

Canadian Pharmacists Conference 2015

Innovation and Collaboration

E-cigarettes: An Overview

Jane Ling

May 2015



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Jointly presented by the Canadian Pharmacists Association (CPA) and the Ontario Pharmacists Association (OPA)

Jane Ling R.Ph. BScPhm.

- Lovell Drugs, Oshawa, On.
North Durham Family Health Team, Port Perry, On.
- President of **CEASE** (Central East Association for Smoking Elimination) www.ceasenetwork.com
- President of Pharmacists for A Smoke Free Canada
www.psfcnetwork.com



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Disclosure

- **Speaking Honorarium: Johnson & Johnson, Pfizer**
- **Advisory Board: Johnson & Johnson, Pfizer**



Learning objectives

- Understand the use and types of electronic cigarettes
- Examine harm and harm-reduction views
- Discuss comprehensive smoking cessation counselling and quit plans for patients



Agenda

- Development history
- Types
- Current and proposed regulations
- Threat or promise?
- Quit plan



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*The History
of the
Electronic Cigarette*

Herbert A. Gilbert

- US patent 1965
- BA in business
- Smokeless unit
- Replaced burning tobacco and paper with heated, moist, flavored air
- Never commercialized



<http://www.ecigarettdirect.co.uk/ashtray-blog/2013/10/interview-inventor-e-cigarette-herbert-a-gilbert.html#comments>



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FIG. 1.

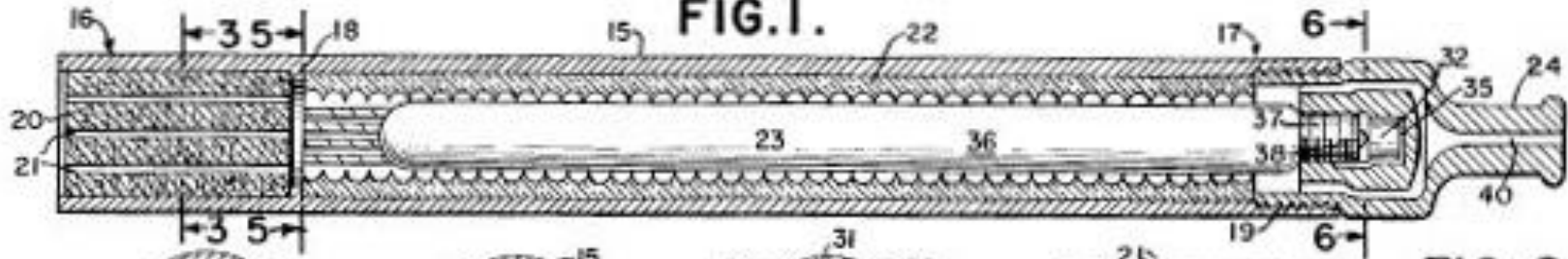


FIG. 2.



FIG. 3.

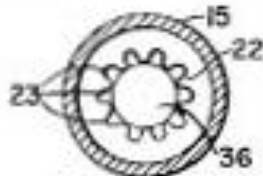


FIG. 5.

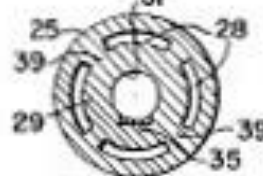


FIG. 6.



FIG. 4.

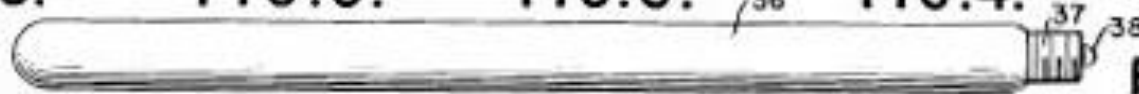


FIG. 10.



FIG. 7.

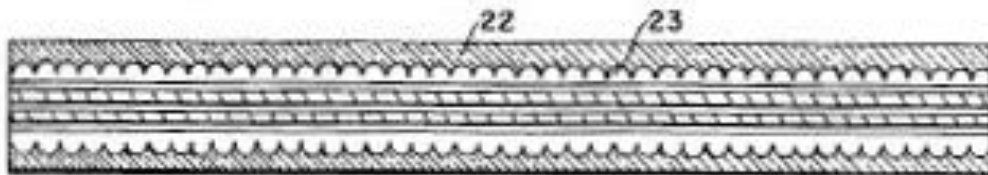


FIG. 8.

