



E-CIGARETTES



Mysterious vapour

E-cigarettes are considered by many users to be modern, cool, and less harmful to health in comparison to tobacco cigarettes. Their basic principle: vaporising the ingredients instead of burning them. The BfR has investigated this alternative to smoking. The result: e-cigarettes are not without harm.



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We simulate human vaping behaviour using a smoking machine.

The machine hums and bubbles as it sucks in air. Nadja Mallock stands in front of the box with four holders. The scientist has put an e-cigarette, shaped like a very long USB stick, in one of them. The smoking machine draws vapour from the device using a pump. 55 millilitres in three seconds, over and over. Mallock is interested in its constituents. The vapour is formed when the filling in the e-cigarette, the liquid, is heated to around 200 degrees Celsius. The substance vaporises, then passes through a glass fibre filter in the holder, followed by a liquid. “We simulate human vaping behaviour,” says Mallock. “This allows us to study the amount of vapour, problematic substances and nicotine release.”

The pharmacist has been researching tobacco products for her doctoral thesis at the BfR for three years, which is why she is also taking a close look at e-cigarettes. There are many varieties available on the market (see illustration on page 13). Most models consist of a heating element and cartridge. E-cigarettes in the “sub ohm” category are conspicuously large. They have a larger battery and the resistance of the heating coil is low. This increases the power flow. The devices are more powerful and, therefore, emit more vapour, which is inhaled directly from the device into the lungs. The temperature is adjustable between 150 and 350 degrees Celsius. Most recently, Nadja Mallock investigated pod devices in the laboratory – a plug-and-play system. In this system, the heating coil and liquid are in a closed capsule, which is placed on the battery and thrown away after use. She has also researched another alternative to tobacco cigarettes, called “Heat not Burn”. These devices do not burn the tobacco directly; they heat it.

Long-term effects are unknown

Dr. Harald Tschiche, who also works on electronic cigarettes at the BfR, says: “The health risk posed by an e-cigarette is less than that posed by a conventional cigarette when used as intended.” The reasons for this: there are fewer carcinogenic substances produced than with a cigarette, which burns at up to 900 degrees Celsius. However: “Assessing the health risk of e-cigarettes in general is difficult when faced with the variety of models and liquids,” says Tschiche. “For example, the consumer inhales far more vapour with a ‘sub ohm’ model than with other devices.” In addition, the substances may decompose more at higher temperatures. This may result in more substances that are harmful to health being produced, and these get directly into the lungs.

Science is focusing on the liquid in order to further understand the health risks to which people are exposed when vaping. The liquid consists of propylene glycol and glycerine; both are vaporising agents that, when heated, produce the vapour that is also used in fog machines. Fragrances, flavouring substances and nicotine are added. For Tschiche, the components are anything but harmless. “Many of the substances used in e-cigarettes have not been sufficiently investigated.” The chemist mentions the vaporising agents, which are harmless when used for a short time, as examples. Nobody knows how they might affect health when inhaled over a long period of time. Vaporisation produces substances such as acrolein, acetaldehyde or the carcinogenic formaldehyde. Besides this, nicotine in e-cigarettes is also harmful to health and is addictive.

Vitamins and caffeine are prohibited

In Germany, e-cigarettes containing nicotine are subject to the Tobacco Products Regulation, which is based on the EU Tobacco Products Directive. It allows manufacturers to add a maximum of 20 milligrams per millilitre of nicotine to the liquids. Carcinogenic substances as well as additives that pretend to have a health benefit or a stimulating effect are prohibited. Examples of these include vitamins and caffeine. In addition, the packaging must contain information on the ingredients. “The tobacco law is designed to protect consumers,” sums up Tschiche. He therefore criticises nicotine-free liquids, which are only subject to the Product Safety Regulation and the Chemicals Regulation. In comparison, these regulations are far less strict. Here too, manufacturers are obliged to use flavouring and aromatic substances that are not harmful to health. But: often it has not been investigated which influence these substances have on health when they are inhaled once vaporised. Furthermore, the ingredients contained in these liquids, which are also called e-shishas because of their flavours, do not have to be specified.

A problem arises when liquids contain undeclared substances or impurities, such as heavy metals. “Liquids that are not subject to European legislation can be bought worldwide via the internet,” warns Tschiche. In contrast, fillings and components for liquids sold in Germany are checked randomly by the state laboratories.



