

Frequently asked questions about e-cigarettes

BfR FAQ, 01 March 2012

The term "e-cigarette" denotes electronic cigarettes which, while resembling conventional cigarettes, typically contain nicotine-based liquids in cartridges instead of tobacco. During smoking, the liquids become heated by means of a battery-driven heating element and thereby vaporized. Depending on the product, the compositions of the liquids differ widely. Apart from the nicotine, the fumigation agents contained in the liquids as well as additives and possible contaminants can pose a health hazard to e-smokers. The fumes of e-cigarettes contain substances that can be detrimental to health and may also be absorbed by passive smokers through inhalation. It is still unknown, whether e-cigarettes can support tobacco withdrawal or not. In the opinion of the BfR, however, these products are well be capable of inducing nicotine addiction in non-smokers and thus can act as a gateway to tobacco smoking. Generally, very little is known about the long-term health effects of e-cigarettes. The BfR therefore advises consumers to avoid consumption of e-cigarettes in general and recommends, in line with non-smoking law, that e-cigarettes should be treated similar to conventional cigarettes. This means that both tobacco smoking as well as smoking of e-cigarettes should be banned in non-smoking areas.

How do e-cigarettes work?

The design of e-cigarettes mimics the appearance of conventional tobacco cigarettes down to the fake cigarette end which gleams red when the smoker takes a drag. E-cigarettes are often marketed as lifestyle products. The electronic cigarette usually consists of a mouthpiece made of plastic, the vaporizer with a battery-driven heating element, a cartridge with the liquid to be evaporated, and a battery. For the cartridges, refill packs can be purchased at the market. The accessories of an e-cigarette invariably also include a recharging item for the battery. Instead of burning tobacco, the so-called liquid is heated up and, in the style of the smoke of a normal cigarette, vaporized. This vapor contains substances of the liquid. The e-cigarette can technically be seen as a conceptual advancement of the "nicotine inhaler". In contrast to the e-cigarette, this looks more technical like an inhaler and is used as a medicinal product in counteracting tobacco addiction.

What does the filling / liquid of e-cigarettes consist of?

Due to the large product spectrum, there is no list of substances available. It is known that the basic mixture in which the nicotine is dissolved represents solutions of propylene glycol and/or glycerol. These solutions are used as fumigation agents and as such act as carrier for additional ingredients such as nicotine, scents and flavors. For example, liquids can contain flavor additives, vanilla extracts, menthol, malic acid and the scents ethyl acetate, linalool, but also fragrances such as tabanone that are typical of conventional tobacco products. In an American study, even pharmacologically active ingredients such as tadalafil (a drug to treat erectile dysfunction) and rimonabant (appetite suppressant) were detected. The BfR is not aware about any data on the availability of such products in Germany.

Do e-cigarettes contain nicotine as well?

In general, e-cigarettes also contain nicotine. However, nicotine-free liquids are available as well. Due to the wide range of products on the market, no general statements are possible with regard to the level of nicotine present in the liquids, nor the quantities absorbed through inhalation of the smoke.

Are the ingredients of the liquids listed on the packaging?

From the perspective of risk assessment, it is advisable to label cartridges containing poisonous ingredients such as nicotine. Scientific studies on e-cigarettes frequently found incorrect declarations of supposedly nicotine-free products as well as inadequate or downright wrong labelling of the liquids. In consequence, e-cigarette smokers (e-smokers) often do not have any reliable information as to what kinds of substances they inhale.

Are e-cigarettes detrimental to health?

The BfR first issued an appraisal of the health effects of electronic cigarettes in 2008 and has been following developments in this area ever since. Inhaling vaporized liquids can have negative effects on the health of consumers on account of nicotine, the fumigation agents propylene glycol or glycerol, as well as additives and contaminants. For this reason, health concerns are not limited to e-cigarettes containing nicotine. Due to the wide range of different products and the lack of knowledge on the identity of substances present in liquids, risk assessment in general remains difficult.

