Today’s Lesson: 
“The Brain”
In order to understand how certain drugs effect the adolescent, one must first understand the biological components and functions involved.
The Brain

**Cerebral Cortex**
- This controls our senses: sight, touch, hearing, taste, and smell.
- It is also responsible for the ability to think, problem solve, and make decisions (National Institute of Drug Abuse N.I.D.A., 2007).

**Brain Stem**
- This connects the spinal cord to the brain (National Institute of Drug Abuse N.I.D.A., 2000).
- It also controls the heart rate, breathing, eating, and sleeping (N.I.D.A., 2007).

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The Brain continued ...

**Limbic System**-
This contains the Hypothalamus, Amygdala, Hippocampus, Thalamus, and Pituitary. It also controls emotions, perceptions, and memory, and reward circuits (N.I.D.A., 2007).

**Cerebellum**-
Responsible for skilled repetitive movement, balance, and posture (N.I.D.A., 2000)

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How the Brain Communicates

- **Neurons** are nerve cells.

- **Neurotransmitters** transfer a message from one neuron to another across the synapse, or space between the neurons.

- **Receptors** are specialized sites on the receiving neuron that will then forward the appropriate message to where it is needed.

- **Transporters** bring back the neurotransmitters for recycling (N.I.D.A., 2007).

Think of this communication as a business trip...

You have to give a presentation to new clients (Brain’s Message).

You arrive at the airport and proceed to your airline’s terminal for departure (Neuron).

You have chosen an airplane/airline you trust to get there (Neurotransmitters).

The plane carries you to your specific destination and you arrive at the designated terminal (Receptors).

The ground crew then directs your plane back to its original airport or it will no longer be in use (Transporters).
Effects of Alcohol

- Alcohol is one such drug that “inhibits the process in which... nerve impulses travel more easily across the gap between nerve cells” (National Institute on Alcohol Abuse & Alcoholism N.I.A.A.A., 2004/2005, p. 126).

- Since adolescence is a period marked by high levels of growth and sex hormone output, “alcohol consumed during rapid development (i.e., prior to or during puberty) has the potential to disrupt normal growth and endocrine development through its effects on the hypothalamus, the pituitary gland, and various target organs such as the ovaries and testes“ (N.I.A.A.A., 2004/2005, p. 126).

Effects of Marijuana

- Marijuana decreases neuron activity in the hippocampus (Limbic System) which affects memory (N.I.D.A., 2000).

- THC, the main ingredient in Marijuana, interrupts nerve impulse in the cerebellum which affects muscle movement and coordination (N.I.D.A., 2000).

- “Marijuana also affects receptors in the brain areas and structures responsible for sensory perception. Marijuana interferes with the receiving of sensory messages ...in the cerebral cortex” (N.I.D.A., 2000, p. 8).

Effects of Inhalants

- Chronic abusers have reduction in certain areas of the brain including the cerebral cortex, cerebellum, and brain stem (N.I.D.A., 2000).

- “The fatty tissues protecting the nerve cells in the brain are destroyed by inhalant vapors. This slows down or even stops neural transmissions” (N.I.D.A., 2000, p. 17). This can have adverse effects on learning ability, memory, and problem solving (N.I.D.A., 2000).

Effects of Hallucinogens

- LSD causes an increase in the receptor of serotonin. This can induce mood swings, altered perception, delusions, and hallucinations (N.I.D.A., 2000).

- Ecstasy can damage neurons containing serotonin, which can cause confusion, depression, sleep problems, drug cravings, and anxiety (N.I.D.A., 2000).

Although PCP is not a true hallucinogen, it affects neurotransmitters in the brain and can cause dopamine to be released from neurons into the synapse which can produce altered perception or hallucinations. This may also account for memory loss and speech difficulties (N.I.D.A., 2000).

Effects of Steroids

- “The American Academy of Pediatrics strongly condemns the use of performance-enhancing substances...among children and adolescents” (American Academy of Pediatrics, 2005, p. 1103). Steroids affect the hypothalamus and limbic system by altering the type of message transmitted by the neurons causing a disruption in the hormone levels which may “result in many problems, including a reduction in normal testosterone production in males and loss of the monthly period in females” (N.I.D.A., 2000, p. 25).

- Steroids also produce violent behavior, impaired judgment, and even psychosis. It can also produce changes in sexual characteristics and stunt the growth of teens (N.I.D.A., 2000).

Cognitive Effects
Dopamine

“Dopamine is a neurotransmitter present in regions of the brain that regulate movement, emotion, cognition, motivation, and feelings of pleasure.

