Comparison of the Cytotoxic Potential of Cigarette Smoke and Electronic Cigarette Vapour Extract on Cultured Myocardial Cells

Journal Article [1)]

Background:

Electronic cigarettes (ECs) have been marketed as an alternative-to-smoking habit. Besides chemical studies of the content of EC liquids or vapour, little research has been conducted on their in vitro effects. Smoking is an important risk factor for cardiovascular disease and cigarette smoke (CS) has well-established cytotoxic effects on myocardial cells. The purpose of this study was to evaluate the cytotoxic potential of the vapour of 20 EC liquid samples and a “base” liquid sample (50% glycerol and 50% propylene glycol, with no nicotine or flavourings) on cultured myocardial cells. Included were 4 samples produced by using cured tobacco leaves in order to extract the tobacco flavour.

Methods:

Cytotoxicity was tested according to the ISO 10993-5 standard. By activating an EC device at 3.7 volts (6.2 watts—all samples, including the “base” liquid) and at 4.5 volts (9.2 watts—four randomly selected samples), 200 mg of liquid evaporated and was extracted in 20 mL of culture medium. Cigarette smoke (CS) extract from three tobacco cigarettes was produced according to ISO 3308 method (2 s puffs of 35 mL volume, one puff every 60 s). The extracts, undiluted (100%) and in four dilutions (50%, 25%, 12.5%, and 6.25%), were applied to myocardial cells (H9c2); percent-viability was measured after 24 h incubation. According to ISO 10993-5, viability of <70% was considered cytotoxic.

Results:

CS extract was cytotoxic at extract concentrations >6.25% (viability: 76.9 ± 2.0% at 6.25%, 38.2 ± 0.5% at 12.5%, 3.1 ± 0.2% at 25%, 5.2 ± 0.8% at 50%, and 3.9 ± 0.2% at 100% extract concentration).

Three EC extracts (produced by tobacco leaves) were cytotoxic at 100% and 50% extract concentrations (viability range: 2.2%–39.1% and 7.4%–66.9% respectively) and one (“Cinnamon-Cookies” flavour) was cytotoxic at 100% concentration only (viability: 64.8 ± 2.5%). Inhibitory concentration 50 was >3 times lower in CS extract compared to the worst-performing EC vapour extract. For EC extracts produced by high-voltage and energy, viability was reduced but no sample was cytotoxic according to ISO 10993-5 definition. Vapour produced by the “base” liquid was not cytotoxic at any extract concentration. Cell survival was not associated with nicotine concentration of EC liquids.

Conclusions:

This study indicates that some EC samples have cytotoxic properties on cultured cardiomyoblasts, associated with the production process and materials used in flavourings. However, all EC vapour extracts were significantly less cytotoxic compared to CS extract.

Related: Evaluation of the cytotoxic potential of e-cigarette vapor on cultured cardiac cells: a new study

z-ref: 2n9uifp6

Cardiovascular, Category-Health and Safety, E-Cigarette, e-liquid, Folder-E-Cigs, Leans-Positive, Nicotine, RESEARCH

1)
Farsalinos , et al. (2013), Comparison of the Cytotoxic Potential of Cigarette Smoke and Electronic Cigarette Vapour Extract on Cultured Myocardial Cells, http://www.mdpi.com/1660-4601/10/10/5146 accessed: 2013-11-02