



fighting heart disease
and stroke

european heart network

Electronic cigarettes and cardiovascular diseases – a European Heart Network paper

November 2016

Introduction

The aim of this paper is to present the data and information that is available with respect to the effect of electronic cigarettes (e-cigarettes) on health, especially cardiovascular health.

Cardiovascular disease (CVD) – the main forms of which are coronary heart disease and stroke – is the main cause of death in the EU, accounting for over 1.9 million deaths each year.¹ CVD is also a major cause of disability and a significant economic burden across the EU, estimated to cost the EU economy almost 196 billion euros every year.²

Leading risk factors for CVD are tobacco use, high blood pressure, high cholesterol, overweight and obesity, physical inactivity, diabetes, unhealthy diets and harmful use of alcohol.

About the European Heart Network

The European Heart Network (EHN) is a Brussels-based alliance of heart foundations and other like-minded non-governmental organisations throughout Europe. EHN has members in 25 countries in Europe. EHN plays a leading role in the prevention and reduction of cardiovascular diseases, in particular heart disease and stroke, through advocacy, networking, capacity-building and patient support, so that they are no longer a major cause of premature death and disability throughout Europe.

Summary

As the use of e-cigarettes³, a battery-powered vaporiser which simulates the feeling of smoking, but does not burn tobacco, is booming, the debate about the role and impact of e-cigarettes is a hot public health potato.

¹ Nichols M, Townsend, N, Scarborough P, Luengo-Fernandez R, Real J, Gray A, Rayner M (2012); *European Cardiovascular Disease Statistics 2012*. European Heart Network, Brussels, European Society of Cardiology, Sophia Antipolis – <http://www.ehnheart.org/cvd-statistics.html>

² Idem

³ In this paper the term “e-cigarettes” include e-cigarettes, with or without nicotine, as well as e-shishas, e-cigars and e-pipes

Health effects of e-cigarettes should be considered in the context of both their intrinsic toxicity and with regard to their relative toxicity compared with the well-known injurious effects of smoking conventional cigarettes.

There is sufficient evidence to caution children and adolescents, pregnant women, and women of reproductive age about use of e-cigarettes because of the potential long-term consequences for brain development of foetal and adolescent nicotine exposure.⁴ Nicotine may contribute to cardiovascular diseases, and although nicotine itself is not a carcinogen, it may function as a ‘tumour promoter’.⁵ Given the lengthy lag time for onset of many diseases, conclusive evidence about the association of e-cigarette use with such diseases will not be available for years or even decades.⁶

It is reasonable to assume that if existing smokers switched completely from conventional cigarettes to e-cigarettes there would be a lower disease burden caused by nicotine addiction. However, e-cigarettes are not harmless and pending more evidence, the precautionary principle would dictate that it is desirable to limit use and uptake, in particular among children and young people. It would be regrettable if e-cigarettes achieved popularity as high as that of conventional cigarettes only for evidence to show that the harm of long-term use is potentially much higher than suspected today. The more so, since in many European countries smoking is declining and has been declining over the past decades without the use of e-cigarettes.

EHN considers that the regulatory framework for e-cigarettes⁷ in the EU as set out in the Tobacco Products Directive (TPD) is pertinent.

To complement the measures in the TPD, EHN recommends that EU Member States:

- A. consider restricting use of e-cigarettes in public places
- B. prohibit access for children and young people
- C. restrict marketing
- D. use tax measures as appropriate.

Countries in Europe that are not members of the European Union are encouraged to adopt the measures included in the TPD complemented by the measures listed under A. to D.

