## Electronic Cigarettes: What are they and are they effective?

East London

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### Disclosures

#### **E-cigarette Industry:**

- Undertaken research for e-cigarette companies
- Received products for research purposes
- Received funding for speaking at research conferences

#### **Tobacco Industry:**

- No funding received
- No conflict of interest

#### **Pharmaceutical Industry:**

- No funding received
- No conflict of interest

## E-Cigarettes (ECs): What are they?

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- Disposable
- Re-chargeable with pre-filled cartridges

#### First Generation ECs ('cigalikes')



### Second Generation ECs

Refillable with liquids







#### Third Generation ECs ('mods')









# The Liquid

#### <u>Contents</u>

- Propylene glycol and/or
   Vegetable glycerine (glycerol)
- Nicotine (in mg/ml; ranging from 0-36)
- Flavourings (e.g. tobacco, mint, fruit)
- Additives







# History



- Introduced into Chinese market in 2004 and Europe in 2006 (Ruyan)
- Rapidly growing market:
  - EC use in smokers in UK increased from 2.7% in 2010 to 6.7% in 2012 (Dockrell et al., 2013)
  - Estimated 1.3m current EC users in the UK (ASH, June 2013)
- Production mainly in China but increasing in EU and US.





Tobacco companies now buying into the EC market.

## Who Uses Them?

Findings from representative samples of the general population:

- Proportion of EC users: 2 to 8 times higher in current smokers than in former smokers
- Little evidence of use in never smokers (0.5% tried ECs)
- Compared with non-users, EC users tended to be:
  - Younger
  - Better educated
  - Higher income
  - No clear association with gender

#### Sources:

Cho (2011) *J Adol Health;* Choi (2013) *Am J Public Health;* Douptcheva (2013) *Epidemio Comm H;* Li (2013) *New Zealand Med J*; Goniewicz (2012) *Pediatrics;* King (2013) *Nicotine Tob Res;* McMillen (2012) *J Environ Pub Health.* 





### Patterns of use in regular users



#### Average duration: 10 months

	%
Product type	
'Cigarette-like'	18
'Second generation'	72
'Mods'	9
Strengths used	
18mg/ml	49
11mg/ml	33
combine strengths	21
0 mg/ml only	1
Preferred flavour	
Tobacco	53
Fruit	33
Mint/menthol	28

From Dawkins et al. (2013) Addiction

# E-Cigarettes: Are they effective?

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- For tobacco craving
- For nicotine delivery
- For smoking cessation

## Effects on Tobacco Craving

- ECs can reduce craving in deprived smokers but not as effectively as tobacco cigarette (Bullen et al., 2010; Vansickel et al., 2010)
- Placebo (0mg/ml) EC also associated with decline in craving after 5 mins and..
- Further reduction in craving with nicotine EC after 20 mins (Dawkins et al., 2012)



### Nicotine Delivery in Naive EC Users

- <u>Bullen et al. (2010):</u>
  - Compared the 0mg, 16mg (Ruyan)
     EC with nicorette inhalator and tobacco smoking



- EC reached max blood level of 1.3ng/ml in 20 mins
- Eissenberg (2010):
  - Compared 2 brands of 16mg ECs to tobacco smoking
  - Only tobacco smoking raised blood nicotine levels
- Ineffective vaping in naive users
- Ineffective first generation devices?

# Nicotine Delivery: Experienced EC users using their own devices

Effective nicotine delivery in 8 experienced 'vapers' using 2<sup>nd</sup> generation devices

From Vansickel & Eissenberg, (2013)



## Nicotine Delivery in regular users



Effective nicotine delivery with 'cigalike' cartomizer device in 14 regular users

## Surveys of EC users

Approx. 15 surveys report high quit rates e.g.:

- 74% reported not smoking for at least a few weeks since starting to use the EC
- 14% dramatically reduced their cigarette consumption (Dawkins et al., 2013)
- 92%: EC helped to reduce my smoking
- 96% (ex-smokers): EC helped me to stop smoking (Etter & Bullen, 2011)
- Non-representative samples = over-estimates of quit rates



# Effects of ECs on smoking behaviour

- <u>Survey of smokers who had</u> purchased an EC:
  - 31% abstinent from smoking at
    - 6 months



- Those using EC > 20x/day: quit rate 70%
- <u>Study of 40 smokers not willing to quit</u>

 6 months smoking abstinence or 50% reduction shown in 55%

Sources: Siegel et al. (2011): Polosa et al. (2011):



## **Randomised Controlled Trials**

- 'Categoria' 7.2mg nicotine EC vs.
  4.8mg nicotine EC vs. no nicotine EC
  - 300 smokers (unwilling to quit)
  - 1 year abstinence rates: 13%, 9% and 4% (Caponnetto et al. 2013)

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- 'Elusion' 16mg nicotine EC vs. nicotine patch vs. no nicotine EC
  - 657 participants
  - 6 month abstinence rates: 7.3%, 5.8% and 4.1%

(Bullen et al. 2013)

# Summary:



- ECs deliver nicotine via inhaled vapour
- Used by smokers wanting to quit/replace or reduce tobacco smoking
- And with increasing popularity
- Moderately effective at alleviating tobacco craving...
- And can effectively deliver nicotine (at least in habitual users)
- RCTs suggest cessation rates at least comparable with NRT....
- But as yet no RCTs on non-'cigalike' devices.