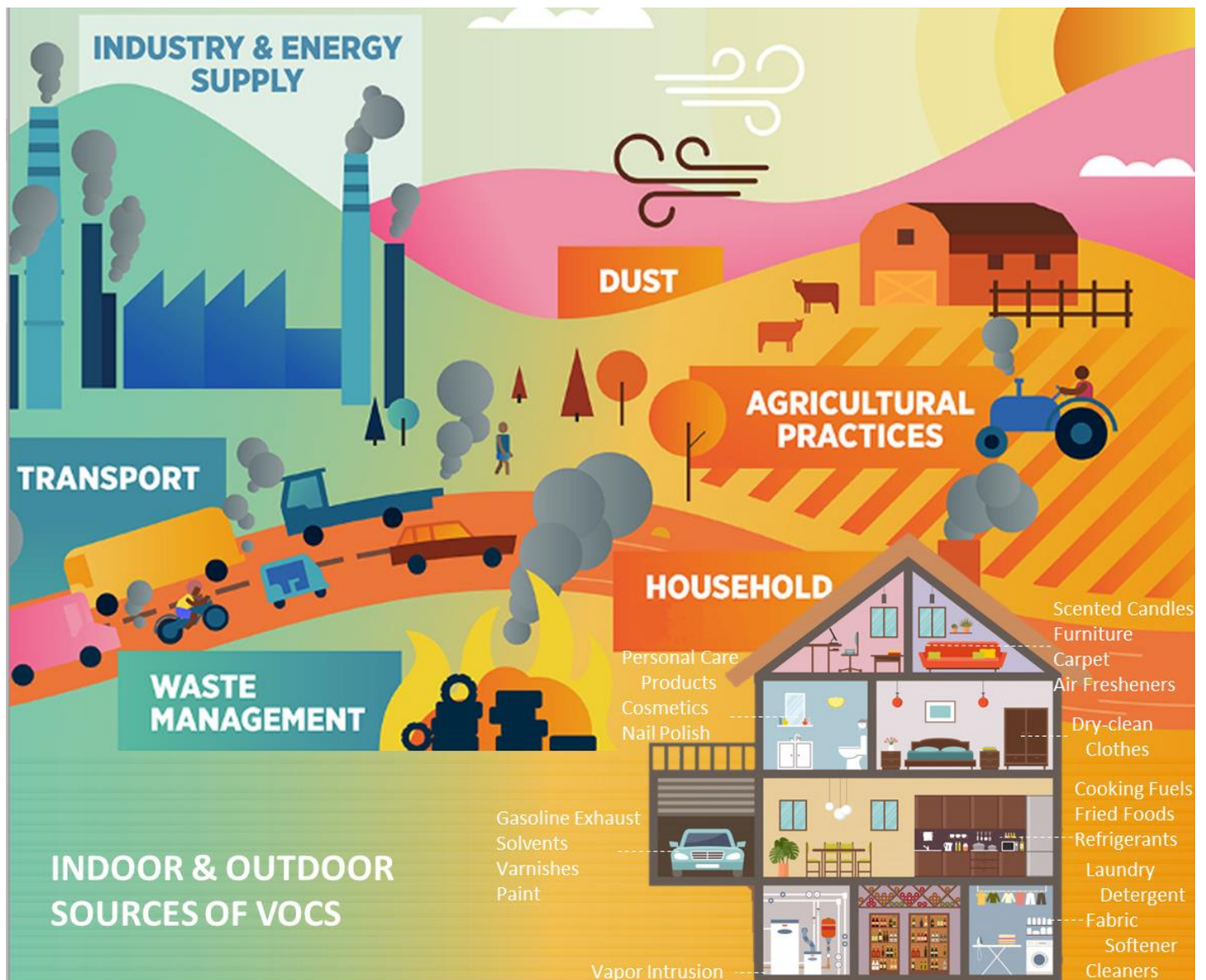


# Volatile Organic Compounds: Common Exposures

## What are Volatile Organic Compounds?

Volatile organic compounds (VOCs) are chemicals that can vaporize at room temperature. Many VOCs are found naturally in the environment. However, some VOCs are also released from man-made sources such as paints, cleaners, cigarette smoke, car exhaust, and factories. This means that VOCs are prevalent in both indoor and outdoor environments. This also means that background VOC levels may be near or above harmful levels. The U.S. Environmental Protection Agency (EPA) reports that many VOCs are found at higher levels indoors than outdoors. Thus, indoor VOCs are a main source of exposure. The EPA also reports that Americans spend most of their time indoors, so indoor VOCs can pose a serious health risk.