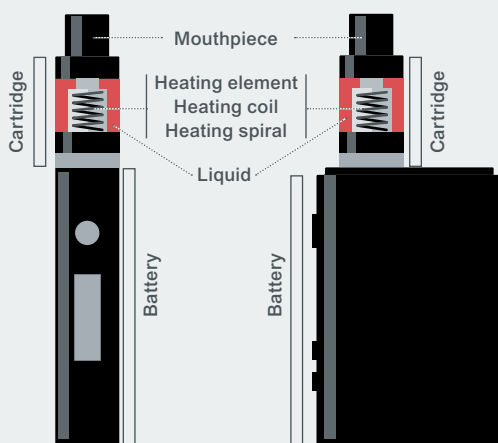
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Cases of poisoning

The BfR and the Society for Clinical Toxicology have evaluated enquiries about e-cigarettes at German poison control centres. Of the 851 poisonings and suspected cases recorded in their “PiMont” study (Pilot Project to establish a national Monitoring of Poisonings), 82 percent related to the accidental ingestion of liquids. These often contained nicotine, which, if swallowed, led to health problems and, in larger quantities, is life-threatening. Small children were often affected. Eight percent of all recorded cases of poisoning or cases of suspected poisoning were due to inhaled vapour from e-cigarettes.

The composition of standard e-cigarettes

There are two models of e-cigarettes, which are comparable in their composition. The model on the right, due to a more powerful battery, emits more vapour, which is inhaled directly into the lungs.



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Shaped like a long USB stick: how much vapour forms from different e-cigarettes? The devices are weighed in the lab in order to find out.



Shaken and checked: the vapour's components are extracted from the smoking machine's filter pad and then analysed.

Fatalities in the USA

It is possible to use self-mixed liquids in e-cigarettes with a fillable tank. Tschiche sees a danger with these open systems: "In principle, any fluid can be mixed into the liquid." This invites misuse, in other words, adding unauthorised or illegal substances.

The BfR advises against self-mixing e-liquids. This applies especially if consumers do not possess sufficient knowledge and experience. DIY mixing, for example, involves the risk of mineral and vegetable oils being used. Liquids should never contain fatty oils, which may lead to serious respiratory disorders if inhaled. Numerous cases of poisoning in the USA may be ascribed to this. By mid-February this year, at least 68 people who had used e-cigarettes were killed and more than 2,700 people were hospitalised. According to the US health agency, the CDC, the poisonings are related to liquids that often contained cannabis oil. They were probably laced with the diluting agent vitamin E-acetate, an oil produced from vitamin E. According to the CDC, initial indications suggest that this substance could be responsible for the lung diseases. There are no known fatalities in Germany. This may be attributed to EU legislation that bans vitamins in liquids.

Vapour is separated into its individual components

In the laboratory, Nadja Mallock opens the smoking machine and takes the filter out of the holder that held the e-cigarette before. Nicotine has stained the once white filter pad slightly yellow as the vapour was drawn through the apparatus. On its journey, remaining substances were collected in impingers, special containers holding a liquid. The scientist injects the samples into different chromatographs in order to be able to examine the traces. The devices separate the components, ultimately revealing the contents of the vapour.

The BfR has been looking at e-cigarettes since 2008, and the work will continue. The technology is changing quickly, as is user behaviour. New models are continually coming onto the market and little is known about their health risks. Therefore, there is great interest in the work of the BfR. Nadja Mallock is certain: "This field of research is becoming more and more interesting." ■

More information:
www.bfr.bund.de/en > A-Z index: electronic cigarette



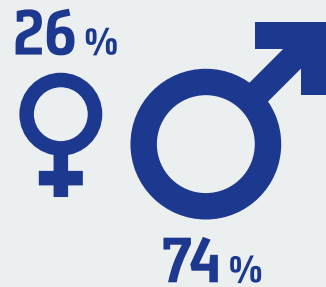
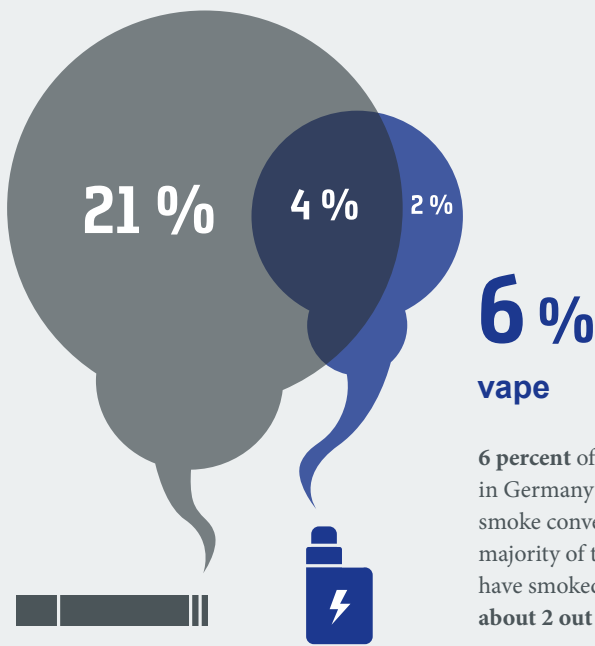
E-cigarettes & Sars-CoV-2 virus?