⁴ The health consequences of smoking – 50 years of progress. A report of the Surgeon General. Rockville (MD); *US Department of Health and Human Services*: 2014 (p.126)

⁵ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

⁶ idem

⁷ NB e-cigarettes in the context of the TPD contain nicotine

E-cigarettes – marketing and prevalence

E-cigarettes

An e-cigarette is a battery-powered vaporiser which simulates the feeling of smoking, but does not burn tobacco. The use is commonly called "vaping". The user activates the e-cigarette by taking a puff or pressing a button. E-cigarettes are often cylindrical, but come in many variations. Some look like traditional cigarettes - the first generation e-cigarettes. Second and third generation devices are larger and generally deliver nicotine more effectively than first generation devices. Instead of cigarette smoke, the user inhales an aerosol, commonly called vapor. E-cigarettes typically have a heating element that atomizes a liquid known as e-liquid, the main constituents of which, in addition to nicotine, when nicotine is present, are propylene glycol, with or without glycerol and flavouring agents.⁸

Flavourings include tobacco, menthol, coffee, fruit, candy, and alcohol flavours, as well as unusual flavours such as cola and Belgian waffle.⁹ It is also possible to mix one's own flavours.

Marketing

The use of e-cigarettes would appear to be booming. It is estimated that in 2014 there were 466 brands and that in 2013 US\$ 3 billion (euros 2.6 billion¹⁰) was spent on e-cigarettes globally.¹¹

Frequently, e-cigarettes are marketed as healthier alternatives to tobacco smoking, as useful for quitting smoking and reducing cigarette consumption and as a way to circumvent smoke-free laws.¹²

To date, however, the evidence of their efficacy as a smoking cessation aid is mixed.^{13,14}

Prevalence

Research shows that the highest rate of e-cigarette use is among current smokers, followed by former smokers, with little use among non-smokers. E-cigarette trial and use rose in all of these categories and data indicate that between 2008 and 2012 use at least doubled among both adults and adolescents in the European Union (EU).¹⁵ Almost all regular users use e-

⁸ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

⁹ E-cigarettes, A scientific review, Grana R et al, in Contemporary reviews in cardiovascular medicine; *Circulation*. 2014;129:1972-1986

¹⁰ Exchange rate April 2016

¹¹ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

¹² idem

¹³ idem

¹⁴ Electronic cigarettes for smoking cessation and reduction (Review); McRobbie H, Bullen C, Hartmann-Boyce J, Hajek P; *Cochrane review*. 2014; http://www.cochrane.org/CD010216/TOBACCO_can-electronic-cigarettes-help-people-stop-smoking-or-reduce-the-amount-they-smoke-and-are-they-safe-to-use-for-this-purpose

¹⁵ E-cigarettes, A scientific review, Grana R et al, in Contemporary reviews in cardiovascular medicine; *Circulation*. 2014;129:1972-1986

cigarettes with nicotine.¹⁶ There are indicators that e-cigarette use could overtake consumption of traditional cigarettes.¹⁷

General health effects of e-cigarettes

Use of e-cigarettes

Components of e-cigarettes include nicotine, propylene glycol, formaldehyde, acrolein, metals, and particles.

Risks from e-cigarette use range from major injuries and illness, including explosions and fires, to less serious adverse events, including throat and mouth irritation, cough, nausea, and vomiting.¹⁸

A recent report published by Public Health England (PHE) *E-cigarettes: an evidence update* states that the clinical outcomes of exposure to e-liquids, as detailed in the National Poisons Information Service's report, were predominantly either 'no toxicity' or 'mild toxicity'. There were two reported cases of 'moderate toxicity' and one 'severe' case that required treatment in an intensive care unit. Toxicity symptoms included conjunctivitis, irritation of the oral cavity, anxiety, vomiting, hyperventilation and changes in heart rate.¹⁹

The US department of health, in its report *The health consequences of smoking – 50 years of progress* states that there is sufficient evidence to caution children and adolescents, pregnant women, and women of reproductive age about use of e-cigarettes because of the potential long-term consequences for brain development of foetal and adolescent nicotine exposure.²⁰

The World Health Organisation (WHO), in its report *Electronic nicotine delivery systems* underlines that nicotine use is not harmless. Nicotine can have adverse effects during pregnancy and may contribute to cardiovascular diseases. Although nicotine itself is not a carcinogen, it may function as a 'tumour promoter' and it seems to be involved in fundamental aspects of the biology of malignant diseases, as well as of neurodegeneration.²¹ WHO states that the main health risk from nicotine exposure is nicotine overdose. WHO points out that, since most countries do not monitor these incidents, information is very scarce, but reports from the United States and the United Kingdom indicate that the number of reported incidents involving nicotine poisoning has risen substantially as the use of e-cigarettes has increased. WHO suggests that the actual number of cases is probably much higher than those reported.

