Call of Abstracts - “International conference on the E-Cigarette: patterns of use and health impacts”

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“International conference on the E-Cigarette: patterns of use and health impacts” - Paris, on 5-6th December 2022

Submission form

Poster & oral presentation

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Background information

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Abstract title

Assessment of nicotine protonation state in e-liquids using benchtop NMR spectroscopy

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Abstract details (poster & oral)

Background, method, results and conclusions

BACKGROUND: The popularity of 'Nic salts' in e-liquids is on the rise. In these e-liquids, nicotine is protonated. Protonated nicotine should lead to reduced bitterness and respiratory irritation compared to freebase nicotine. The reduced irritation allows consumers to inhale higher concentrations of nicotine, thereby increasing addictiveness and appeal of e-cigarette smoking, as compared to freebase nicotine. The European Tobacco Product Directive prohibits the use of ingredients that facilitate inhalation or uptake of nicotine. A fast method for detecting nicotine salts in e-liquids may therefore be of interest. Benchtop NMR spectroscopy might be particularly suitable for this purpose, as it permits measurements on undiluted, unmodified samples. METHOD: A method was developed to use a 60 MHz benchtop NMR spectrometer for the assessment of the protonation state of nicotine in e-liquids and compared with results derived from pH measurements. 19 Nic salt and 14 regular (i.e. free-base) e-liquids were analysed. Types were attributed according to the labelling on the packages. Protonation degrees were assessed based on the peak at ~7.5 ppm in the 1H-NMR spectrum. RESULTS: Nic salt and regular e-liquids form clearly separated populations, with respective protonation degrees of <30% and >80%. All Nic salt e-liquids were found to contain protonated nicotine. Three of the fourteen regular e-liquids were found to contain protonated nicotine, even though they were not labelled as Nic salt e-liquids. CONCLUSIONS: Benchtop NMR spectrometry provides a facile manner to assess the protonation state of nicotine in e-liquids. The developed method has been used to analyse 33 e-liquids and assess their degrees of nicotine protonation. As Nic salts might facilitate inhalation of nicotine, and increase the appeal of e-smoking, the easy acquisition of data on the protonation state of nicotine in e-liquids can be important for future regulatory decision making and enforcement.

Main messages

Benchtop NMR spectroscopy can be used to assess the protonation state of e-liquids.
Three of fourteen e-liquids that were advertised as regular e-liquids were found to contain protonated nicotine.

Type of study / research

Quantitative

Geography of the study

International (including Europe)

Funding of study

Federal source

Yes

State source

No

Nonprofit Grant Funding Entity Source

No

Nonprofit Grant Funding Entity Source

No

Academic Institution Source

No

Pharmaceutical Industry Source

No

Tobacco/E-Cigarette Industry Source

No

Declaration of interest

The submitter declares that during the past 5 years have a direct nor indirect link (professional*, personal or financial) with the tobacco and e-cigarette companies**

No