When drugs of abuse are taken, they can release 2 to 10 times the amount of dopamine than natural rewards. The resulting effects on the brain's pleasure circuit dwarfs those produced by naturally rewarding behaviors such as eating and sex. The effect are so strong that it motivates people to take drugs repeatedly” (N.I.D.A., 2007).

The brain begins to adjust to the surges of dopamine and begins to produce less dopamine or by reducing the amount of receptors.

Their levels get so low that they begin to take more of the drug in order to get their dopamine levels up to normal. An effect known as tolerance (N.I.D.A., 2007).

Dopamine Releasing Chemicals

- Alcohol
- Opiates
- Cocaine
- Amphetamines
- MDMA
- Cannabinoids
- Inhalants
- Nicotine
- Caffeine
- Anabolic Sterioids

(Gilbert, 2008)

Dopamine

(N.I.D.A., 2007)
Arrested Development

- **Definition:** becoming stranded at the psychosocial stage which prevailed at the time of drug use.
- **Effects:**
  - Increased social disinhibition
  - Risky, impulsive behavior
  - Poor planning and judgment
  - Little ability to weigh consequences

(Gilbert, 2008)

Arrested Development

- If you arrest at the age of 13 and get sober at 18, you are emotionally 13 years old.
- At age 11 or 12, before puberty, there’s only about 50 percent of the neurochemicals needed to make the brain work properly. At age 18, it’s about 75 percent (Gilbert, 2008).

Gogtay et al., 2004)
Social Emotional Effects
Natural Inclination

• “For many teens, their brains and bodies drive them toward risky or thrill-seeking behavior.

• For teens, who are socially awkward, the use of drugs can provide them an entry way into the social world” (Berger, 2010).

Significant Factors

- Age
- Culture
- Cohort
- Gender

(Berger, 2010)

Age

- Drug use becomes more widespread from about 10-25 years of age.

- Drug use before 18 is the best predictor of later drug abuse (Berger, 2010).

Age Differences

- “Inhalants are the only drug category used more by 8th graders (16%) than 12th graders (11%).

- Middle school boys who live in quiet neighborhoods are particularly vulnerable” (Berger, 2010).

Cohort Differences

- “In general, drug use among adolescents has decreased in the U.S. since 1976. Most teens have experimented with drugs but are *not* regular drug users.

- Adolescent culture may have a greater effect on drug-taking behavior than laws do.

- A significant minority (about 20%) never use any drugs, usually because of religious values” (Berger, 2010)

Gender

• “With some exception, adolescent boys use more drugs and more often than girls do.
• Heavy use of drugs (such as daily use of marijuana) is about twice as prevalent among boys.
• Among 8th graders, drug use is unisex, but drug use increases faster among boys than girls” (Berger, 2010).

Social Connections

• “For many teens, drug use signifies independence from social restrictions,
• Enhances sensations, and fosters social connections.
• “Many adolescents believe that occasional use is harmless, just an expression of friendship or generational solidarity” (Berger, 2010).

Adolescents who abuse drugs often:

- Act out
- Do poorly academically
- Drop out of school
- Are at risk for unplanned pregnancies, violence, & infectious diseases


Emotional Aspects

“Since psychoactive drugs excite the limbic system and interfere with the prefrontal cortex, drug users tend to be more emotional (specifics vary, from ecstasy to terror to paranoia to rage) than they otherwise would be, as well as less reflective” (Berger, 2010).

Motivations

- To feel good
- To feel better
- To do better
- Curiosity & “because others are doing it”

(N.I.D.A., 2007)

Environmental Factors That Increase Risk

- **Home & Family**

- **Peer & School**
  (N.I.D.A., 2007)
  - Peer Pressure
  - Popularity
  - Conformity
  (Santor, Messervey, and Kusumakar, 2000)


Results of Study

- “Perceived peer pressure and a need to be popular were strongly interrelated but did not predict risk behaviors and psychosocial difficulties equally well.

- Doing thing to be popular with others may be less of a risk factor than the experience of being urged or pressured to act in certain ways, but it is related to feeling pressured by others to engage in certain activities.

- Strong correlation between substance use, peer pressure, and peer conformity exists and is a strong predictor of risk behaviors” (Santor, Messervey, and Kusumakar, 2000).
Preventative Social Factors

- Involvement in community activities
- Social support from community members
- Strong attachments to family
- All lead to higher self esteem and less risk taking behaviors

(Peterson, Buser, and Westburg, 2010)

References

References