¹⁶ Pisinger C, Døsing M, A systematic review of health effects of electronic cigarettes; *Preventive Medicine*. 69 (2014) 248–260

¹⁷ Herzog B, Wells Fargo Securities, 2013 <http://business.time.com/2013/01/08/can-electronic-cigarettes-challenge-big-tobacco/>

¹⁸ Electronic Cigarettes: A Policy Statement From the *American Heart Association*. 2014 <http://circ.ahajournals.org/content/130/16/1418.full.pdf+html>

¹⁹ E-cigarettes: an evidence update: a report commissioned by *Public Health England* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/457102/E-cigarettes_an_evidence_update_A_report_commissioned_by_Public_Health_England_FINAL.pdf

²⁰ The health consequences of smoking – 50 years of progress. A report of the Surgeon General. Rockville (MD); *US Department of Health and Human Services*: 2014 (p.126)

²¹ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

A study from December 2015 *Flavoring Chemicals in E-Cigarettes: Diacetyl, 2,3-Pentanedione, and Acetoin in a Sample of 51 Products, Including Fruit-, Candy-, and Cocktail-Flavored E-Cigarettes*²² noted the presence of diacetyl and other high-priority flavouring chemicals in flavoured e-cigarettes in the United States.

The European Union published a paper in May 2016 on the potential risks to public health associated with the use of refillable electronic cigarettes concluding that the use of refillable electronic e-cigarettes, and the potential exposure to e-liquids containing nicotine in high concentrations, may pose risks to public health.²³

Many studies conclude that due to the numerous methodological problems, the relatively few and often small studies, the inconsistencies and contradictions in results and the lack of long-term results, no firm conclusions can be drawn on the safety of e-cigarettes. Moreover, a substantial number of studies were published by authors with a conflict of interest.²⁴

E-cigarettes vs tobacco smoking

Health effects of e-cigarettes should be considered in the context of both their intrinsic toxicity and with regard to their relative toxicity compared with the well-known injurious effects of smoking conventional cigarettes.

The above-cited PHE report states that encouraging smokers who cannot or do not want to stop smoking to switch to e-cigarettes, could help reduce smoking-related disease, death and health inequalities. It also states that there is no evidence that e-cigarettes are undermining the long-term decline in cigarette smoking among adults and youth, and may in fact be contributing to it. Despite some experimentation with e-cigarettes among never smokers, they are attracting very few people who have never smoked into regular use.²⁵

In terms of e-cigarettes being effective smoking cessation aids, the current body of evidence is mixed. One 2016 study found that e-cigarettes, as currently being used in the real world, i.e. not just as smoking cessation aids, are associated with significantly less quitting among smokers compared with smokers not using e-cigarettes.²⁶ Another 2016 study found that smokers who use over-the-counter e-cigarettes or prescribed medications are more likely to succeed than those who are getting no help, although greatest increase in chance of stopping successfully occurs with prescribed medications used together with specialist behavioural support.²⁷ There is also evidence that points to high levels of dual use of e-cigarettes with conventional cigarettes.²⁸

It is reasonable to assume, though, that if existing smokers switched completely from conventional cigarettes to e-cigarettes there would be a lower disease burden caused by

²² <http://dx.doi.org/10.1289/ehp.1510185>

²³ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=COM:2016:269:FIN&from=EN>

²⁴ Pisinger C, Døsing M, A systematic review of health effects of electronic cigarettes; *Preventive Medicine*. 69 (2014) 248–260

²⁵ E –cigarettes: an evidence update: a report commissioned by *Public Health England* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/457102/E-cigarettes_an_evidence_update_A_report_commissioned_by_Public_Health_England_FINAL.pdf

²⁶ Kalkhoran, S., Glantz A.S. E-cigarettes and smoking cessation in real-world and clinical settings: a systematic review and meta-analysis; *Lancet Respir Med*; published online January 14, 2016 [http://dx.doi.org/10.1016/S2213-2600\(15\)00521-4](http://dx.doi.org/10.1016/S2213-2600(15)00521-4)

²⁷ *Nicotine without smoke: Tobacco harm reduction*. London: RCP, 2016.

