Nicotine Reduction Workshop
Role of nicotine in smoking behaviour

Derek Mariner
Introduction

- “Nicotine itself is not especially hazardous ... if nicotine could be provided in a form that is acceptable and effective as a cigarette substitute, millions of lives could be saved.”

  *Harm reduction in nicotine addiction: helping people who can’t quit, a report by the Tobacco Advisory Group of the Royal College of Physicians, 2007*

- Nicotine inhaled from smoking tobacco is highly addictive. But it is primarily the toxins and carcinogens in tobacco smoke – not the nicotine – that cause illness and death.

  "Tobacco harm reduction approaches to smoking, UK National Institute for Health and Care Excellence, public health guidance 45, July 2013"

- “People smoke for the nicotine, but die from the tar.”

  *Professor Michael Russell, British Medical Journal, 1976*

- Nicotine at all concentrations has the potential to cause addiction.  www.bat.com
Smoke effects

- **Pharmacological (nicotine)**
  - binds to nicotinic cholinergic receptors facilitating neurotransmitter release: dopamine, glutamate, and gamma aminobutyric acid
  - induces stimulation and pleasure, and reduces stress and anxiety

- **Sensory (smoke and nicotine)**
  - Gustation, olfaction, flavour
  - Common chemical sense (trigeminal): irritation, mouthfeel/full, impact

Nicotine uptake

- Plasma nicotine peaks after each cigarette

- Behaviour varies widely

Russell et al, BMJ, 1976, 1, 1043-1046

Mariner et al, Reg Toxicol Pharmacol, 2011, 61, S39–S50
Compensation

The extent to which smokers change their behaviour when switching to a cigarette with different tar and nicotine yield

- Review by Scherer (1999) concluded that compensation is partial
- NIH NCI Monograph 13 (2001) concluded that compensation is complete

Potential mechanisms

- Puff number ✓
- Puff volume ✓
- Inhalation pattern ✗
- Ventilation blocking ⇔
- Cigarette consumption ✗
Role of nicotine in compensation

- Early studies (70s): Difficult to separate nicotine effects from tar effects

- Low tar/medium nicotine
  - Stepney et al (1981) concluded that tar yield was more important than nicotine yield, possibly due to sensory mechanisms
  - BAT sensory panels rejected the products as unbalanced – mouthfeel too low and irritation too high

- Denicotinised tobacco
  - Hasenfratz et al (1993) “reduction in tar yield appeared to be more important than a reduction in nicotine yield”

- Constant tar/varying nicotine (similar to the proposed regulatory approach)
  - Dixon et al (2003) No significant effect on puffing parameters, no evidence of compensation, significant reduction in “impact”
  - Benowitz et al (2004) found a reduction in nicotine exposure, no increase in CO or NNK exposure
Non-nicotine factors

- Requires that nicotine and non-nicotine factors can be decoupled eg using IV administration of nicotine (Jed Rose, 2005)
  - IV nicotine provides limited subjective satisfaction, but some craving relief
  - IV nicotine plus denicotinised cigarettes provide increased satisfaction and craving relief (increased in subjects with higher FTND scores)
  - IV nicotine had only small effect on ad libitum smoking behaviour
- Concluded that sensory and behavioural /motor cues are important
Does appropriate e-cigarette regulation provide an opportunity to reduce smoking prevalence?

- Similar nicotine uptake to cigarettes possible
- Provide many of sensory and behavioural cues from cigarette smoking
- Use appears to be associated with an increase in successful quit attempts (Beard et al (2016))
References


Tobacco harm reduction approaches to smoking, UK National Institute for Health and Care Excellence, Public Health Guidance 45, July 2013


NIH NCI Monograph 13 (2001)


Thank you

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