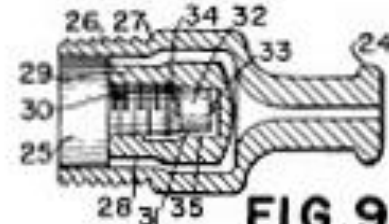


FIG. 9.

Herbert A. Gilbert
INVENTOR

Hon Lik

- Chinese research pharmacist
- Ruyan Holdings
- **2003** - patented the first nicotine-based electronic cigarette
- **2004** - manufactured and sold in China
- **2007**- international patent
- **2013** - Imperial Tobacco purchased patent for \$75 million



<http://www.prlog.org/10588774-hon-lik-2010-kcancer-hero-nominee.html>



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Terms

- E-cigs
- Electronic cigarettes
- ENDS (Electronic Nicotine Delivery System)
- E-liquid
- E-juice
- Vaping/ Vapers

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4110871>



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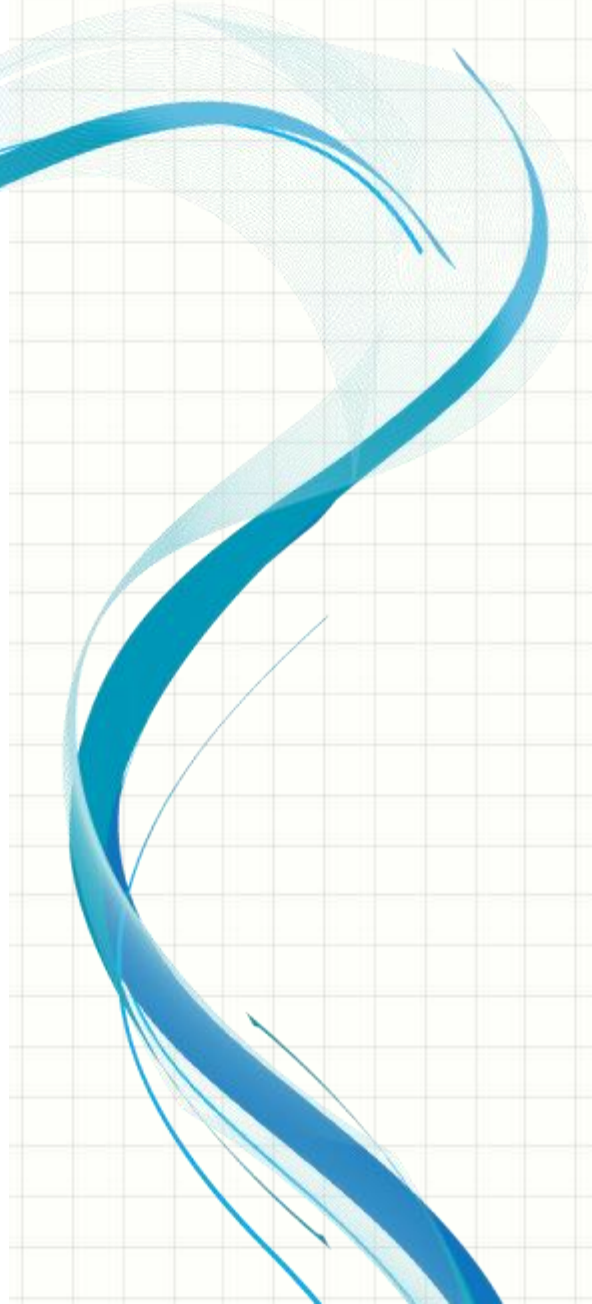
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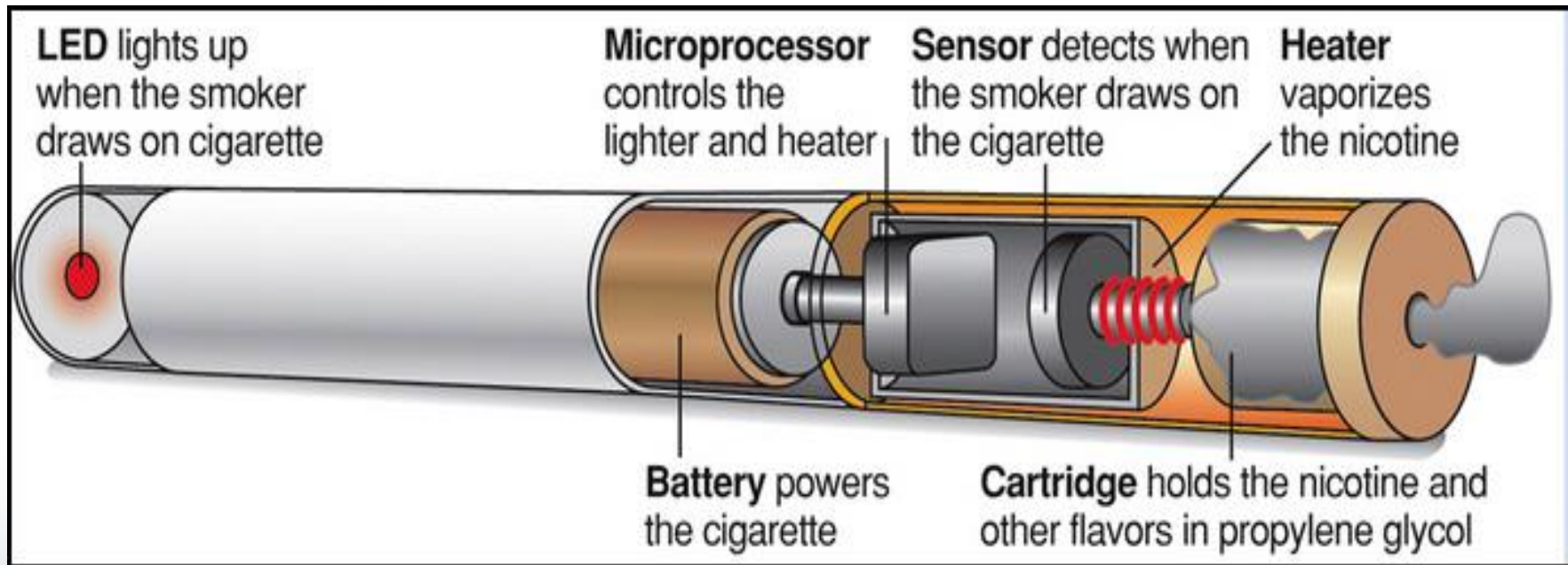
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Types