²⁸ E-cigarettes, A scientific review, Rachel Grana et al, in Contemporary reviews in cardiovascular medicine; *Circulation*. 2014;129:1972-1986

nicotine addiction.²⁹ However, long-term biological effects are unknown at this time because e-cigarettes have not been in widespread use long enough for assessment.³⁰ Data from controlled trials looking at hard end-points such as the occurrence of smoking-related diseases, chronic pulmonary disease, lung cancer, major adverse cardiac events or death, are currently not available and may not be for a long time.³¹

Second-hand exposure

E-cigarettes do not burn or smoulder the way conventional cigarettes do, so they do not emit second hand smoke, although bystanders are exposed to aerosol exhaled by the user.

The study *Second-hand Exposure to Vapors From Electronic Cigarettes* shows that e-cigarettes are a source of second-hand exposure to nicotine but not to combustion toxicants and that the average concentration of nicotine resulting from smoking tobacco cigarettes is 10 times higher than from e-cigarettes.³² The study concludes that: “Using an e-cigarette in indoor environments may involuntarily expose nonusers to nicotine but not to toxic tobacco-specific combustion products. More research is needed to evaluate health consequences of second-hand exposure to nicotine, especially among vulnerable populations, including children, pregnant women, and people with cardiovascular conditions.”³³

The WHO, in its 2014 report on electronic nicotine delivery systems, states that “bystanders are exposed to the aerosol exhaled by e-cigarettes users, which increases the background level of some toxicants,^{34,35} nicotine³⁶ as well as fine and ultrafine particles in the air. Nevertheless the level of toxicants, nicotine and particles emitted from one e-cigarette is lower than that of conventional cigarette emissions.³⁷ It is not clear if these lower levels in exhaled aerosol translate into lower exposure, as demonstrated in the case of nicotine. Despite having lower levels of nicotine than in second-hand smoke, the exhaled e-cigarette aerosol results in similar uptake as shown by similar serum cotinine levels.”³⁸

In its review of the latest science in 2014, the American Heart Association (AHA) concludes that second-hand exposure to e-cigarette aerosol exposes a non-smoker to nicotine, particulates, and several potentially toxic organic chemicals, but at much lower levels than from conventional cigarette smoke. The biological effects of such an exposure are expected to be much less than that of second-hand smoke, but non-smokers are exposed to some

²⁹ Idem

³⁰ Idem

³¹ Electronic cigarettes: the pulmonologist’s point of view. *CardioPulse*

³² Czogala J, Goniewicz ML, Fidelus B, Zielinska-Danch W, Travers MJ, Sobczak A, 2014. Secondhand exposure to vapors from electronic cigarettes

³³ Czogala, J., Goniewicz, M.L., Fidelus, B., Zielinska-Danch, W., Travers, M.J., Sobczak, A., 2014. Secondhand exposure to vapors from electronic cigarettes

³⁴ Under near real-use conditions, e-cigarettes increased indoor air levels of polycyclic aromatic hydrocarbons, 1,2-propanediol, 1,2,3-propanetriol, glycerine, and aluminium

³⁵ Schober W, Szendrei K, Matzen W, Osiander-Fuchs H, Heitmann D, Schettgen T et al. Use of electronic cigarettes (e-cigarettes) impairs indoor air quality and increases FeNO levels of e-cigarette consumers. *International Journal of Hygiene and Environmental Health*. 2014;217(6):628–37. doi:10.1016/j.ijheh.2013.11.003

