

Vaping: Serious side effects

Vaping exposes users to a variety of harmful chemicals and causes serious damage throughout the body, including in the brain, heart, nerves, lungs and immune system. This damage is primarily due to the side effects of toxic compounds that worsen stress responses and inflammatory reactions.

BRAIN

- Nicotine addiction
- Headache
- Dizziness
- Seizures
- Tremors
- Anxiety
- Restlessness
- Confusion
- Attention issues
- Learning disorders
- Mood disorders

LUNGS

- Rapid and shallow breathing
- Coughing
- Wheezing
- Lung damage from diacetyl, a flavouring chemical found in vapes that scars the bronchioles (small airways in the lungs), leading to inflammation and difficulty in breathing
- Asthma
- Pneumonia

KIDNEY

- Damage, especially in adolescents and young adults

CENTRAL NERVOUS SYSTEM

- Breakdown of the protective barrier between the bloodstream and the brain, allowing harmful substances to leak into brain tissue
- Inflammation of the brain, spinal cord and nerves

IMMUNE SYSTEM

- Compromised immune cell function
- Increased inflammation
- Decreased ability of the body to mount an effective defence against infection

EYES

- Irritation, dryness
- Blurred vision

MOUTH

- Irritation, dryness
- Gum disease

THROAT

- Soreness
- Irritation, dryness

HEART

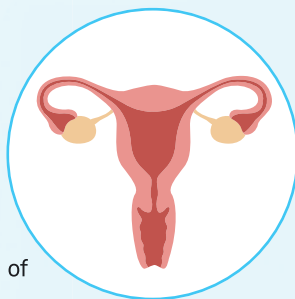
- Increased heart rate and blood pressure
- Blood vessel constriction
- Chest pain
- Increased risk of heart attack and heart failure
- Increased risk of stroke

STOMACH AND INTESTINES

- Nausea, vomiting
- Acid reflux
- Abdominal pain
- Inflammation, which may worsen conditions like inflammatory bowel disease
- Altered balance of bacteria in the gut, potentially leading to metabolic issues
- Diarrhoea

UTERUS

- Delay in implantation of a fertilised egg in the uterus
- Inflammation of uterine lining
- Reduced fertility
- Increased risks of miscarriage, stillbirth and placental abruption (when the placenta separates early from the womb, resulting in a 15 per cent chance of foetal death)



What vaping does to the body: Lung damage, poor brain development, addiction

Judith Tan
Correspondent

Vapes, e-cigarettes, dab pens, pod-mods, and vaporisers – whatever they are called, an increasing number of younger people think they are cool, easy to use undetected, and safer than cigarettes.

But experts warn that vaping is a silent killer, its seemingly less harsh candy, dessert and fruit flavours hiding its ability to cause harm without immediate, obvious symptoms.

In fact, the vaping device, which looks like a pen or a lighter, is potentially more dangerous than cigarettes, said Dr Puah Ser Hon, who heads the Department of Respiratory and Critical Care Medicine at Tan Tock Seng Hospital.

“The vape device is more harmful than a stick of cigarette. There is an end point with a cigarette when it burns out. The device is run on battery, allowing the user to continuously vape until the battery runs out,” said Dr Puah, who is also the chairman of the Smoking Cessation Workgroup at NHG Health.

He told The Sunday Times that the liquid in the e-cigarette device has various chemicals that are not restricted or checked at all.

Vape devices were previously marketed as a safer alternative to smoking, driving people to vape and exposing them to various harmful chemicals that lead to lung damage, nicotine addiction and other health problems.

The United States Centres for Disease Control and Prevention says that apart from nicotine – which is highly addictive and particularly dangerous to youth because their brains are still developing – aerosol from e-cigarettes can contain harmful substances including cancer-causing chemicals and tiny particles that can be inhaled deep into lungs.

According to the American Lung Association, the dangerous chemicals produced include acetaldehyde, acrolein, and formaldehyde, which can cause lung and heart disease.

Acrolein, a herbicide used to kill weeds, can cause acute lung injury and chronic obstructive pulmonary disease, and may cause asthma

and lung cancer.

In addition, experts have warned about the risks of inhaling second-hand e-cigarette emissions, because bystanders may breathe in substances such as nicotine and toxic chemicals within the vapour.

To make things worse, the use of vapes and e-cigarettes is a brewing global crisis – crime syndicates are packing potent and addictive substances into the devices, such as etomidate, an anaesthetic, and more youth are getting hooked on drugs.

In Singapore, where vaping is illegal, there has been a rise in related offences – there were roughly 8,000 cases of e-cigarette use in 2023, a 43 per cent jump from the 5,600 similar offences recorded in 2022.

