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Unveiling the toxicological risks of synthetic cannabinoid smoking: a GC-MS-based investigation

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Abstract

Background: Synthetic cannabinoids (SCs) are a significant class of new psychoactive substances (NPS) commonly consumed via smoking. This process generates pyrolysis byproducts, some of which may exhibit increased toxicity compared to their parent compounds. The structural diversity and rapid emergence of SCs and the use of different herbal products pose challenges in forensic toxicology, necessitating comprehensive chemical analysis of SC-infused herbal blends before and after combustion [1]. **Objective:** This study aimed to identify SCs and their combustion byproducts in an herbal blend using gas chromatography-mass spectrometry (GC-MS). The goal was to assess potential structural modifications due to pyrolysis and evaluate their toxicological relevance. **Methods:** A commercially available SC herbal blend, *Esfinge*, provided by the Portuguese Judiciary Police, was analyzed before and after combustion. GC-MS analysis used headspace solid-phase microextraction (HS-SPME) and liquid extraction with dichloromethane and methanol. A controlled combustion apparatus was used to simulate smoking conditions. The detected compounds were identified through spectral library matching and/or by comparison with chemical standards and their toxicological potential was assessed using Globally Harmonized System (GHS) hazard statements. **Results:** Before combustion, JWH-210 was the primary SC identified, along with other organic compounds (i.e., Eucalyptol, Oplopanone). After combustion, several pyrolysis products emerged, including naphthalene, quinoline, indole, and acetophenone, which are known to have potential toxicological effects [2]. The transformation of SCs into novel pyrolytic derivatives suggests alterations in their pharmacological and toxicological profiles. **Conclusions:** The study highlights the formation of hazardous pyrolysis products from SC combustion, emphasizing the need for further toxicological evaluation. These findings contribute to forensic toxicology by improving the understanding of SC combustion products and their implications for public health and regulatory frameworks.

Keywords: synthetic cannabinoids (SCs); pyrolysis byproducts; gas chromatography-mass spectrometry (GC-MS)

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