³⁶ Czogala J1, Goniewicz ML, Fidelus B, Zielinska-Danch W, Travers MJ, Sobczak A. Secondhand exposure to vapors from electronic cigarettes. *Nicotine and Tobacco Research*. 2014;16(6):655–62. doi: 10.1093/ntr/ntt203

³⁷ McAuley TR, Hopke PK, Zhao J, Babaian S. Comparison of the effects of e-cigarette vapor and cigarette smoke on indoor air quality. *Inhalation Toxicology*. 2012;24(12):850-7

³⁸ Flouris AD, Chorti MS, Poulianiti KP, Jamurtas AZ, Kostikas K, Tzatzarakis MN et al. Acute impact of active and passive electronic cigarette smoking on serum cotinine and lung function. *Inhalation Toxicology*. 2013;25(2):91–101. doi: 10.3109/08958378.2012.758197

nicotine, and the regular use of e-cigarettes has the potential to substantially contaminate the environment with nicotine.³⁹

As is the case with active use of e-cigarettes, the dangers of second-hand exposure have not been thoroughly evaluated yet.

Effects of e-cigarettes on the cardiovascular system

A systematic review, published in 2014, reported that some studies found that in people who had never smoked e-cigarettes before, short-term vaping resulted in increased heart rate, an elevation in diastolic blood pressure and a decrease in oxygen saturation. Other studies found no increase in heart rate or in blood pressure but an increase in oxygen saturation. One study found that active and passive vaping in e-cigarette-naïve smokers did not influence the complete blood count. But another study, using experienced e-cigarette users, found a slight elevation in diastolic blood pressure, but no effect on cardiac function.⁴⁰

The AHA review found that few studies have reported the cardiovascular effects of e-cigarettes. The results of these studies suggest that e-cigarettes can increase heart rate and blood pressure, as expected with systemic absorption in nicotine. These concerns are related to the ability of nicotine to release catecholamines, including hemodynamic effects (increase in heart rate, a transient increase in blood pressure, vasoconstriction of coronary and other vascular beds), adverse effects on lipids, and induction of insulin resistance. Nicotine has also been reported to produce endothelial dysfunction and to cause foetal teratogenicity, operating by different mechanisms. Nicotine in vitro and in animals can inhibit apoptosis and enhance angiogenesis, effects that raise concerns about a role of nicotine in promoting the development and spread of cancer and in the acceleration of atherosclerotic disease.⁴¹

In a presentation in the European Parliament (7 May 2013),⁴² Charlotta Pisinger, Associate Professor, Research Centre for Prevention and Health, Glostrup Hospital, DK-2600 Glostrup, Denmark, said “We need hundreds of thousands of users and many more years of use in order to see any *long-term effects* of e-cigarette on cardiovascular health.”

Although adverse cardiovascular health effects of e-cigarettes are not fully known, they are likely to be much less than those of cigarette smoking; they could, though, be significant in individuals with heart disease.⁴³

³⁹ Electronic Cigarettes: A Policy Statement From the *American Heart Association*. 2014
<http://circ.ahajournals.org/content/130/16/1418.full.pdf+html>

⁴⁰ Pisinger C, Døsing M, A systematic review of health effects of electronic cigarettes; *Preventive Medicine*. 69 (2014) 248–260

⁴¹ Electronic Cigarettes: A Policy Statement From the *American Heart Association*. 2014
<http://circ.ahajournals.org/content/130/16/1418.full.pdf+html>

⁴² <http://www.europarl.europa.eu/document/activities/cont/201305/20130506ATT65635/20130506ATT65635EN.pdf>

⁴³ Electronic Cigarettes: A Policy Statement From the *American Heart Association*. 2014
<http://circ.ahajournals.org/content/130/16/1418.full.pdf+html>

World Health Organisation (WHO) report on Electronic nicotine delivery systems

In July 2014, WHO published its report *Electronic nicotine delivery systems*.⁴⁴ The report states that while e-cigarettes represent an “evolving frontier filled with promise and threat for tobacco control,” regulations are needed to:

- Impede e-cigarette promotion to non-smokers and young people;
- Minimise potential health risks to e-cigarette users and nonusers;
- Prohibit unproven health claims about e-cigarettes; and
- Protect existing tobacco control efforts from commercial and other vested interests of the tobacco industry.