The Government has announced it is enhancing current enforcement laws, following a spike in seizure of drug-laced e-vaporisers.

Dr Puah said some people have reported an asthma-like attack shortly after vaping, where the airways get constricted, and they feel breathless. In some instances, users suffered e-cigarette or vaping product use-associated lung injury, or EVALI.

“They can come in with severe respiratory failure where the oxygen levels are super low, and they need to go into the intensive care unit. (As) they need help with breathing... we have to attach them to a mechanical (ventilator) that pumps oxygen and helps them breathe,” Dr Puah said.

“There are people who do not survive this. Some who survived may live on with scars in the lungs, and they end up having permanent symptoms like cough and breathlessness,” he added.

WASHING OUT POPCORN LUNGS

Another health problem related to vaping is pulmonary alveolar proteinosis, or popcorn lungs, a rare disease in which protein and fatty material build up in the air sacs of the lungs, making breathing difficult.

Renovation site supervisor Muhammad Dandiar Rosli, 38, who suffered from the condition, had to undergo lung washing, not once but twice – in 2020 and then again in 2021.

The procedure, called whole lung lavage, is the primary treatment for popcorn lungs. The Singapore General Hospital is the only hospital in Singapore that performs it.

Carried out in the operating theatre, and performed on one lung at a time while the patient is under anaesthesia, whole lung washing uses warm sterile saline to wash away abnormal build-up of protein from the lung.

The patient has a double lumen tube inserted through the mouth and into the windpipe to isolate the left and right lungs from each other.

A large volume of saline is infused sequentially into one lung while the patient is ventilated through the other, and the saline is drained out through a bronchoscope until the liquid extracted turns from milky to almost clear.

The whole process takes three to four hours, after which the patient is returned to the intensive care unit and the procedure is repeated for the other lung after one to two weeks.

Vaping is still very new, so there is still a lot to learn about the long-term health effects.

Add drugs into the chemical cocktail, and the health risks increase exponentially.

For instance, etomidate is a short-acting anaesthetic agent used intravenously in clinical practice to induce sedation and general anaesthesia.

Controlled under the Poisons Act, its use is restricted to licensed medical professionals.

Inhaling etomidate directly into the lungs through vapes can cause failure of vital organs. It can also induce confusion, tremors and unsteady gait, leading to falls and accidents.

The Health Sciences Authority (HSA) announced on July 25 that etomidate had been detected in the blood samples of two people involved in a fatal road accident in Punggol Road.

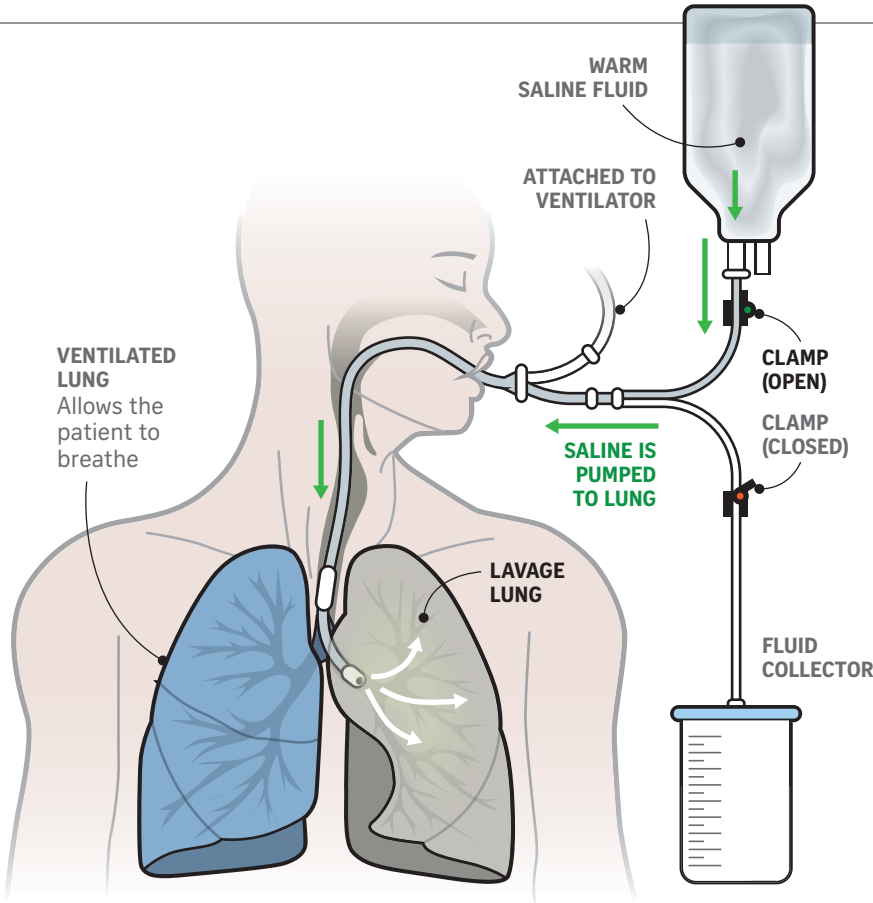
The pair were riding in a car that collided with a bus at about 2.50pm on May 13.

