ΕΝΑΛΛΑΚΤΙΚΕΣ ΜΟΡΦΕΣ ΚΑΠΝΙΣΜΑΤΟΣ

E CIGARETTE ENDS: ELECTRONIC NICOTINE DELIVERY SYSTEM) HEAT-NOT-BURN CIGARETTES (IQOS)
CHEMICAL COMPOUNDS IN CIGARETTE SMOKE

A SUMMARY OF A SELECTION OF HAZARDOUS COMPOUNDS IN CIGARETTE SMOKE & THEIR EFFECTS

ESTIMATED NUMBER OF CHEMICAL COMPOUNDS IN CIGARETTE SMOKE

- 7,357

NUMBER OF THESE COMPOUNDS WITH CONFIRMED CARCINOGENIC ACTIVITY

- 70

The compounds shown below are all found in cigarette smoke. The mass figures, given in μg, take into account both mainstream (inhaled) and sidestream smoke. 1 μg is equal to 1 millionth of a gram. Amounts of these compounds vary in different brands of cigarettes - these figures are approximate.

NICOTINE
- Approx. 919μg per cigarette
- Addictive
- Increases heart rate
- Increases blood pressure
- Increases blood glucose
- Lethal dose: around 500-1000mg

ACETALDEHYDE
- Approx. 680-1571μg per cigarette
- Known animal carcinogen
- Probable human carcinogen
- Irritant to skin & eyes
- Irritant to respiratory tract

N-NITROSAMINES
- Large class of compounds
- Several are tobacco-specific
- Known human carcinogens
- NNK & NNN
- NNK: approx. 0.3μg per cigarette
- NNN: approx. 2-50μg per cigarette
- May cause reproductive damage

1,3-BUTADIENE
- Approx. 36-191μg per cigarette
- Known human carcinogen
- Suspected human teratogen
- Irritant to eyes & skin
- Irritant to upper respiratory tract

BENZENE
- Approx. 46-272μg per cigarette
- Known human carcinogen
- Damages bone marrow
- Lowers red blood cell count
- May harm reproductive organs

ACROLEIN
- Approx. 69-306μg per cigarette
- Possible human carcinogen
- Known DNA mutagen
- Irritant to skin & nasal passages
- May contribute to heart disease

AROMATIC AMINES
- Large class of compounds
- Includes 2-aminonaphthalene:
  - Known human carcinogen
  - Linked with bladder cancer
  - Approx. 0.04μg per cigarette

POLYAROMATICs
- Large class of compounds
- Includes benzo[a]pyrene:
  - Known human carcinogen
  - Known DNA mutagen
  - Affects reproductive capacity
  - Up to 0.14μg per cigarette
NICOTINE DELIVERY SYSTEMS
NICOTINE DELIVERY SYSTEMS
Joseph Robinson filed a patent for the first “Electric Vaporizer” in 1927 and was approved in 1930.

My invention relates to vaporizing devices for holding medicinal compounds which are electrically heated to produce vapors for inhalation, and to provide a device for individual use which may be freely handled without any possibility of being burned.

Although not actually made for vaporizing tobacco, the device has similar capabilities to a modern electronic cigarette.

Herbert A. Gilbert files a US Patent for the first smokeless cigarette.

The present invention relates to a smokeless non tobacco cigarette and has for an object to provide a safe and harmless means for and method of smoking by replacing burning tobacco and paper with heated, moist, flavored air.
• **2003**: the first commercially successful electronic cigarette is created in Beijing, China by **Hon Lik**, a 52 year old pharmacist, inventor and smoker.

• **April 2006**: Electronic cigarettes introduced to Europe.

• **2006-2007**: Electronic cigarettes introduced to the U.S.
HOW DOES IT WORK?

- LED: Lights up when the smoker draws on the cigarette
- Battery: Controls heater and lighter
- Microprocessor: Controls heater and lighter
- Sensor: Detects when smoker takes a drag
- Heater: Vaporises nicotine
- Cartridge: Holds nicotine dissolved in propylene glycol
THE THREE GENERATIONS

Figure 1: The three generations of e-cigarettes

First generation
Second generation
Third generation

Images courtesy of Anna Phillips
E LIQUID
Nicotine delivery from e-cigarettes (concentration of nicotine - puffing (‘vaping’) technique).

Nicotine delivery is better from second- and third-generation

Experienced vapers VS naive users

The speed of nicotine delivery remains much slower than from cigarettes.
Propylene glycol glycerol to generate the synthetic smoke

...acute exposure to propylene glycol has been shown to induce airway irritation and cough in humans, together with minor airflow obstruction...
• Heating propylene glycol or glycerine can cause decomposition to low-molecular-mass carbonyl compounds including formaldehyde and acetaldehyde, which can be carcinogenic in large doses.
e-cigarette devices include metals, ceramics and rubber, all of which may become aerosolised in the process of vapour generation, copper particles of respirable size - levels of nickel and silver that are also higher than those in tobacco smoke.

