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Toxicity of synthetic cannabinoids is increasing along with the regulatory measures taken for their control

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ABSTRACT

Introduction: Novel psychoactive substances (NPS) represent a rising public health threat due to the associated side effects and the lack of success on their control policies. NPS are freely sold, mostly on the internet, as legal and safe replacements of controlled drugs of abuse. Synthetic cannabinoids (SCs) represent one of the largest groups of NPS and are designed as mimetics of Δ9-tetrahydrocannabinol from cannabis [1]. After the identification of JWH-018, the first SC appearing on the market, many countries took measures to control the free circulation of these products [2]. Nevertheless, efforts to control them are rapidly contoured, since clandestine manufacturers are constantly changing their chemical structures leading to previously unknown SCs [3]. The aim of this study is to show how chemical changes on recent generations of SCs to evade the law lead to the production of more harmful compounds, with potential application in forensic context. With that purpose, the toxicity of three SCs, representatives of the first, second and third generations [4], was assessed.

Materials and methods: The SC JWH-018 was obtained as >98.5% pure powders from Lipomed AG Switzerland. SCs THJ-018 and EG-018 were bought through an internet website (www.chem.eu). THJ-018 and EG-018 were purified through HPLC/DAD and confirmed by GC/MS. Pure SCs stock solutions were prepared in 100% DMSO accordingly to the stipulated final concentrations and diluted into the culture medium prior addition to cells. The neuroblastoma human cell line SH-SY5Y was exposed, for 24 h, to several concentrations of each SC. Cell toxicity was evaluated through MTT assays.

Results: Figure 1 shows the MTT results for SH-SY5Y viability in the presence of JWH-018, THJ-018 and EG-018. SH-SY5Y cells viability does not decrease in the presence of JWH-018 at the range of concentrations used. However, when the same cell line is exposed to THJ-018 or EG-018 there is a decrease in cell viability with the increase in the concentration of these substances.

Discussion and conclusions: The results from the present study points THJ-018 and EG-018, JWH-018 analogues of 2nd and 3rd generations, as more toxic to the neuroblastoma cells than JWH-018, the first SC found on the street market. These results suggest that emerging modified SCs, to avoid the law, are becoming more toxic and dangerous. Given the emergence of this situation, it is time to rethink current legislation to prevent rise on public health issues derived from consumption of molecules of unknown toxicological profile.

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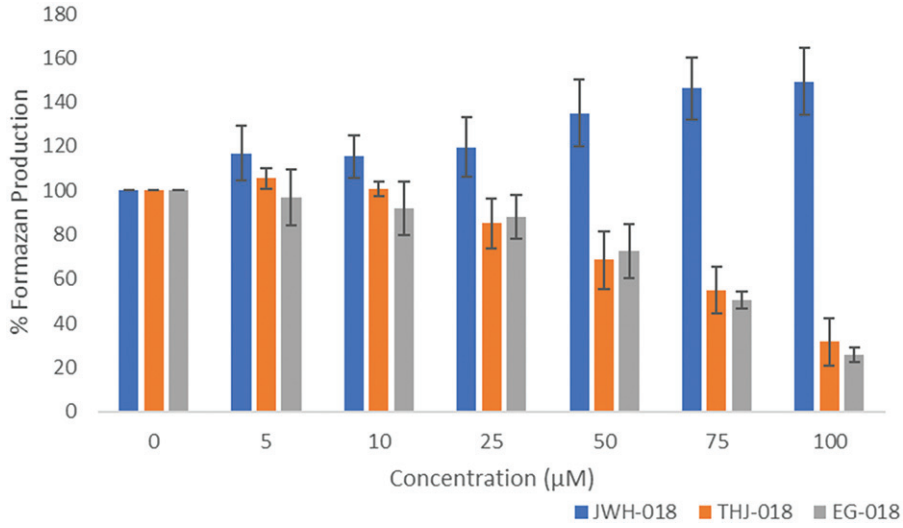

Figure 1. Cytotoxic evaluation by MTT assay of JWH-018, THJ-018 and EG-018 in SH-SY5Y cells. Data are expressed as the mean ± SD ($n = 3$).

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Vehicle identification from automotive paints transferred in road accidents

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ABSTRACT

Introduction: Paint chips and smears represent the most common types of trace evidence resulting from vehicle-related incidents [1,2]. Analysis of these traces would ideally lead to the identification of the paint producer and ultimately of the vehicle in question [2]. Despite the chemical complexity of automotive paints, several reports showed this identification to be possible through the use Py-GC/MS, SEM-EDX, WDXRF, Raman and FTIR spectroscopy [1,3–5]. However, these studies were focussed on the analysis of each of the individual layers that compose the painting, making the analysis more complex, time consuming and dependent on highly specialised equipment. In the present work, we evaluated the discriminative potential of ATR-FTIR for the identification of paint producers, based on the analysis of the paint as a whole.

Materials and methods: Fragments of 6 different car paints obtained from the hood and lateral panels were milled and analysed through ATR-FTIR, both individually and as mixtures between pairs of paint Figure 1. Spectra were obtained between 450 and 4000 cm^{-1}, with a resolution of 4 cm^{-1} and 16 accumulations.

Results: The obtained results show the paint spectra to have considerable differences both in the number and intensity of IR bands. Furthermore, the mixtures' spectra clearly show bands of both individual paints that are proportional, in intensity, to the ratio of each individual paint.

Discussion and conclusions: These preliminary results show considerable differences between the FTIR spectra of the individual paints that propagate throughout the paint mixtures. This suggests that there are features in the ATR-FTIR spectra of automotive paints, as a whole that might be suitable predictors for the development of highly accurate predictive models.