The other drug often found in modified e-cigarettes is ketamine, an anaesthetic doctors use to induce loss of consciousness. It can be injected, or administered orally and through the nose.

Whole lung washing to restore breathing

WHAT THE PATIENT GOES THROUGH:

- Whole lung lavage is performed under general anaesthesia, with the use of muscle relaxants and a combination of sedatives and pain-relief medication.
- The patient is given antibiotics before surgery to decrease the risk of post-operative infections.
- Under general anaesthesia, he is intubated with a large double-lumen tube, and its position is confirmed using fibre-optic bronchoscopy. His temperature, heart rate, blood pressure, the level of carbon dioxide in his exhaled breath and blood oxygen saturation are continuously monitored.
- The patient is then placed in various positions to help drain the fluid used to wash his affected lung. They may include positions where he is face down, on his side, and at an angle with his head higher than his feet.



THE PROCEDURE:

- At the start, both lungs are ventilated with 100 per cent oxygen for 10 minutes to remove nitrogen from the lungs. The targeted lung, usually the more severely affected side, is then isolated and freed of excess gas. The non-lavage lung receives a reduced amount of oxygen, keeping the haemoglobin level in the blood above 90 per cent.
- Sterile warm saline, at 37 deg C, is allowed to flow under gravity into the target lung, up to its estimated capacity. The saline is drained from the lung, helped by manual chest percussion or a vibrating "chest vest" device. Then the cycle is repeated, using 500ml to 1,000ml of saline in each cycle.
- The input and output of fluid are continuously monitored to ensure that there is no net loss of fluid of more than 1,000ml, which may indicate spillage into the other lung or the space between the lungs and the chest wall.