## What are the sources?



## What are the Health Effects?



Cancer



Liver Damage



Cardiovascular Disease



Kidney Damage



Respiratory Irritation



Gastrointestinal Complications



Eye, Nose, and Throat Inflammation



Skin Irritation



Headache, Dizziness



Altered Blood Flow in Extremities

## Potential Sources and Known Health Effects of Volatile Organic Compounds

| <i>Volatile Organic Compound</i> | <i>Potential Sources</i>   | <i>Known Health Effects</i>  |
|----------------------------------|--|--|
| <i>1,3-Butadiene</i>             | Cigarette smoke, Industry, Rubber manufacturing, Gasoline exhaust  | Respiratory irritation, Cancer, Cardiovascular disease   |
| <i>Acrolein</i>                  | Natural internal production, Combustion, Cigarette smoke, Fried and burnt foods, Beer, Coffee                  | Eye and skin irritation, Respiratory irritation, Cardiovascular disease, Cancer                |
| <i>Benzene</i>                   | Naturally occurring, Cigarette smoke, Industry, Gasoline exhaust, Plastics                                     | Gastrointestinal disturbances, Difficulty breathing, Cancer                                    |
| <i>Carbon tetrachloride</i>      | Old fire extinguishers, Refrigerants, Dry cleaning   | Liver damage, Kidney damage, Cancer  |
| <i>Chloroform</i>                | Chemical manufacturing, Cigarette smoke, Water chlorination  | Respiratory irritation, Cancer, Kidney damage, Liver damage, Central nervous system depression |
| <i>Formaldehyde</i>              | Natural internal production, Combustion, Cleaning products, Building materials, Cigarette smoke, Preservatives | Respiratory irritation, Cancer   |
| <i>Methane</i>                   | Natural gas, Decomposition of organic material, Industry   | Generally non-toxic  |
| <i>Trichloroethylene</i>         | Industry, Dry cleaning, Cleaning products, Refrigerants  | Central nervous system depression, Headache, Respiratory and circulatory depression, Cancer    |
| <i>Vinyl chloride</i>            | Cigarette smoke, PVC production, Industry  | Dizziness, Altered blood flow in hands and feet, Liver damage, Cancer                          |

## Ways to Reduce Exposure

Physical measures can help reduce the health impacts of VOCs. The EPA has recommended guidelines for indoor VOC levels to minimize exposure from building materials. One possible source of indoor exposure is vapor intrusion. Vapor intrusion occurs when VOCs are released from underground sources and move through the soil to enter homes and other buildings. If vapor intrusion is found to be an issue, systems can be put in place to help reduce indoor VOCs. The most common of these systems are vapor barriers, which are physical barriers that create a seal between the building and the ground underneath to prevent VOCs from entering the structure. Some indoor VOC levels are linked to household products. Proper handling and storage of these products can help decrease exposure. Products containing VOCs often include product warning labels that explain the right way to use them. Using these products in a well-ventilated space is typically recommended. Although house plants have numerous health benefits, they are not proven to be helpful in adequately reducing indoor VOCs. Medical treatments for VOC exposure are currently an important area of research. Scientists are interested in using antioxidants to decrease the harmful effects of VOCs. Early studies of the compound carnosine, a naturally-occurring compound found in muscle, brain, and heart tissue, show some protection against VOC exposure. A current study (the NEAT trial at the University of Louisville) is looking into whether these effects are also seen in humans.

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