1st Generation- E-cigs-“cigalikes”



www.ncbi.nlm.nih.gov/pmc/articles/PMC4110871



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- Looks like a cigarette
- Cartridge + atomizer = cartomizer
- Heating coil plus reservoir
- Disposable or rechargeable
- Short battery life- 40 cigarettes or 400 puffs
- With or without nicotine
- \$10 - \$25

www.ncbi.nlm.nih.gov/pmc/articles/PMC411087



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2nd Generation – vap pens

- “Clearomizer”
- Refillable (e-juice)
- Wick
- Rechargeable (USB or power adapter)
- Produces more flavour and vapour
- Longer battery life - eight hours
- ~\$25 - \$50

www.ncbi.nlm.nih.gov/pmc/articles/PMC4110871



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3rd Generation – mods/APV

- Modification
- Advance Personal Vapourizer
- Variable voltage (battery output), variable power watts (heating element)
- LCD/LED screens are used to display things like: battery life, voltage/wattage, device settings, heating element OHM's, puffs taken
- Variable mouthpieces
- ~ \$30 - \$70

www.ncbi.nlm.nih.gov/pmc/articles/PMC4110871



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E-juice

- 150,000 different flavours
- Contains mixture propylene glycol, glycerin, nicotine, flavour
- 0, 3, 6, 12, 18, 24, 30, 36 mg/ml nicotine
- ~1-2ml e-juice per day most users
- 10ml (~\$7.99) and 30 ml (~\$14.99) per bottle

<http://bestejuce.com/how-many-cigarettes-are-in-a-30ml-bottle-of-e-liquid>



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E-Liquid Strength Guide

<i>Regular Cigarettes</i>	<i>E-Liquid Strength</i>
<i>0 - 5 Per Day</i>	<i>- None 0mg</i>
<i>5 - 10 Per Day</i>	<i>- Extra Low 6mg</i>
<i>10 - 20 Per Day</i>	<i>- Low 12mg</i>
<i>20 - 30 Per Day</i>	<i>- Medium 18mg</i>
<i>30 + Per Day</i>	<i>- Strong 24mg</i>



WARNING: THIS PRODUCT CONTAINS NICOTINE, A POISONOUS AND ADDICTIVE SUBSTANCE. THIS PRODUCT IS INTENDED FOR COMMITTED SMOKERS OF LEGAL SMOKING AGE AND IS NOT FOR USE BY CHILDREN OR WOMEN WHO ARE PREGNANT OR MAY BECOME PREGNANT FOR THEIR SAFETY, KEEP OUT OF REACH OF CHILDREN AND PETS. DO NOT INGEST. THIS PRODUCT IS NOT INTENDED TO TREAT, PREVENT, OR CURE ANY DISEASE OR CONDITION.