According to the WHO report, regulations are required now to address health concerns, in particular for:

- Advertising: an appropriate government body must restrict e-cigarette advertising, promotion and sponsorship, to ensure that it does not target youth and non-smokers or people who do not currently use nicotine.
- Indoor use: legal steps should be taken to end use of e-cigarettes indoors in public and work places. Evidence suggests that exhaled e-cigarette aerosol increases the background air level of some toxicants, nicotine and particles.

The regulatory framework for e-cigarettes in the European Union (EU)

In March 2014, EU adopted the Tobacco Products Directive (TPD).⁴⁵ It will enter into force in May 2016.

Article 20 of the TPD outlines the rules for e-cigarettes sales and use in the EU. It covers all consumer electronic cigarettes placed on the EU market. Medicinal e-cigarettes are not covered by the TPD.

Nicotine levels

The TPD stipulates a maximum nicotine concentration level for e-cigarettes of no more than 20 mg/ml, and maximum volumes for cartridges, tanks and containers of nicotine liquids. These will have to be child and tamper-proof and protected against leakage to limit the risk of exposing consumers – in particular children – to the risks of handling or ingestion. Only ingredients of high purity may be used in the nicotine-containing liquid, and e-cigarettes will be required to deliver the nicotine doses at consistent levels under normal conditions of use. This means that a similar level of nicotine should be delivered each time an e-cigarette is puffed for the same amount of time and with the same strength.

⁴⁴ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

⁴⁵ http://ec.europa.eu/health/tobacco/docs/dir_201440_en.pdf

Labelling and packaging

Health warnings on e-cigarette packs will be mandatory, as will instructions for their use, information on addictiveness and toxicity. A list of all substances contained in the product is also mandatory as is information on the product's nicotine content. No promotional elements will be allowed on packs.

Advertising

Existing rules for cross-border advertising and promotion of tobacco products will apply to e-cigarettes.

Notification and reporting

E-cigarette manufacturers will be required to notify EU Member States before placing new products on the market: notification must include information on the manufacturer, the ingredients used and emissions, nicotine dose and uptake, product and production process and a declaration that the manufacturer takes full responsibility for the quality and safety of the product under normal use.

They will also be required to report annually to EU Member States on the sales volumes of the products, types of users and their preferences and trends.

Discussion, conclusions and recommendations

Discussion

The debate about the role and impact of e-cigarettes in tobacco control remains a hot public health potato.

Main concerns are nicotine exposure, gateway to smoking cigarettes, re-normalisation of tobacco smoking and chemical content.

There is sufficient evidence to caution children and adolescents, pregnant women, and women of reproductive age about use of e-cigarettes because of the potential long-term consequences for brain development of foetal and adolescent nicotine exposure.⁴⁶ Nicotine may contribute to cardiovascular diseases, and although nicotine itself is not a carcinogen, it may function as a 'tumour promoter' and it seems to be involved in fundamental aspects of the biology of malignant diseases, as well as of neurodegeneration.⁴⁷ Moreover, given the lengthy lag time for onset of many diseases, conclusive evidence about the association of e-cigarette use with such diseases will not be available for years or even decades.⁴⁸

⁴⁶ The health consequences of smoking – 50 years of progress. A report of the Surgeon General. Rockville (MD); US Department of Health and Human Services: 2014 (p.126)

⁴⁷ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

⁴⁸ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

To date, no studies have investigated whether e-cigarettes are a gateway to smoking cigarettes.⁴⁹ Likewise, there is no data available to confirm or reject whether they fuel nicotine addiction among young people.⁵⁰

As to the question of whether public use of e-cigarettes leads to renormalisation of tobacco smoking, there is currently no evidence for such a development.^{51,52}

In terms of chemical content, it is clear that e-cigarettes contain numerous chemicals, but it is very likely that average e-cigarette use produces lower exposure to toxicants than conventional cigarettes.⁵³

Conclusions

It is reasonable to assume that if existing smokers switched completely from conventional cigarettes to e-cigarettes there would be a lower disease burden caused by nicotine addiction. To obtain the maximum health benefit, smokers need to quit completely both tobacco and nicotine use.

