Table 1. Chemicals contained in vapes and their health impacts

Chemical group	Chemical details	Other uses and health impacts
e-liquid ingredients These are chemicals that have been added to the e-liquids on purpose	Propylene glycol	Used in **antifreeze**.
	Ethylene glycol	Large amounts are toxic and can **damage your nervous system**, also used in **antifreeze**.
	Glycerine	Often used in food but when you breathe it in it **can damage the airways**.[11]
	Toluene	A chemical used in **paint thinner, permanent markers, glue and cement**
	Phenol	Comes from **coal tar** and used to make **detergents, bug spray and paint stripper** – can harm the eyes, skin, airways and nervous system, causing **seizures**. Breathing in for a long time can harm the **liver and kidneys**.
	Xylenes	Used to make **plastic bottles, paint thinner**, it slows down the nervous system and can cause **headaches, dizziness, nausea, vomiting** and slow down your reaction time.
	Ethyl acetate	Used in **nail polish remover,** and can harm the eyes, nose and throat and slow down the nervous system.
	Methanol	The purest form of alcohol, can lead to death when small amounts are swallowed and can cause blindness.
	Pyridine	Used in **bug spray**, is **toxic** and **flammable**. When burnt it makes **carbon monoxide** – a poisonous gas that's in **car exhaust**. When you breathe it in, it **hurts the throat**, slows down the nervous system and can cause dizziness, headache, nausea and can make you pass out.
	Acetylpyrazine, 2,3,5-trimethylpyrazine	These chemicals are used to make the flavours. **They are not made to be inhaled so can damage your throat and lungs.**
	Benzene, ethylbenzene, styrene[12]	Are used to **make petrol and are known to cause cancer** (carcinogenic). Benzene is the biggest air-borne cause of cancer in countries like Australia and America and one of the **main ingredients in cigarettes that causes cancer**. [11]
	Nicotine	Nicotine is a drug that can make you feel relaxed and stimulated. It hits your brain within seconds of breathing it in, making your heart race. **"Nicotine dependence" is when you need nicotine all the time to feel normal and it can develop quickly**. Over time, the number of receptors in the brain that use nicotine increases, meaning you need more nicotine to satisfy them. When you don't have nicotine, you get withdrawal symptoms like grouchiness, stress, anxiety, cravings, poor sleep and the shakes. Nicotine is in most vapes, even if the label doesn't say so.
Chemical reactions These are new chemicals that are created via chemical reactions when the coil heats the e-liquid.	Aldehydes (predominantly acetaldehyde and formaldehyde)	**Acetaldehyde can cause cancer**. It harms the skin, eyes, nose, mouth and throat and can cause nausea, vomiting and headaches.[13] Formaldehyde is also cancer-causing and highly toxic.
	Acrolein (propenal)	Acrolein is **very harmful to the skin, eyes and nasal passages**.
	Free radicals and reactive oxygen species and furans	Free radicals are very 'reactive' and **harmful to human tissue**.
Contaminant chemicals These are chemicals that 'leak' into the e-liquid and aerosol from the materials the e-cigarette device is made of, including metals and plastic.	Metals, with the following having been reported in aerosols: aluminium, antimony, arsenic, boron, cadmium, chromium, copper, iron, lanthanum, lead, nickel, potassium, silver, tin, titanium, zinc	Heavy metals are known to be very toxic to humans. **Chromium and arsenic cause cancer**. Breathing in a lot of heavy metals can poison you, causing long-term health effects and death.

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