LOT #:
PG 50% VG 50%
DOB:



Castle Blue™
Blueberry Tobacco

Premium E-Liquid
100% Made in the USA
www.vastvapor.com

INGREDIENTS: USP FOOD GRADE VEGETABLE GLYCERIN, USP FOOD GRADE PROPYLENE GLYCOL, NICOTINE, ARTIFICIAL AND NATURAL FLAVORS.

KEEP OUT OF REACH OF CHILDREN. SHAKE WELL. USE AS DIRECTED.

NICOTINE STRENGTH

○ 0mg ○ 6mg ○ 12mg ○ 18mg ○ 24mg





Nicotine vape shops in Canada



Nicotine labs in
Canada



Current regulation

Canada

- Electronic cigarettes **without** nicotine in Canada are currently legal
- Nicotine-containing e-fluid is unapproved by Health Canada
- Widely unenforced and commonly available for sale Canada-wide
- Health Canada does not recommend the use
- Wild West/Unregulated/Gray Area

<http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2009/13373a-eng.php>



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Provinces and Territories

- The provinces have been pushing for collaborative action across the country to avoid a patchwork quilt of different approaches
- Local smoke-free bylaws to restrict the use of e-cigs anywhere where smoking is banned
- Schools are putting policies in place to restrict use



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Self-Regulated



**THE CANADIAN VAPING
ASSOCIATION**

www.canadianvapingassociation.org



THRA
**Tobacco Harm Reduction Association
of Canada**

www.thra.ca



**Electronic Cigarette
Trade Association
of Canada**

www.ectaofcanada.com



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Testing a-juice

Component / Element	Protocol MDL*	Tolerance
Nicotine Concentration	GC/FID Analysis 0.1 mg/ml	± 10%
Diethylene glycol (DG)	GC/FID Analysis 2.23 µg/ml (ppm)	< 100 µg/ml (ppm)
Acetaldehyde	HPLC/UV Analysis 0.640 µg/ml (ppm)	< 100 µg/ml (ppm)
Acetoin	HPLC/UV Analysis 0.841 µg/ml (ppm)	None Set (Informational)
Diacetyl (2,3-Butanedione)	HPLC/UV Analysis 0.742 µg/ml (ppm)	<div style="background-color: #00FF00; padding: 2px;">Non-Detection Goal</div> <div style="background-color: #90EE90; padding: 2px;">< 22 µg/ml no disclosure</div> <div style="background-color: #FFFF00; padding: 2px;">< 100 µg/ml (ppm) disclosure</div> <div style="background-color: #FF0000; padding: 2px;">> 100 µg/ml (ppm) is Fail</div>
Formaldehyde	HPLC/UV Analysis 0.846 µg/ml (ppm)	< 30 µg/mL (ppm)
Acetyl Propionyl (2,3-Pentanedione)	HPLC/UV Analysis 0.840 µg/ml (ppm)	<div style="background-color: #00FF00; padding: 2px;">Non-Detection Goal</div> <div style="background-color: #90EE90; padding: 2px;">< 45 µg/ml no disclosure</div> <div style="background-color: #FFFF00; padding: 2px;">< 100 µg/ml (ppm) disclosure</div> <div style="background-color: #FF0000; padding: 2px;">> 100 µg/ml (ppm) is Fail</div>
pH Level	Karl Fischer Analysis	Target Levels (Informational) 5.0 to 8.5
% Water	Karl Fischer Analysis	None Set (Informational)

* MDL - Minimum Detection Limit

Labelling

CONTENTS HARMFUL

Do not swallow.
Do not get in eyes or on skin or clothing.
Keep out of reach of children and pets.
TO OPEN: Push down, turn counterclockwise. **TO CLOSE:** Place cap over nozzle, turn clockwise.