Potential toxicity: carcinogenicity, cardiovascular disease and diseases such as COPD and interstitial lung...
• safe when **ingested orally**, some are irritant to the airways and the safety of most flavours after heating and inhalation is unknown.

• Vapour produced from e-liquids containing flavours has been demonstrated to be more cytotoxic than unflavoured vapour.
### Table 1. Levels of Toxicants in E-Cigarette Aerosol Compared With Nicotine Inhaler and Cigarette Smoke

<table>
<thead>
<tr>
<th>Toxicant</th>
<th>Range in Content in Aerosol From 12 E-Cigarette Samples per 15 Puffs*</th>
<th>Range in Content in Conventional Cigarette Micrograms in Mainstream Smoke From 1 Cigarette</th>
<th>Content in Nicotine Inhaler Mist per 15 Puffs*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde, µg</td>
<td>0.2–5.61</td>
<td>1.6–52</td>
<td>0.2</td>
</tr>
<tr>
<td>Acetaldehyde, µg</td>
<td>0.11–1.36</td>
<td>52–140</td>
<td>0.11</td>
</tr>
<tr>
<td>Acrolein, µg</td>
<td>0.07–4.19</td>
<td>2.4–62</td>
<td>ND</td>
</tr>
<tr>
<td>α-Methylbenzaldehyde, µg</td>
<td>0.13–0.71</td>
<td>...</td>
<td>0.07</td>
</tr>
<tr>
<td>Toluene, µg</td>
<td>ND–0.63</td>
<td>8.3–70</td>
<td>ND</td>
</tr>
<tr>
<td>p,m-xylene, µg</td>
<td>ND–0.2</td>
<td>...</td>
<td>ND</td>
</tr>
<tr>
<td>NNN, ng</td>
<td>ND–0.00043</td>
<td>0.0005–0.19</td>
<td>ND</td>
</tr>
<tr>
<td>NNK, ng</td>
<td>ND–0.00283</td>
<td>0.012–0.11</td>
<td>ND</td>
</tr>
<tr>
<td>Cadmium, ng</td>
<td>ND–0.022</td>
<td>...</td>
<td>0.003</td>
</tr>
<tr>
<td>Nickel, ng</td>
<td>0.011–0.029</td>
<td>...</td>
<td>0.019</td>
</tr>
<tr>
<td>Lead, ng</td>
<td>0.003–0.057</td>
<td>...</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Prepared using data from Goniewicz et al.\(^41\) E-cigarette indicates electronic cigarette; and ND, not determined.
Electronic Cigarette Smoking Increases Aortic Stiffness and Blood Pressure in Young Smokers

Vlachopoulos, C, Ioakeimidis, N et al JACC 2016
Electronic Cigarette Smoking Increases Arterial Stiffness and Oxidative Stress to a Lesser Extent Than a Single Conventional Cigarette
An Acute and Chronic Study

Ignatios Ikonomidis, Dimitrios Vlastos, Kallirrhoe Kourea, Gavriela Kostelli, Maria Varoudi, George Pavlidis, Panagiotis Efentakis, Helen Triantafyllidi, John Parissis, Ioanna Andreadou, Efstathios Iliodromitis, John Lekakis

Circulation. 2018;137:303-306
Originally published January 15, 2018
In all subjects we measured at acute and chronic phase of the study:

- Carotid-femoral pulse wave velocity (PWVc, Complior SP ALAM)
- central systolic blood pressure (cSBP)
- augmentation index (AI) of the aortic pulse wave (Arteriograph TensioMed).
- Malondialdehyde (MDA) and protein carbonyls (PCs) plasma levels.
- Exhaled CO concentration
Electronic Cigarette Smoking Increases Arterial Stiffness and Oxidative Stress to a Lesser Extent Than a Single Conventional Cigarette
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Electronic Cigarette Smoking Increases Arterial Stiffness and Oxidative Stress to a Lesser Extent Than a Single Conventional Cigarette
E-cigarettes 'less harmful' than cigarettes?
Nicotine without smoke
Tobacco harm reduction

A report by the Tobacco Advisory Group of the Royal College of Physicians
AIDS USED IN MOST RECENT QUIT ATTEMPT

