

INDEPENDENT TEST

THE HARMFUL CHEMICALS IN VAPE JUICES

Study on vape liquids finds that they are filled with hazardous and carcinogenic substances

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An independent test carried out on popular vape liquid samples readily available in the market suggests that users are at risk of developing cancer and other life-threatening health complications.

Among the more hazardous compounds in the vape liquids and vapour include heavy metal like lead, as well as formaldehyde, a compound widely used in embalming corpses.

With over 1,000 types of chemicals used in the preparation of these juices, experts dismissed popular marketing campaigns that promote vaping to be a "healthier alternative" to smoking.

The *New Straits Times* commissioned an extensive laboratory study on vape samples bought off the market for an analytical chemist from Universiti Teknologi Mara, Dr Noraini Kassim,

Testing method

The composition of vape liquids was analysed using a separation technique called gas chromatography.

A small sample of vape liquid is injected into a gas chromatograph machine, which will separate the chemical compounds.

When the compounds reach the detector, they are identified and displayed on a monitor. Each sample takes approximately 35 minutes to analyse.

to test.

The result of Noraini's analysis concurred with earlier tests carried out by Universiti Putra Malaysia's (UPM) Dr Emilia Zainal Abidin, Universiti Kebangsaan Malaysia's (UKM) Dr Aziemah Zulkifli and Management & Science University's (MSU) Dr Najihah Zainol Abidin.

Emilia is an associate professor at UPM's Department of Environmental and Occupational Health while Aziemah is a senior lecturer at UKM's Institute for Environment and Development. Najihah is an environmental health expert at MSU.

Their findings from studying the ingredients? Exactly what doctors and researchers had been concerned about.

The vape juices that were analysed consist of four main compounds — propylene glycol (PG), vegetable glycerine (VG), nicotine, and different flavouring agents.

The liquids that were analysed by Dr Emilia, Aziemah and Najihah found an additional compound — tobacco-specific nitrosamines (TSNAs).

PG is an odourless and colourless liquid often used as a solvent, intermediate and molecule carrier in a host of food and industrial products including paint.

While the United States Food and Drug Administration (FDA) lists PG as "Generally Recognised as Safe", the interaction between PG and heat in vape devices has raised concerns about the potential health risks.

VG is often considered a more natural alternative to PG. It is a solvent used as a base in vape juices as it produces vapour clouds more easily than PG.

Nicotine is synonymous with smoking. Found in tobacco, it is what makes smoking addictive.

The concern with nicotine use in vape juices is that it can be absorbed into the bloodstream in seconds and lead to addiction.

Among the flavourings found in the vape juices tested include



Universiti Teknologi Mara expert Dr Noraini Kassim extracting vape liquid at the varsity's Faculty of Applied Sciences in Shah Alam on Sept 24. PIC BY GENES GULITAH

eucalyptol, levomenthol, eugenol, ester and carvone, all of which are colourless and produce different fragrances and flavours.

These flavourings are either synthetic or derived from natural oils. While these ingredients are generally considered safe, levomenthol can be toxic if swallowed.

Levomenthol is often used in nasal decongestants, topical analgesics and local anaesthetics and if ingested, can cause stomach pain, dizziness, drowsiness, impaired coordination and even unconsciousness.

TSNAs are a group of carcinogenic chemicals.

The analysis carried out by Dr Emilia, Dr Aziemah, and Dr Najihah found two potent TSNAs, N-Nitrosornicotine (NNN) and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK), in the vapour from all 17 vape juices tested.

NNN and NNK are classified as Group 1 carcinogens by the International Agency for Research on Cancer (IARC), indicating they pose the highest risk of causing cancer in humans.

VAPOUR

The analysis of the vapour produced from Dr Emilia, Dr Aziemah and Dr Najihah was more alarming. The vapour was found to contain aldehydes and heavy metals.

Among aldehydes and heavy metals found in the vapour from the 17 vape juices include formaldehyde, acetaldehyde, aluminium, chromium, iron, nickel, copper, cadmium and lead.

Of these, formaldehyde and nickel levels exceeded the permissible exposure limit.