INGREDIENTS: Propylene Glycol (<70%), Glycerin (30%), Nicotine (1.2%), Food Grade Alcohol, Natural and Artificial Flavourings.

BATCH: MFFN12483859
EXPIRES: JUNE 2016



Produced by: JuiceDude, ON, Canada



**MY FAVOURITE
FLAVOUR NAME**

Medium Strength: 12mg

May
contain
traces
of nuts



DANGER

Peut con-
tenir des
traces de
noix

CONTENIR NOCIF

Ne pas avaler.
Ne pas obtenir dans les yeux ou sur la
peau ou les vêtements.
Tenir hors de la portée de enfants et des
animaux de compagnie.
POUR OUVRIR: Enfoncez et tournez, sens
anti-horaire. **POUR FERMER:** Placez le
bouchon sur le bec et tournez, sens
horaire.

INGREDIENTS: Propylène Glycol (<70%),
glycérine (30%), de la nicotine (1.2%), l'alcool
de qualité alimentaire, arômes naturels et
artificiels.

Approx: 30 mL

Produit par: JuiceDude, ON, Canada

ECTA requires that all Client Members (including Founding/Board Directors) comply with the regulations outlined in [Consumer Chemicals and Containers Regulations \(CCCR\), 2001](#)

Global regulation



WHO FRAMEWORK CONVENTION
ON TOBACCO CONTROL

FCTC/COP/6/10
21 July 2014

Type of ENDS	ENDS regulated as					Not regulated or unknown
	consumer product	therapeutic product	tobacco product	other	total	
With nicotine	14 (27%)*	12 (6%)	22 (10%)	11 (6%)	59 (49%)	135 (51%)
Without nicotine	23 (35%)	0 (0%)	18 (7%)	12 (2%)	53 (44%)	141 (56%)

* The figure in parentheses after the number of countries indicates the percentage of the world population living in these countries

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



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Proposed regulation



Ontario Bill 45

(Making Healthier Choices Act, 2014)

Nov 14, 2014 – 1st reading

Schedule 3 - Electronic Cigarettes Act, 2014

- No sales to **minors** under 19 years
- Prohibit the use of e-cigarettes **where** the smoking of tobacco is prohibited
- Ban the **sale** of e-cigarettes where the sale of tobacco is prohibited
- Prohibit the **display and promotion** of e-cigarettes in places where e-cigarettes or tobacco products are sold, or offered for sale.

http://www.ontla.on.ca/web/bills/bills_detail.do?BillID=3080



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United States

- FDA has proposed e-cigs would be “**tobacco products**” and subject to the requirements of the Tobacco Control Act.
- Existing and new companies could be required to register, pay fees and meet premarket requirements, as well as **list the ingredients** found in these products.
- Additional public health regulations might include restrictions on online e-cigarette sales, and **marketing to children**.

<http://www.cpha.ca/en/about/digest/38-1/8.aspx>



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E-cigarettes should be regulated in a way to reduce smoking of combusted tobacco products to the greatest extent possible.

Threat or promise?

Harm or
harm
reduction?



Benefits and
risks?

• 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

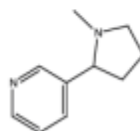
70

NUMBER OF THESE COMPOUNDS WITH CONFIRMED CARCINOGENIC ACTIVITY



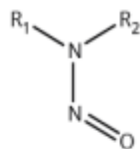
The compounds shown below are all found in cigarette smoke. The mass figures, given in μg , take into account both mainstream (inhaled) and sidestream smoke. 1 μg is equal to 1 millionth of a gram. Amounts of these compounds vary in different brands of cigarettes - these figures are approximate.

NICOTINE



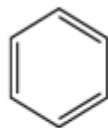
- Approx. 919 μg per cigarette
- Addictive
- Increases heart rate
- Increases blood pressure
- Increases blood glucose
- Lethal dose: around 500-1000mg

N-NITROSAMINES



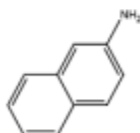
- Large class of compounds
- Several are tobacco-specific
- **Known human carcinogens**
- Most carcinogenic: NNK & NNN
- NNK: approx. 0.3 μg per cigarette
- NNN: approx. 2-50 μg per cigarette
- May cause reproductive damage

BENZENE



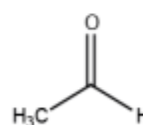
- Approx. 46-272 μg per cigarette
- **Known human carcinogen**
- Damages bone marrow
- Lowers red blood cell count
- May harm reproductive organs

