

Activity 1b: Aerosol Analysis

E-cigarette ‘clouds’ are not harmless water vapor. Scientific studies have identified hundreds of chemicals in the e-cigarette aerosol which is inhaled by the user and could also be inhaled by people nearby as second-hand aerosol.

1. Read the following information about the chemicals in e-cigarette aerosol.
2. As a group, record the chemicals’ effects on different sticky notes.
3. Post your sticky notes next to the appropriate organ poster/sign.

Toxicants (e.g. Nicotine): Toxicants are substances found in nature that can be toxic to the body when inhaled or ingested. Nicotine is considered a severe toxicant and psychoactive substance.

- **Nicotine** is the highly-addictive drug found in tobacco leaves, cigarettes, and most e-liquids. It changes the brain causing addiction, depression, and anxiety.
- Nearly all e-liquids contain nicotine, even some that claim they don’t.
- Nicotine overdose symptoms include vomiting, diarrhea, dizziness, uncontrolled shaking, rapid heart rate, seizures and even death.
- E-liquids with nicotine can be deadly if swallowed. Since 2013, there have been over 25,000 poison control center cases related to e-liquid; most were children.



Flavor Chemicals (e.g. Diacetyl, Cinnamaldehyde, Benzaldehyde): Flavor chemicals are substances added to hide the taste of e-cigarette aerosol to make it more appealing and to attract young users. There are more than 8,000 flavors and thousands more flavor chemicals being used in e-liquids.

- Flavor Chemicals often irritate the nose and throat causing coughing, wheezing, and shortness of breath.
- When **diacetyl** is regularly inhaled, it causes a condition known as ‘popcorn lung’ which scars your lungs and is potentially fatal.
- **Diacetyl (butter)** and **cinnamaldehyde (cinnamon)** are two examples of flavor chemicals that have known harmful effects on the lungs, but e-cigarette companies used them anyway. While some companies still choose to ignore this information, others removed the chemicals from their products. If stronger regulation isn’t in place or companies choose to ignore known side-effects, what else could be included in e-juice?



Carcinogens (e.g. Formaldehyde): Carcinogens are substances that are known to cause cancer.

- **Formaldehyde** is a by-product created when e-liquid is heated. It is also found in glue, concrete, nail polish, and the embalming fluid used to preserve dead bodies.
- Inhaling formaldehyde can make you feel sick, causing symptoms like sore throat, cough, scratchy eyes, and nosebleeds. It's also known to cause cancer, particularly of the nose and throat.
- Formaldehyde may also cause birth defects and damage to the liver, kidneys, brain, and spinal cord.



Heavy Metals (e.g. Nickel, Tin, Lead): Heavy metals are created when e-liquid is heated or leaked from inside the device. Heavy metals have a very high density and are highly toxic to humans.

- Heavy metal poisoning affects many organs in the body. Side effects include stomach cramps, headache, kidney disease, and bone damage.
- They can also cause neuropathy (brain dysfunction/disease) such as reduced intelligence, decreased memory, and brain cancer.
- Heavy metals are found in magnets, bullets, coins, and batteries.



Volatile Organic Compounds (e.g. Cadmium, Acrolein): Volatile organic compounds (VOCs) are created when e-liquid is heated. VOCs are gases that leak from certain solids or liquids. VOCs include a variety of chemicals, many of which may have negative health effects.

- Breathing **acrolein** for even a short time can cause eyes to water and a sore nose/throat. Long-term exposure at high levels is severely toxic to the lungs and can be fatal.
- Acrolein has been found in chemical weapons and is linked to lung cancer.
- When **cadmium** dust is inhaled, it causes dryness of the throat, choking, headache, and pneumonia-like symptoms. Cadmium is often found in batteries.