So far, the most important health risk factor seems nicotine. Some of its physiological effects, such as elevation of blood pressure, the promotion of thrombogenesis, the release of stress hormones and an increased production of gastric acid all contribute to the development of certain chronic diseases. In the past, the long-term adversity of nicotine has predominantly been studied in the context of tobacco products. Whether chronic nicotine absorption from e-cigarettes also increases the probability of developing cardiovascular diseases such as, for example, cerebral ischemia and stroke, can only be established on the basis of long-term investigations and epidemiological studies. The BfR suggests that even the promotion of nicotine dependence alone would already constitute a serious health issue.

In addition, there are some indications that in the process of vaporization of the liquids, carcinogenic substances such as formaldehyde, acetaldehyde and acrolein may be formed, and which are also found in tobacco smoke.

How does the fumigation agent "propylene glycol", which is frequently used in e-cigarettes, affect the body?

Propylene glycol is the substance which is used in fumigation machines. If the substance is inhaled for a short time, it is relatively safe from a health viewpoint. However, in sensitive persons propylene glycol fumes can cause irritation of the upper respiratory tract and the eyes and lead to breathing difficulties. After inhalation a high proportion of the propylene glycol initially remains in the lungs rather than being exhaled. Subchronic inhalation studies in animals led to changes in blood counts. At the moment, nothing is known about the long-term effects in humans resulting from regular and repeated inhalation of propylene glycol. Nor are there any data on whether inhaling of propylene glycol may trigger allergies. In the skin, the substance is known to exert a moderate allergenic potential. Similarly, it cannot be ruled out that in the process of heating up of the fumigation agents (propylene glycol and glycerol) carcinogenic aldehydes are being produced. To clarify this crucial question, additional studies are urgently needed and are thus recommended by BfR.

Is passive smoking a problem with e-cigarettes?

E-smokers release emissions into the ambient air in the form of visible vapor. Based on the current state of knowledge, risks for passive smokers cannot be excluded. E-smokers may also mix their own and individual liquids. In doing so they can apply different concentrates and different kinds of additives and substances. Under such particular circumstances, neither e-smokers nor passive smokers will have any clue whether the emissions released pose any

health risks to their body. For this reason, the BfR recommends that smoking of all e-cigarettes should be banned in smoke-free areas and that, for the purpose of non-smoker protection, e-cigarettes should be treated like conventional cigarettes. In private homes, e-cigarettes should be handled like normal cigarettes as well. They should not be used in the presence of sensitive persons such as children, pregnant women and sick persons.

Can e-cigarettes create addiction?

In the opinion of BfR, it is possible that the use of nicotine-containing e-cigarettes may induce to nicotine dependence. Smoking of e-cigarettes may thus even pave the way for the subsequent switch to tobacco products. The BfR is especially concerned that youths and non-smokers may have a lower aversion against low-dose products and therefore e-cigarettes may become first-time products leading to nicotine dependence.

Are e-cigarettes suitable for overcoming smoking addiction?

It is not known whether e-cigarettes are a suitable aid in giving up smoking. There is a lack of clinical studies that would support this assumption. There is simply no information on whether or not tobacco-dependent smokers may actually benefit from e-cigarettes under certain circumstances. However, to overcome tobacco addiction, nicotine inhalers permitted under pharmaceutical law are certainly to be preferred. They can be purchased in pharmacies. The approval procedure under pharmaceutical law ensures high product standards and effectiveness of the product in the interest of the consumer.

Have there been any cases of poisoning with e-cigarettes?

Two cases of acute nicotine poisoning following excessive smoking of e-cigarettes have been reported to the BfR. In addition, in the view of the BfR, liquids with concentrated amounts of nicotine and refill solutions in particular pose an additional health hazard for children. The BfR has received reports on the poisoning of children and adults after contacts with e-cigarette liquids. There are no specific antidotes available to counteract the effects of nicotine poisoning.

Can the substance quantity contained in the vapor, for example nicotine, vary for the same liquids?

The ingredients of the liquids are transported with the vapor. There are indications that the vapor density varies on a case-by-case basis not only for different e-cigarette models but even for identical models. One cause for this is may be the quantity of air actually sucked in. Other factors, for example the condition of the battery and the vaporizer, may also play a role. It is possible that the composition of the vapor varies for different e-cigarettes, even if the same liquids are used. Furthermore, it is known that the vapor density decreases during smoking. The BfR assumes that as vapor density drops down the quantity of substances that are transported and inhaled decreases as well. Whether the composition of the vapor changes as well during smoking is not known.