

ALCOHOL AND THE DEVELOPING BRAIN

Alcohol can cause alterations in the structure and function of the developing brain, which continues to mature into a person's mid 20s, and it may have consequences reaching far beyond adolescence.

In adolescence, brain development is characterized by dramatic changes to the brain's structure, neuron connectivity (i.e., "wiring"), and physiology. These changes in the brain affect everything from emerging sexuality to emotionality and judgment.

Not all parts of the adolescent brain mature at the same time, which may put an adolescent at a disadvantage in certain situations. For example, the limbic areas of the brain mature earlier than the frontal lobes. The limbic areas regulate emotions and are associated with an adolescent's lowered sensitivity to risk. The frontal lobes are responsible for self-regulation, judgment, reasoning, problem-solving, and impulse control. Differences in maturation among parts of the brain can result in impulsive decisions or actions and a disregard for consequences.

How Alcohol Affects the Brain

Alcohol affects an adolescent's brain development in many ways. The effects of underage drinking on specific brain activities are explained below.

Alcohol is a central nervous system depressant. Alcohol can appear to be a stimulant because, initially, it depresses the part of the brain that controls inhibitions.

CEREBRAL CORTEX—Alcohol slows down the cerebral cortex as it works with information from a person's senses.

CENTRAL NERVOUS SYSTEM—When a person thinks of something he wants his body to do, the central nervous system—the brain and the spinal cord—sends a signal to that part of the body. Alcohol slows down the central nervous system, making the person think, speak, and move slower.

FRONTAL LOBES—The brain's frontal lobes are important for planning, forming ideas, making decisions, and using self-control.

When alcohol affects the frontal lobes of the brain, a person may find it hard to control his or her emotions and urges. The person may act without thinking or may even become violent.

Drinking alcohol over a long period of time can damage the frontal lobes forever.

HIPPOCAMPUS—The hippocampus is the part of the brain where memories are made.

When alcohol reaches the hippocampus, a person may have trouble remembering something he or she just learned, such as a name or a phone number. This can happen after just one or two drinks. Drinking a lot of alcohol quickly can cause a blackout—not being able to remember entire events, such as what he or she did last night.

If alcohol damages the hippocampus, a person may find it hard to learn and to hold on to knowledge.

CEREBELLUM—The cerebellum is important for coordination, thoughts, and awareness. A person may have trouble with these skills when alcohol enters the cerebellum. After drinking alcohol, a person's hands may be so shaky that they can't touch or grab things normally, and they may lose their balance and fall.

HYPOTHALAMUS—The hypothalamus is a small part of the brain that does an amazing number of the body's housekeeping chores. Alcohol upsets the work of the hypothalamus. After a person drinks alcohol, blood pressure, hunger, thirst, and the urge to urinate increase while body temperature and heart rate decrease.

MEDULLA—The medulla controls the body's automatic actions, such as a person's heartbeat. It also keeps the body at the right temperature. Alcohol actually chills the body. Drinking a lot of alcohol outdoors in cold weather can cause a person's body temperature to fall below normal. This dangerous condition is called hypothermia.

Sources

*Office of the Surgeon General. (2007). The Surgeon General's Call to Action To Prevent and Reduce Underage Drinking (PDF 1.41MB) Rockville, MD: U.S. Department of Health and Human Services.

*Office of the Surgeon General. (2007). The Surgeon General's Call to Action To Prevent and Reduce Underage Drinking: A Guide for Families (PDF 900KB) Rockville, MD: U.S. Department of Health and Human Services.

*U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Ad