INHALANTS
HISTORY OF INHALANTS:

- **800 BC - 392 AD** Oracle at Delphi inhales Ethylene vapors from fissures in the rock beneath the temple. The oracle would answer questions or make prophecies after entering a “trance” or being in a state of “frenzy.”

- **1275** Ether was named “sweet vitriol” when it was discovered by Spanish chemist Raymundus Lullius.

- **1772** Nitrous Oxide gas was first discovered by English scientist Joseph Priestley.
1831 – 1832 Chloroform was discovered independently by 3 scientists: Samuel Guthrie, Justus von Liebig, and Eugene Soubeiran. Originally used as treatment for asthma.

1840 Ether used as a social lubricant for parties called “Ether Frolics.”

Late 1940s First known outbreak of gasoline sniffing in Warren, Pennsylvania.

1950s Reports of many cases of deliberate inhalation of gasoline fumes by young people in the US, Australia, India, and Great Britain.

1959 Earliest known references to glue-sniffing in either medical or popular literature.

1960s An increasing number of newspaper articles report adolescents sniffing airplane glue.

1961 – 1965 Glue sniffing epidemic in Denver. The epidemic may have been caused by hyperbolic media reports about the activity. Reports of glue sniffing soon spread to other U.S. cities like New York and Salt Lake City.
TERMINOLOGY

**Sniffing** - Inhaling vapors from an open container or off a heated pan

**Huffing** - Inhaling vapors from a volatile-soaked cloth held against the face

**Bagging** - Application of the volatile into a paper or plastic bag, which is then held over the face
The Users, The Culture
Inhalants don’t get a lot of attention

But...

In the 1990s, they were the second most commonly-used illicit drug among 12-17-year olds.

(Brouette & Anton, 2001).
Source: University of Michigan, 2001 Monitoring the Future Study
Types of Inhalants

All different psychoactive substances are together grouped as Inhalants

3 groups of Inhalants:
- Solvents
- Anesthetics
- Nitrites
<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solvents (common household products)</td>
<td>model airplane glue, rubber cement, household glue</td>
</tr>
<tr>
<td>Adhesives</td>
<td>spray paint, hairspray, air freshener, deodorant, fabric protector</td>
</tr>
<tr>
<td>Aerosols</td>
<td>nail polish remover, paint thinner, type correction fluid and thinner, toxic markers, pure toluene, cigar lighter fluid, gasoline, carburetor cleaner, octane booster</td>
</tr>
<tr>
<td>Solvents and gases</td>
<td>dry cleaning fluid, spot remover, degreaser</td>
</tr>
<tr>
<td>Cleaning agents</td>
<td>vegetable cooking spray, dessert topping spray (whipped cream), whippets</td>
</tr>
<tr>
<td>Food products</td>
<td></td>
</tr>
<tr>
<td>Anesthetic</td>
<td>nitrous oxide, ether, chloroform, isofluorane, desflurane...</td>
</tr>
</tbody>
</table>

![Nitrous Oxide Tank](image1.jpg)

![Nitrous Oxide Hardware](image2.jpg)

![Reddi-wip](image3.jpg)
## Nitrites

<table>
<thead>
<tr>
<th>Sodium nitrite</th>
<th>Curing meat</th>
</tr>
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Amyl

- Vasodilator; treatment for angina

Butyl

- “Poppers”, "Rush," "Locker room," "Bolt," "Climax," also marketed in head shops as "video head cleaner"
Why are Inhalants so Popular?

- Easy to obtain
- The high is achieved instantly and lasts 5-15 minutes. (Pandina and Hendren 1999).
- Easy to conceal (e.g., permanent markers, correction fluid)
- Since inhalants are common, youths have misperception of safety (Johnston et al. 2002).
Pharmacokinetics
and
Pharmacodynamics
Inhalants: Pharmokinetics

- **Route of Ingestion:**
  - Inhaled, either directly or by pouring/spraying into a bag or onto a cloth

- **Metabolism:**
  - Liver

- **Distribution:**
  - Some leave the body quickly, others are absorbed by fatty tissues in the brain and nervous system.