AROMATIC AMINES



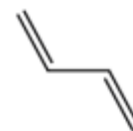
- Large class of compounds
- Includes 2-aminonaphthalene:
- **Known human carcinogen**
- Linked with bladder cancer
- Approx. 0.04 μg per cigarette

ACETALDEHYDE



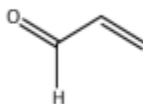
- Approx. 680-1571 μg per cigarette
- **Known animal carcinogen**
- **Probable human carcinogen**
- Irritant to skin & eyes
- Irritant to respiratory tract

1,3-BUTADIENE



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

ACROLEIN



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

POLYAROMATICS



- Large class of compounds
- Includes benzo[a]pyrene:
- **Known human carcinogen**
- **Known DNA mutagen**
- Affects reproductive capacity
- Up to 0.14 μg per cigarette

Health consequences of smoking

Cancer

- Bladder
- Blood (acute myeloid leukemia)
- Cervix
- Colon and rectum (colorectal)
- Esophagus
- Kidney and ureter
- Larynx
- Liver
- Lung
- Oropharynx (includes parts of the throat, tongue, soft palate, and the tonsils)
- Pancreas
- Stomach
- Trachea, bronchus, and lung

Increased risk of:

- Stroke and coronary heart disease
- Peripheral vascular disease
- Erectile dysfunction
- Tuberculosis
- Diabetes
- Osteoporosis/hip fractures
- Cataracts
- Macular degeneration
- Rheumatoid arthritis
- COPD

<http://www.surgeongeneral.gov/library/reports/50-years-of-progress/>



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Nicotine



- Health effects: Fairly benign, similar to caffeine
- **Harm:** Short term increase in BP and pulse, addictive, fetal development
- **Benefits:** Increases focus, relief from stress, anxiety, or panic, Parkinsons?
- Lower limit causing fatal outcomes is **500–1000 mg** of ingested nicotine

<http://www.ncbi.nlm.nih.gov/pubmed/8614291>



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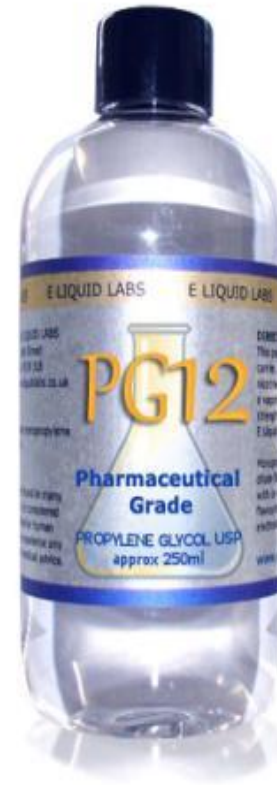


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Propylene glycol

- Water-miscible cosolvent
- Creates vapour when heated
- Used in fog machines
- 0-70 per cent in e-cigs
- SA- dryness in throat, irritant
- No specific long term studies in the lungs
- In cigarettes/pressurized asthma inhalers



[https://www.rsc.org/Merck-Index/monograph/m9238/propylene glycol](https://www.rsc.org/Merck-Index/monograph/m9238/propylene-glycol)