Infected people can transmit coronaviruses to the mouthpiece while vaping, where these can survive for a certain period. An indirect contact infection of another person is possible if the virus reaches the mucous membranes of the oral cavity. To minimise this risk, e-cigarettes should not be shared with others.

More information:
www.bfr.bund.de/en > A-Z index: COVID-19/corona

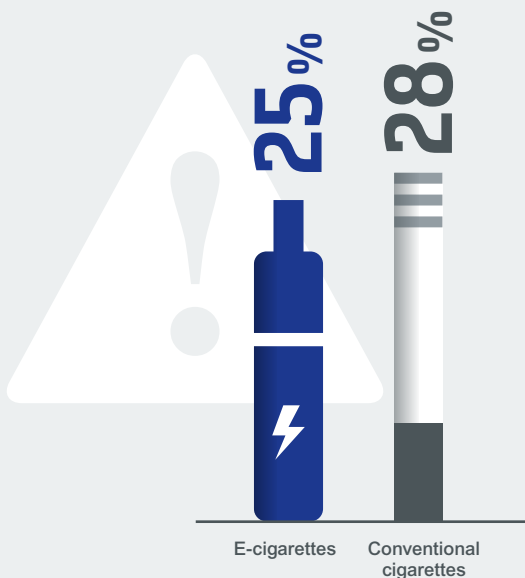
Vapour is in the air

A BfR survey shows how widespread e-cigarettes are in the population living in Germany and what they think about the associated health risks.

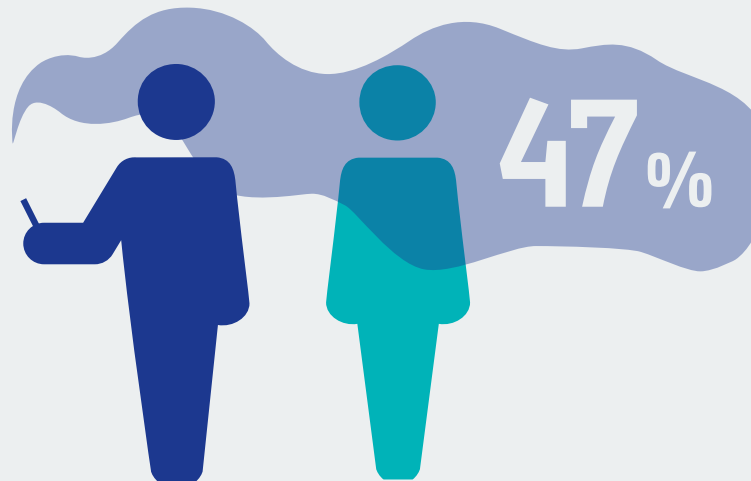


Noteworthy: more men than women vape (74% m, 26% f). The gender ratio among smokers is almost balanced (54 % m, 46 % f).

Higher health risks?



The majority of respondents agree that using e-cigarettes poses potential health risks, particularly effects on the lungs and cancer. Opinions differ, however, when it comes to which of the two products poses greater health risks: 25 percent classify the e-cigarette and 28 percent the conventional cigarette as more risky.



Risks through second-hand vaping

Almost half of the respondents (47%) see potential health risks caused by passive vaping. As many as 30 percent do not expect any risks for bystanders.

Underlying study:
Representative telephone survey of 1,006 people (German-speaking population in Germany aged 14 and above) in December 2019

More information:
www.bfr.bund.de/en > Publications > Brochures > BfR Consumer Monitor > BfR 2019 Consumer Monitor, Special E-cigarettes