Long term effects of using e-cigarettes are not known. More research is needed as data from controlled trials looking at hard end-points such as the occurrence of chronic pulmonary disease, lung cancer, major adverse cardiac events or death, are currently not available.

Concerns about the quality of many studies and conflict of interest of researchers must be taken seriously.

A cautious approach is, therefore, warranted. E-cigarettes are not harmless and pending more evidence, the precautionary principle would dictate that it is desirable to limit use and uptake, in particular among children and young people. It would be regrettable if e-cigarettes achieved popularity as high as that of conventional cigarettes only for evidence to show that the harm of long-term use is potentially much higher than suspected today. The more so, since in many European countries smoking is declining and has been declining over the past decades without the use of e-cigarettes.

On this basis, EHN considers that the regulatory framework for e-cigarettes⁵⁴ in the EU as set out in the Tobacco Products Directive (TPD) is pertinent

⁴⁹ Pisinger C, Døsing M, A systematic review of health effects of electronic cigarettes; *Preventive Medicine*. 69 (2014) 248–260

⁵⁰ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

⁵¹ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

⁵² E –cigarettes: an evidence update: a report commissioned by *Public Health England*
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/457102/Ecigarettes_an_evidence_update_A_report_commissioned_by_Public_Health_England_FINAL.pdf

⁵³ http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_10-en.pdf?ua=1

⁵⁴ NB e-cigarettes in the context of the TPD contain nicotine

Recommendations

Due to the nature of the TPD, i.e. regulating the internal market of the EU, it is not fully comprehensive. There are areas where EU Member States need to consider further regulation of e-cigarettes.

Below are EHN's recommendations:

A. Consider restricting use of e-cigarettes in public places

Second-hand exposure to e-cigarette aerosol exposes a non-smoker to nicotine, particulates, and several potentially toxic organic chemicals, but at much lower levels than from conventional cigarette smoke. However, the dangers of second-hand exposure have not been thoroughly evaluated yet.

Given the fact that second-hand exposure has some impact on bystanders' health, that use of e-cigarettes may make it more complicated to enforce smoke-free legislation, and that use of e-cigarettes may change the norm in terms of use of conventional cigarettes in public places, EHN recommends to consider restricting e-cigarette use in public places, at least in places where children and young people are present.

B. Prohibit access for children and young people (e.g. vending machines and online shopping/online delivery)

Considering that there is sufficient evidence to caution children and adolescents about use of e-cigarettes because of long-term consequences for brain development and due to the uncertainty about long-term use of e-cigarettes and its potential for fuelling nicotine dependency and causing serious disease, EHN considers that sales of e-cigarettes to children and young people should be prohibited.

C. Restrict marketing

Robust marketing and advertising has led to a booming of the e-cigarettes market. Adhering to the precautionary principle, and the fact that potential long-term consequences of e-cigarette use are not yet fully known, EHN recommends that marketing of e-cigarettes to the general public should be restricted. In particular, marketing must not be directed at children and young people; nor should it induce use by non-smokers and people not using nicotine.

D. Use tax measures as appropriate

Applying a special excise duty or tax on e-cigarettes has the dual benefit of discouraging use – especially for young people – and raising income for governments. EHN recommends taxing e-cigarettes at a rate high enough to discourage uptake, while ensuring price differentials with conventional cigarettes to encourage a shift towards e-cigarettes from conventional cigarettes. Such a policy is likely to benefit low-income smokers particularly.

Countries in Europe that are not members of the European Union are encouraged to adopt the measures included in the TPD complemented by the measures listed under A. to D.