- **Half life:**
  - Short half-life: Varies among Inhalants, typically 1-5 mins
Inhalants: Pharmacodynamics

- **Lipid Soluble**: causes a disruption of cell membrane and membrane components.
- **Disruption of electrical Impulses within the system**.
- **Effects GABA neurotransmitters and its effect on GABA-A receptors**.
- **Ultimately it inhibits neuronal activity in the CNS**.
Inhalants: Effects

- Chemicals become absorbed into fatty tissues in the brain and the nervous system
  - Typically affecting the myelin surrounding the bodies nerve cells
  - with long term use myelin is broken down and ultimately nerve cells can not transmit messages to one another.
EFFECTS:
- Immediate effects, usually lasts less than a min. Repeated use extends and intensifies the experience.
- Results in temporary loss of motor control and a "dissociative" psychological effect, where sensations and perceptions become disconnected.
- Effects include a dreamy mental state, and mild audio and visual hallucinations.
Solvents

- Immediate effects.
- Effects include euphoria, delirium and hallucinations.
- Solvents are highly addictive and will cause damage to the liver and CNS.
Poppers

EFFECTS:

- Immediate effects: typically within a few seconds and lasts for 1-2 mins.
- Causes muscles to relax; therefore, the heart rate increases as well as cardiac output. As a result oxygen-rich blood will quickly reach the brain to produce a “rush”.
Sensations

Users may experience:

- Euphoria
- Light-headedness
- Sleepiness
- Distorted Space Perception
- Nausea
- Spinning
- Drunkenness
- Altered shapes and colors
- Dizziness
- Numbness
Undesirable Effects

- Slowed breathing
- Slowed heart rate
- Disorientation
- Loss of body control
Undesirable Effects

- Death
  - Suffocation
    - Choking on one’s vomit while unconscious
  - Asphyxiation
    - Decrease in oxygen and increase in carbon dioxide.
    - Occurs after losing consciousness with plastic bag over the head.
  - “Sudden Sniffing Death”
Undesirable Effects

“Sudden Sniffing Death”

- Prolonged session of inhalation leading to the failure of the heart.
- Can happen any given time someone abuses inhalants.
Effects, Treatment, Prevention
Inhalants: Effects on the Body

- A. Blood- inhalant chemicals will block the oxygen carrying capacity of blood
- B. Lungs- repeated use causes damage
- C. Heart- results in “Sudden Sniffing Death Syndrome”
- D. Liver- components of aerosol and paints will damage the liver
- E. Kidney- Toluene (inhalant substance) will damage the kidney’s ability to control the amount of acid in the blood, may result in kidney stones

www.inhalants.org/damage.html
Inhalants: Effects on the Brain

A. Brain- causes sensory and psychological disorders. Since myelin sheaths are affected cell death is predominant.

B. Cerebral Cortex- Cell death causes permanent personality changes, memory impairment, hallucinations and learning disabilities

C. Cerebellum- damage results in a loss of coordination and slurred speech. Chronic users experience tremors and uncontrollable shaking

The scan shows diffuse, severe changes in cerebral white matter (center).
MRI Scan of 25-Year-Old Chronic Solvent Abuser
- Rosenberg et al.
Possible Long Term Effects of Prolonged Inhalant Abuse

- Depressed CNS Function
- Impaired Motor Coordination
  - Loss/Impaired Vision
- Reduced Lung Function
  - Hearing Loss
  - Liver Damage
- Reduced Kidney Function
- Decreased Sensory Capacity

- Heart Damage
- Neuronal Myelin Sheath Damage
- Muscle Tremor
- Numbness in extremities
  - Slurred Speech
  - Memory Loss
  - Decreased Sensory Capacity

Note: Neurological Deficits appear to be reversible with time and appropriate medical/rehabilitative services.
Tolerance and Withdrawal Symptoms

- Tremors
- Irritability
- Insomnia
- Delirium
- Tingling Sensations
- Seizures
- Muscle Cramps
- Anxiety

Physical withdrawal may arise a few hours to a few days after inhalant use.
Treatment

- Difficult to treat
  - Abuse coincides with social, family, financial, or behavior problems
  - Few go voluntarily

- Cognitive impairment may last for months

- Length of treatment may go up to two years
Treatment

Step 1- Detoxification, may last up to a month.

Step 2- Extended Therapy, may last up to two years.

*Initial therapy sessions are between 15-20 minutes. Inhalant abusers have short attention spans and exhibit difficulty with complex thinking.*
Most successful prevention program involves comprehensive school Health Education.

- Multiple years of programming
- Interactive Methods
- Development of skills (assertiveness)
- Peer-to-peer activities
- Providing information on risks.