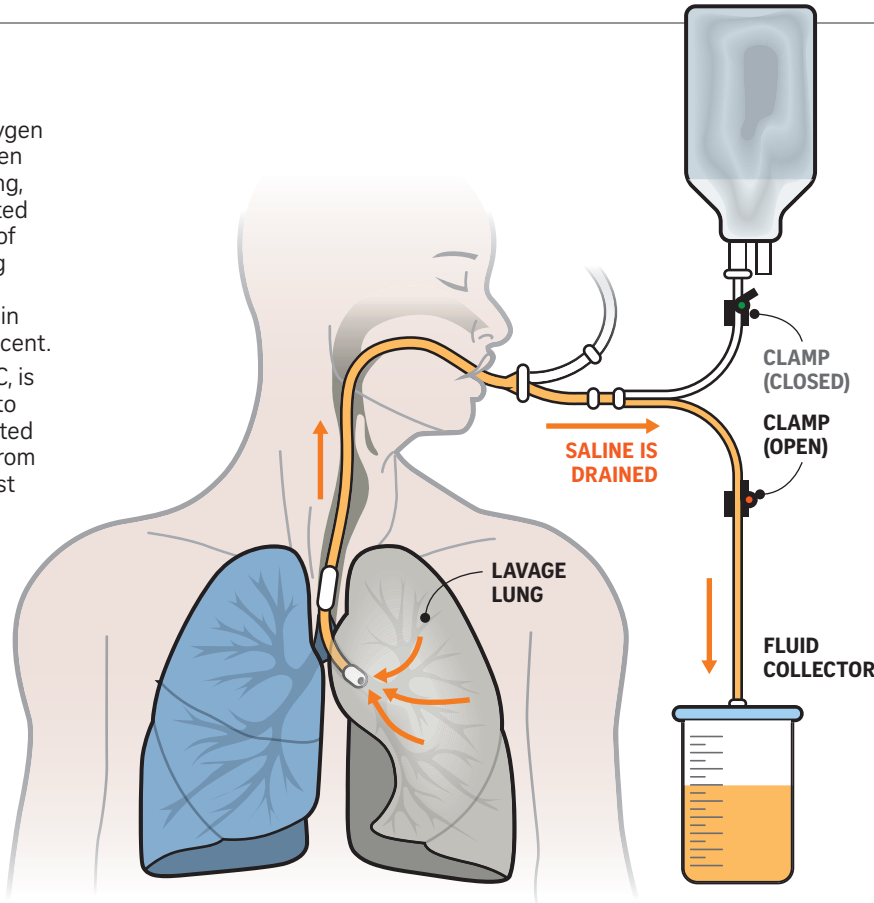


PHOTO: SGH

- The washing continues until the fluid leaving the lungs turns clear (left), signifying the successful removal of the bulk of the proteinous content in the lung with pulmonary alveolar proteinosis.
- The volume of saline that is required may differ for each patient, but can be as much as 30 litres in more severe cases.

- Finally, all the remaining saline fluid is suctioned out from the lungs and both lungs are ventilated. After the procedure, the double lumen tube is replaced by a standard endotracheal tube and the patient is ventilated for six hours. A chest radiograph is done post-procedure to look for complications such as pneumothorax, or air leakage.

Source: JOURNAL OF CARDIOTHORACIC AND VASCULAR ANESTHESIA ST GRAPHICS: MIKE M DIZON

Ketamine on its own can cause severe short-term side effects such as hallucinations and dissociation; impaired motor skills and coordination; increased blood pressure and heart rate; and memory loss.

International studies concluded that when ketamine is smoked, these effects can become more unpredictable due to the drug's altered potency.

TEENS WHO VAPE MORE LIKELY TO HAVE POOR MENTAL HEALTH

On Feb 26, Health Minister Ong Ye Kung said in a written parliamentary reply that there were 2,000 cases of students, including those from institutes of higher learning, reported for possessing or using e-vaporisers in 2024.

This is up from 800 cases in 2022, and 900 cases in 2023.

The problem is exacerbated by easy access to a vaping fix – vapes

are cheaper than cigarettes and can be found via messaging groups, according to users and parents in previous ST reports.

Many users would scan through a series of Telegram groups to pick a seller based on price, and a "deliveryman" would meet them with an e-vaporiser laced with etomidate within two hours.

Some youth turn to vaping as a coping mechanism for stress and other negative emotions, perhaps unaware that it could harm them more than it harms adults.

Exposure to potent psychoactive substances such as etomidate or ketamine through vaping hampers the adolescent brain from developing normally, said Dr Elaine Chew Chu Shan, head of the adolescent medicine service at KK Women's and Children's Hospital.

"The adolescent brain is still undergoing critical development, particularly in areas like the pre-

MORE DANGEROUS

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frontal cortex that governs impulse control, decision-making and emotional regulation, and is particularly vulnerable to the exposure to drugs," she said, adding that there can be "long-term changes in brain structure and function".

Another doctor explained that "youth also metabolise drugs differently than adults, which may lead to unpredictable side effects".

"Sedatives such as etomidate can potentially affect memory, cognition or emotional regulation," said Dr Clare Anne Fong, a consultant with the division of respiratory and critical care medicine in the Department of Medicine at the National University Hospital (NUH) and Alexandra Hospital.

Dr Chee Tji Tjian, a senior consultant with NUH's Department of Psychological Medicine, explains how two chemicals in vaping liquids impact users.

"Nicotine mimics natural neuro-

transmitters and alters neuron communication, particularly in the prefrontal cortex, which governs decision-making and self-control," he said.

Etomidate poses additional risks by suppressing brain activity and "potentially causing long-term neurotoxic effects, including increased vulnerability to emotional dysregulation, anxiety and depression, though research remains limited", Dr Chee added.

With both substances disrupting the dopamine system, which is a network of nerve cells in the brain that use dopamine to communicate, they raise the risk of addiction and persistent behavioural problems.

Dr Chee said that while some ill effects of vaping may improve with early cessation, changes to brain function, especially with repeated exposure, can persist into adulthood, raising the possibility of

long-term neurodevelopmental harm.

Psychiatrist Adrian Wang, who runs his own clinic at Gleneagles Medical Centre, said it is hard to predict who may be vulnerable to such side effects.

"Teenagers with a history of anxiety, depression or past trauma are vulnerable, and those with low self-esteem or impulsive behaviour are also at risk. They may succumb to peer pressure and try these devices out of curiosity, wrongly assuming that they are safe," he said.

"(Drugs such as) etomidate, ketamine and fentanyl can cause loss of consciousness, hallucinations and seizures. Intoxication can be rapid and lead to abnormal behaviour in users before they realise what is happening. It gets them into 'zombie-like' states," Dr Wang added.

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