However, the exposure to these

aldehydes and heavy metals was based on an assumption of 50 puffs or around three puffs per hour.

Heavy vapour device users typically take around 300 puffs daily, meaning their exposure to aldehydes and heavy metals could be beyond permissible limits.

According to various researchers cited by Dr Noraini, TSNAs were detected in vape aerosols at varying levels.

HEALTH IMPLICATIONS

Universiti Malaya's Nicotine

Addiction Research and Collaborating Group deputy coordinator Associate Professor Dr Nur Amani@Natasha Ahmad Tajuddin said there was emerging evidence that vape liquids, might contain up to 1,000 chemical compounds and these could accumulate in the body.

In the short term, vapers can experience headaches, breathing difficulties, throat irritation, and flu-like symptoms, as early as their first puff.

"When PG or VG gets into the

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Expert: Vaping linked to 'popcorn lung'

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lungs, it (the chemicals) sits on the small air sacs called alveoli preventing it from opening.

"Our lungs are like balloons. If we fill them with air they expand, and they should be expanding. But when you fill up them in with PG or VG, it (the chemicals) sits in the lungs and they cannot expand as they should, which causes shortness of breath."

The symptoms can be worse for people with asthma.

Dr Amani said there have been cases of people suffering from chronic obstructive pulmonary disease after vaping.

She said vaping has been linked to "popcorn lung", a condition arising from damage to tiny air sacs and passages in the lungs.

Meanwhile, Dr Emilia, Dr Aziemah and Dr Najihah said on their one-year study on people who vaped, one in three experienced throat irritation.

The study indicated that a small number of people experienced nose bleeds, cough, flu-like symptoms, bloody phlegm and shortness of breath.

The experts warned of the significant risk of developing various forms of cancer and other

health complications due to exposure to NNN and NNK.

They added that formaldehyde, acetaldehyde, and certain heavy metals were also classified as carcinogenic to humans by the IARC.

"Based on the health risk assessment done on the aldehydes and heavy metals from the vapour produced, we calculate that one to two in every 10,000 healthy adults with a similar pattern of use (of vape products) are at risk of developing cancer in their lifetime.

"Although it seems to be very low, it must be emphasised that this calculation is based on 50 puffs per day."

They added that exposure to formaldehyde and acetaldehyde may result in respiratory system and liver cancers, respectively.

Exposure to other heavy metals including chromium, iron, nickel, and cadmium have also been linked to cancer.

Universiti Kebangsaan Malaysia's environmental health

expert Professor Dr Jamal Hisham Hashim said heavy metals absorbed by the body could impact the central nervous system and kidneys.

LONG-TERM EXPOSURE TO PG

Dr Jamal said although PG was generally considered safe when used in high doses or for prolonged periods, PG toxicity could occur especially in children.

He said this could result in central nervous system toxicity, hyperosmolarity (high level of sodium and glucose in blood), haemolysis (destruction of red blood cell), cardiac arrhythmia (irregular heartbeat), seizures, agitation, and lactic acidosis (lactic acid build up in



Professor Dr Jamal Hisham Hashim

blood).

Meanwhile, Dr Amani said there should be a limit to PG consumption.

PG is the largest chemical compound found in vapes.

She said this was because there were cases of children developing seizures after ingesting PG.

WHAT'S IN VAPE JUICES

The vape juices analysed contained four main compounds — propylene glycol, vegetable glycerine, nicotine and flavouring agents.

- PROPYLENE GLYCOL**

A clear, odourless liquid often used in food, medicines and everyday products like cosmetics, paint, and cleaning supplies.
- VEGETABLE GLYCERINE**

It is a thick, sweet-tasting liquid, often seen as a more natural alternative to propylene glycol. It produces vapour clouds more easily than propylene glycol.
- NICOTINE**

Nicotine makes smoking addictive. It can be absorbed into the bloodstream in seconds and lead to addiction.
- FLAVOURINGS**

Colourless liquids which produce different fragrances and flavours. They include eucalyptol, eugenol, ester, carvone and levomenthol, a common ingredient in nasal sprays, topical analgesics and local anaesthetics.

INFOGRAPHIC NST



Dr Emilia Zainal Abidin