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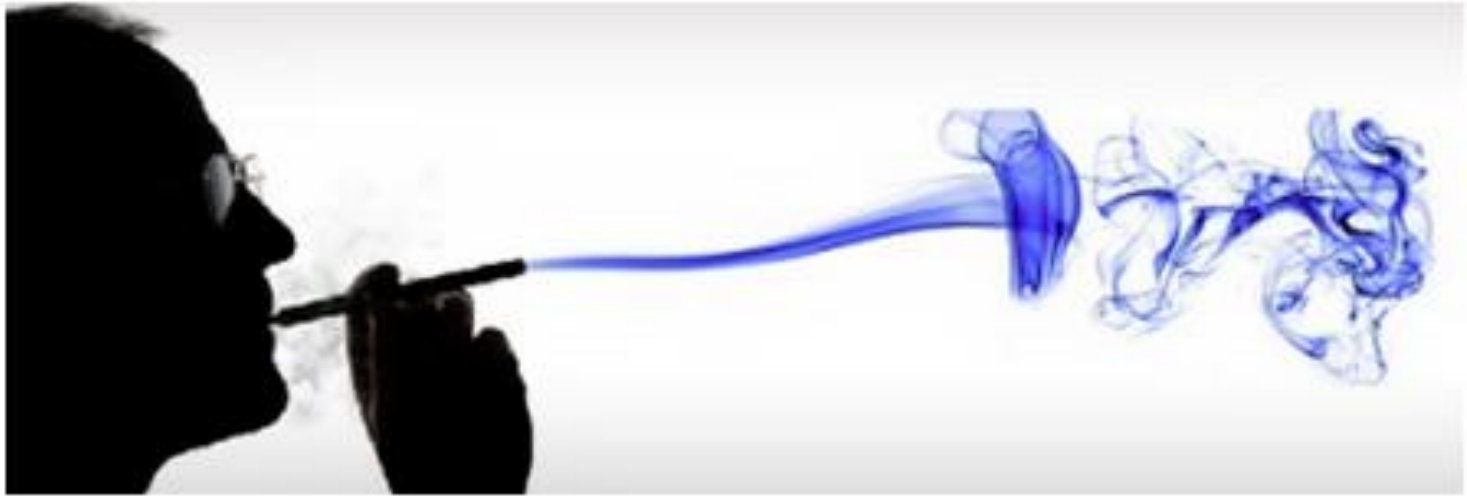
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Potential harm?

- **Dual use** – lose gains, keep or increase nicotine addiction
- **Gateway for youth** – nicotine addiction to smoking tobacco
- **Re-normalize smoking** – lose gains
- **Harmful** – nitrosamines, formaldehyde?
- **Tobacco company involvement** – lack of ethics





**SLIM. CHARGED.
READY TO GO.**

**AVAILABLE
NATIONWIDE!**

Visit us at blucigs.com/store-locator



NOT FOR USE WITH TOBACCO. blu and bluflavor are trademarks of Lorillard Technologies, Inc. ©2010 Lorillard Technologies, Inc. All rights reserved. Electronic cigarettes are not a smoking cessation product and have not been evaluated by the Food and Drug Administration. You may find e-cigarettes to be addictive. Use only as directed. ©2010 Lorillard Technologies, Inc. blu and bluflavor are trademarks of Lorillard Technologies, Inc.

CIGARETTES, YOU'VE MET YOUR MATCH.



**INTRODUCING THE NJOY KING
ELECTRONIC CIGARETTE.
FINALLY, SMOKERS HAVE A
REAL ALTERNATIVE.**

It's the first electronic cigarette with
the look, feel and flavor of the real thing.

njoy.com

©2010 NJOY, Inc. All rights reserved. Smoking products which contain nicotine and tar.

SMOKE IN STYLE
With blu Electronic Cigarettes

Fashion never goes out of fashion. Control when and where you want to smoke with blu electronic cigarettes. blu provides an tobacco smoke and no ash, only vapor, making it the ultimate accessory and the perfect alternative to regular cigarettes. Step out in style with blu.

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blu

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18+ ID required. No single brand or model of electronic cigarette has yet been evaluated by the Food and Drug Administration. See our blog blucigs.com for more information.

You've come a long way, baby.

DUROCK GENUINE SMOKING CIGARETTES
Smoke. Enjoy. Carbon Monoxide. Tar. Nicotine.

DUROCK GENUINE'S SMOKING Cigarettes
Smoke. Enjoy. Carbon Monoxide.





Potential benefits?

- Reduce harm – less toxicants
- Potential to help smokers quit
- Cheaper
- Impact on contraband criminal activity
- Odourless

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4154473/#SD2>



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Toxicants

Comparison of toxicants levels between conventional and electronic cigarettes.

Toxic compound	Conventional cigarette (μg in mainstream smoke) [35]	Electronic cigarette (μg per 15 puffs)	Average ratio (conventional vs. electronic cigarette)
Formaldehyde	1.6-52	0.20-5.61	9
Acetaldehyde	52-140	0.11-1.36	450
Acrolein	2.4-62	0.07-4.19	15
Toluene	8.3-70	0.02-0.63	120
NNN	0.005-0.19	0.00008-0.00043	380
NNK	0.012-0.11	0.00011-0.00283	40

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Quit plan

Tool box

- Encourage smokers to try approved evidence based smoking cessation methods/medications first
- May be useful for smokers who cannot quit
- If smoker wants to use e-cigs, provide the most up-to-date information possible



Pharmacists for a Smoke-Free Canada

www.psfcnetwork.com



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Questions?

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