

Inhalants

The Brain's Response to Drugs

BACKGROUND

Most inhalants are common household products that give off mind-altering chemical fumes when sniffed.

These common products include paint thinner, fingernail polish remover, glues, gasoline, cigarette lighter fluid, and nitrous oxide. They also include fluorinated hydrocarbons found in aerosols, such as whipped cream, hair and paint sprays, and computer cleaners. The chemical structure of the various types of inhalants is diverse, making it difficult to generalize about the effects of inhalants. It is known, however, that the vaporous fumes can change brain chemistry and may be permanently damaging to the brain and central nervous system.

- Inhalant users are also at risk for **Sudden Sniffing Death (SSD)**, which can occur when the inhaled fumes take the place of oxygen in the lungs and central nervous system. This basically causes the inhalant user to suffocate.
- Inhalants can also lead to death by disrupting the normal heart rhythm, which can lead to cardiac arrest.
- Use of inhalants can cause hepatitis, liver failure, and muscle weakness.
- Certain inhalants can also cause the body to produce fewer of all types of blood cells, which may result in life-threatening aplastic anemia.

Inhalants also alter the functioning of the nervous system. Some of these effects are transient and disappear after use is discontinued. But inhalant use can lead to serious neurological problems, some of which are irreversible.

- Frequent long-term use of inhalants can cause a permanent change or malfunction of nerves in the back and legs, called polyneuropathy.
- Inhalants can also act directly in the brain to cause a variety of neurological problems.
- Inhalants can cause abnormalities in brain areas that are involved in movement (the cerebellum) and higher cognitive function (the cerebral cortex).

MECHANISM OF ACTION

Inhalants enter the bloodstream quickly and are then distributed throughout the brain and body. They have direct effects on both the central nervous system (brain and spinal cord) and the peripheral nervous system (nerves throughout the body).

Using brain imaging techniques, such as magnetic resonance imaging (MRI), researchers have discovered that there are marked structural changes in the brains of chronic inhalant abusers. These changes include a reduction in size in certain brain areas, including the cerebral cortex, cerebellum, and brainstem. These changes may account for some of the neurological and behavioral symptoms that long-term inhalant abusers exhibit (for example, cognitive and motor difficulties). Some of these changes may be due to the effect inhalants have on myelin, the fatty tissue which insulates and protects axons and helps speed up nerve conduction. When inhalants enter the brain and body, they are particularly attracted to fatty tissues. Because myelin is a fat, it quickly absorbs inhalants, which can then damage or even destroy the myelin. The deterioration of myelin interferes with the rapid flow of messages from one nerve to another.

Inhalants can also have a profound effect on nerves that are located throughout the body. The polyneuropathy caused by some inhalants, as well as other neurological problems, may be due in part to the effect of the inhalants on the myelin sheath that covers axons throughout the body. In some cases, not only is the myelin destroyed, but the axons themselves degenerate.

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