on the questions listed below.

1. What are the two major roles/goals of the reward pathway?
2. How does the reward system insure that those goals will be carried out and repeated?
3. What neurotransmitter is primarily involved in the reward pathway?
4. What are the basic parts of the limbic system? Create a diagram showing those basic regions.

Part 2: Neurotransmitter Actions

[The Four Major Neurotransmitters](#)

[Neuroanatomy and Physiology of the "Brain Reward System"](#) (Part IV)

[Neurotransmission lesson](#) (Part 2)

Divide students into groups and have them learn about major neurotransmitters using the links above. You may want to make one student responsible for each of the links. The goal is to have them use the links and work collaboratively to understand the:

- major neurotransmitters
- basic role(s) of each neurotransmitter

It may also be useful to have them sort the neurotransmitters as either excitatory or inhibitory.

You may wish to have them create a presentation to highlight each neurotransmitter.

Part 3: Drugs of Abuse

[Drugs That People Abuse](#)

[Mouse Party](#)

[Drugs of Abuse](#)

[Neuroanatomy and Physiology of the "Brain Reward System" \(Part V\)](#)

Divide students into groups and have them learn about different drugs of abuse using the links above. You may want to make one student responsible for each of the links. The goal is to have them use the links and work collaboratively to:

- list the major drugs of abuse
- tell how each drug alters neurotransmission
- list the effects that the drug causes

Part 4: Changes to the Brain

[Drug Use Changes the Brain Over Time](#)

Students listen to the audio clips in the link above and then write a short summary of the long term changes to the brain from drug use.

Part 5: Ad campaign

Have groups select (or you assign) a particular drug of abuse.

They should then create an ad campaign to discourage youth from using the drug of abuse they selected. Depending upon your student's interests/talents, you may have them use any of a wide variety of resources to create radio or television or newspaper ads or create posters to display around your school or community.

Extension and Follow-up Activity

[When Does Abuse Become Addiction Card Game](#)-use this link to have students play a card game that leads to great discussion about what may lead one person to become an addict while another person does not. After playing and discussing the game as directed, have students view the following links regarding risk factors:

[Social Environment Impacts Reward Pathway](#)

[The Adolescent Brain](#)

[Environmental Risk Factors](#)

Also see this [link](#) for other Precursors to addiction discussion items.

Students could now create a new version of the game whereby they create risk factors cards and assign points to them based on the above links. They could also create unique choice cards reflecting various choices students may have to make. Here is a [Playing Card Template](#) that may be useful. In creating

the cards, they could include cards that are worth negative point values to indicate factors that would put them less at risk for becoming an addict.

Here is a link to a [partially completed card template](#) as an example.

Note: Sheigla Murphy's research shows that females tend to get addicted faster than males. To represent this in the card game, you could have females draw two risk cards. See this [link](#) for additional activities regarding gender differences related to addiction.

Discussion surrounding possible treatment methods for addiction based on the physiology of what is occurring in the synapse. Part VI of [this article](#) is a great starting point.

Sources/Bibliography

Drug Use Changes the Brain Over Time. (n.d.). Retrieved June 30, 2015.

Drugs That People Abuse. (n.d.). Retrieved June 30, 2015.

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