Characterization of URB series synthetic cannabinoids by HRMS and UHPLC–MS/MS

Marco Agostini,[1] Donata Favretto *,[2] Andrea Duranti *[3]

1 Laboratory of Toxicology A.S.U.R. AV1, Via Lombroso 15, Pesaro, 61122, Italy
2 Legal Medicine and Toxicology, Via Falloppio 50, University Hospital of Padova, Padova, 35121, Italy
3 Department of Biomolecular Sciences, Piazza del Rinascimento 6, University of Urbino Carlo Bo, Urbino (PU), 61029, Italy

Background. A large number of synthetic cannabinoids are included in new psychoactive substances (NPS) [1, 2] and constitute an open research area in analytical pharmaceutical and toxicology when methods are needed to unambiguously identify these substances and their metabolites.

Methods. The molecular characterization of five representative URB series molecules (Figure 1) was achieved by high resolution mass spectrometry (HRMS) and ultra–high performance liquid chromatography coupled with a triple quadrupole (UHPLC-MS/MS) (Figure 2) in positive ion electrospray ionization and collisional experiments on the protonated parent ions obtaining characteristic fragmentation patterns.

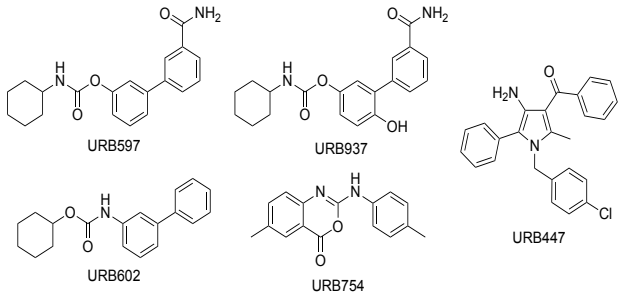

Figure 1. Chemical structures of URB compounds.

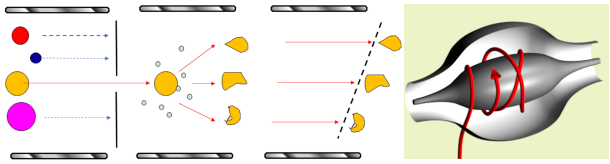

Figure 2. Representation of triple quadrupole and orbitrap analyzers.

Although, at the moment, the phenomena of abuse and fatality have not been correlated to URB series drugs but only one notification and a literature report are present [3, 4], their molecular characterization and MS fragmentation behaviour are important for the unambiguous identification of those substances.

The present study integrates and extends the MS characterization of synthetic drugs able to interact with the cannabinoid system. It provides the first description of the URB compounds by CID in tandem quadrupole MS and hybrid ion trap-orbitrap MS.

The methods here used have made it possible to unequivocally characterize the molecules, to determine the operating conditions for their accurate identification and therefore to lay the foundations for a future development of analytical methods aimed at early screening on NPS in seizures or biological samples.

The data reported will play a key role in the future development of LC–MS/MS or LC–HRMS screening useful for URB compounds' research.

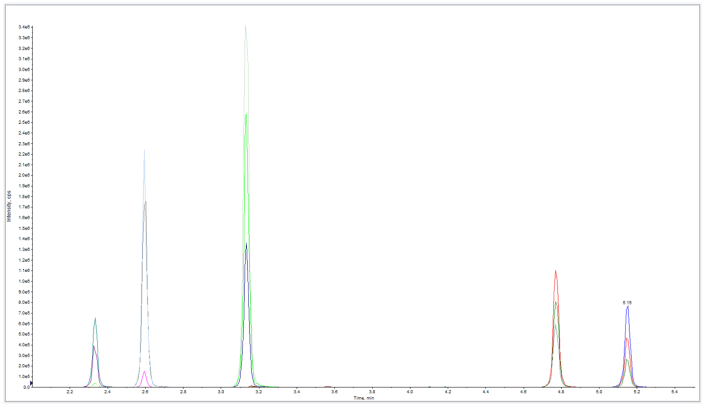

Figure 3. Multiple reaction monitoring extracted ion chromatogram of URB compounds. Chromatographic gradient separation was performed on a 50 x 2.1 mm KINETEX EVO 1.9 µm C18 column through mobile phases composed by 0.1% formic acid and 0.1% formic acid in acetonitrile with 5% water. Total run time was 11 minutes at the constant flow rate 0.5 mL/min and the column temperature was set at 40 °C.

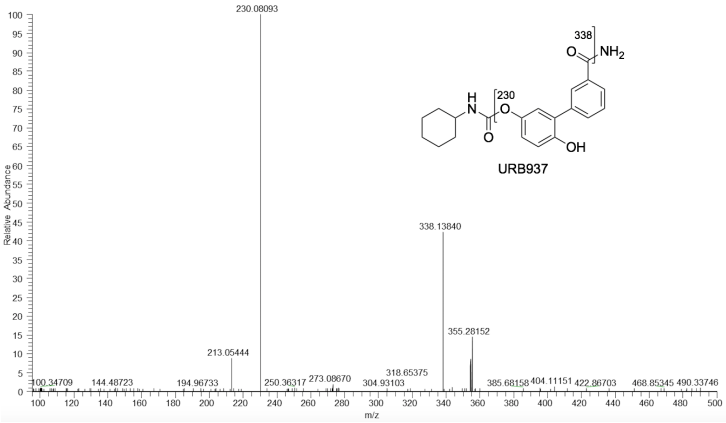

Figure 4. Representation of the collisional–induced fragment ions of URB937 compound, as an example of the series. The most abundant ion at m/z 230 results from the loss of cyclohexyl isocyanate. Other main characteristic fragments are observed at m/z 213 due to the loss of cyclohexyl isocyanate and ammonia, and m/z 338 due the only loss of ammonia.

References. [1] https://www.unodc.org/documents/scientific/NPS_threats-IV.pdf. [2] https://www.unodc.org/LSS/Page/NPS. [3] http://www.emcdda.europa.eu/attachements.cfm/att_229598_EN_TDAN14001ENN.pdf. [4] Uchiyama, N *et al. Forensic Sci. Int.* **2013**, *227*, 21–32.