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Chemical differences between alternative and traditional tobacco products

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Abstract

Background: Electronic cigarettes (E-cigs) and heated tobacco products (HTPs) have gained popularity as alternatives to traditional tobacco products (TTPs), claiming to reduce harm. The carcinogenic properties of chemicals in the smoke of TTPs are widely recognized. However, there is still an incomplete understanding of the different chemicals in E-cigs and HTPs and their toxicity to human cells [1]. **Objective:** Thus, this study aimed at characterizing and comparing the chemical composition of three different brands of E-cigs, HTPs and TTPs. **Methods:** We selected the three top-selling brands of E-cigs, HTPs, and TTPs in Portugal, and each brand (n=9) was analyzed in triplicate. Volatile compounds present in all brands were extracted by headspace solid-phase microextraction (HS-SPME) and solvent extraction (dichloromethane). The volatile compounds in the headspace and solvent extracts were analysed by gas chromatography-mass spectrometry (GC-MS). Compound annotation was performed by comparing the mass spectrum of each chromatographic peak in the sample with a mass spectral library and standards, where available. **Results:** A total of 53 compounds were detected in E-cigs, 44 in HTPs and 41 in TTPs by HS-SPME. Solvent extraction revealed 43 compounds in E-cigs, 35 in HTPs and 22 in TTPs. Only 7 compounds were common to E-cigs, HTPs, and TTPs. Overall, the chemical classes included alcohols, aldehydes, ketones, esters, pyridines and others. The composition of HTPs and TTPs was similar (20 compounds in common), particularly in the classes of ketones, alcohols, terpenoids, and pyridines. In contrast, E-cigs contain a larger number of compounds than HTPs and TTPs, including several alcohols, esters, pyranones, and lactones. The volatile composition of HTPs and TPPs showed less variation between different brands, whereas E-cig brands showed greater variability in their composition. **Conclusions:** HTPs have a volatile chemical composition similar to that of TTPs in their original form, so their health effects will depend on the impact of the different types of combustion. E-cigs show a distinct chemical profile across all brands, with chemical classes that are potentially relevant for toxicological studies.

Keywords: electronic cigarettes; heated tobacco products; volatile chemical composition; gas chromatography-mass spectrometry

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