E-cigarette use for quitting is still increasing

N=11976 adults who smoke and tried to stop or who stopped in the past year; method is coded as any (not exclusive) use.
• The main findings
  • Vaping poses only a small fraction of the risks of smoking and switching completely from smoking to vaping conveys substantial health benefits
  • E-cigarettes could be contributing to at least 20,000 successful new quits per year and possibly many more
  • E-cigarette use is associated with improved quit success rates over the last year and an accelerated drop in smoking rates across the country
  • The evidence does not support the concern that e-cigarettes are a route into smoking among young people (youth smoking rates in the UK continue to decline, regular use is rare and is almost entirely confined to those who have smoked)
Practitioner Training and Assessment Programme funded by Public Health England
The FDA now regulates all tobacco products, including (as shown): hookah, e-cigarettes, dissolvables, smokeless tobacco, cigarettes, all cigars, roll-your-own tobacco, pipe tobacco, and future tobacco products that meet the statutory definition of a tobacco product.
Manufacturing ENDS and E-Liquids

Beginning in 2018, the product packages and advertisements of all newly-regulated covered tobacco products must bear the following warning statement:

"**WARNING**: This product contains nicotine. Nicotine is an addictive chemical."
Focusing on Youth

The new rule aims to deter youth initiation through restricting youth access to these products by:

- Not allowing products to be sold to persons under the age of 18 years;
- Requiring age verification by photo ID;
- Not allowing the selling of tobacco products in vending machines (unless in an adult-only facility);
- Not allowing the distribution of free samples.
From 20th May 2016 e-cigarettes containing nicotine will be regulated in the Europe Union under Article 20 of the Tobacco Products Directive.

**Electronic Cigarettes (Containing Nicotine)**

- **No information to consumers required**
- **No maximum volume or concentration**
- **Max 10ml**
- **Max 20 mg/ml**
- **2 ml max**
- **Maximum volume and concentration of nicotine**
- **Warning and ingredients**
- **Information to consumers required**
Reduced-Risk Products ("RRPs") is the term used to refer to products that present, are likely to present, or have the potential to present less risk of harm to smokers who switch to these products versus continued smoking.
Heat not burn cigarettes—heat sticks
Impact of the temperature on the formation of toxicants

Transfer from tobacco into smoke
- Nicotine
- Aromas

« The chemical factory »
(5000+ compounds)
- Decomposition of biopolymers, proteins...
- HPHCs
- Benzo[a]pyrene

Energy source
- CO₂ ; CO ; H₂O

Distillation
< 300°C

Pyrolysis
~ 300 - 700°C

Combustion
> 750°C
Demonstrated that the operation of THS2.2 does not result in the combustion of tobacco.

Average reductions in formation of harmful or potentially harmful constituents for THS2.2 compared to levels measured in smoke from the 3R4F reference cigarette.

<table>
<thead>
<tr>
<th>Component</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDA 18 (18 chemicals)</td>
<td>&gt; 90% reduction</td>
</tr>
<tr>
<td>PMI 58 (58 chemicals)</td>
<td>&gt; 90% reduction</td>
</tr>
<tr>
<td>Carcinogens (15 chemicals)</td>
<td>&gt; 95% reduction</td>
</tr>
<tr>
<td>Air</td>
<td></td>
</tr>
</tbody>
</table>

THS 2.2 stands for Tobacco Heating System version 2.2 and refers to a commercialized version of iQOS.

(a) Aerosol collection with Intense Health Canada's Smoking Regime (55 mL puff volume, 2 second puff duration, 30 second interval puff); Comparison on a per-stick basis Reduction calculations exclude Nicotine, Glycerin and Total Particulate Matter
(b) The PMI 58 list includes the FDA 18 and (c) the 15 carcinogens of IARC Group 1
Adult smokers used the products *ad libitum*

Adult smokers randomized to cigarettes or THS2.2 were free to use the product as often as they wished, in confinement (5 days) and then ambulatory (85 days).

Note: These data alone do not represent a claim of reduced risk.
Source: PMI Research and Development. Registered on clinicaltrials.gov: NCT01970995
HEATSTICKS NOT SUCH A HOT SOLUTION TO TOBACCO-RELATED DISEASE

PHILIP MORRIS TELLS PEOPLE TO QUIT SMOKING
a note of caution about many issues, including whether the perception that it is less risky and that its iPhone-like design might entice adolescents to start smoking, as well as the fact that IQOS users might continue to smoke cigarettes.
• enthusiastic about the potential for IQOS to reduce smoking-related harms
• heating blade in the holder rises to 662°F, vaporizing the tobacco. A conventional cigarette burns tobacco at 1200°F.
• cigarette smoke contains some 4330 chemicals, the IQOS aerosol has just 750.

• The committee was more fully convinced — voting 8 to 1 — that IQOS "significantly reduces your body's exposure to harmful or potentially harmful chemicals."
HARM REDUCTION

A Look Inside a Methadone Clinic

FREE CONDOMS

HARM REDUCTION SAVES LIVES
HARM REDUCTION
Ευχαριστώ πολύ

Παντελόνι μέσω του 1535: Διακοπή Καπνίσματος-Καρδιολογικό (κωδικός 06803)