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To determine the geographical origin of street ketamine samples by using 13C and 15N stable isotope ratio analysis

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The anaesthetic ketamine is abused for its dissociative effects resulting in it being a controlled substance. There is a need to determine the sources of the abused ketamine, in particular whether it is being diverted from legitimate veterinary and clinical supplies or manufactured abroad and imported illegally. Element analysis by isotopic ratio was employed to help answer this question. Therefore, the isotopic ratio values of 11 street samples were compared with the available ketamine pharmaceutical products, VetalarTMV and Ketalar®, as well as an authentic ketamine HCl sample purchased from Sigma Aldrich.

Materials & Apparatus: Eleven different ketamine samples obtained from different sources were subjected to isotopic ratio analysis, EA-IRMS analysis. VetalarTMV and Ketalar® were purchased as ketamine hydrochloride injections, ketamine HCl was purchased from Sigma-Aldrich. All % elemental data are traceable to The National Institute of Standards and Technology (NIST) primary references, with 15N calibrated to reference IAEA-N1 ammonium sulfate and 13C calibrated to reference IAEA-CH-3 cellulose.

Results & Discussion: We applied the EA-IRMS technique to obtain evidence for any of the seized and amnesty bin ketamine samples we are investigating having been diverted from hospital or veterinary supplies. The δ13C ‰ and δ15N ‰ values of these samples were therefore compared with the data from ketamine obtained from known geographical sources, specifically VetalarTMV (Germany), Ketalar® (Ireland) and authentic ketamine HCl (India). δ13C and δ15N of samples of interest were determined by EA-IRMS, avoiding any extraction step to nullify potential isotopic fractionation from the solvent. Based on the δ13C‰ and δ15N‰ (parts per thousand) values, 8 of the 11 samples can be grouped into three sets: I (seized samples), II (Bristol night club amnesty bin), and III (Glastonbury 2013 amnesty bin). The δ15N ‰ isotopic ratios of the 11 samples varied between 4.175 and 13.975‰. These results show that the seized ketamine samples had almost identical values of δ13C‰ and δ15N‰ and therefore might be from a single source. Similarly, all the Bristol night club samples could be grouped together. The VetalarTMV and Ketalar® samples had different δ15N‰, but very close δ13C‰ values which did not match any of the illicit samples. None of the illicit samples had an isotopic ratio fingerprint comparable to the purchased ketamine (Indian). Three samples from the Glastonbury 2013 amnesty bin appeared to have distinctive profiles.

Conclusions: This study shows the feasibility of using δ13C‰ and δ15N‰ values to link or discriminate between various ketamine samples. None of the illicit samples had isotopic ratio fingerprints equivalent (or even similar) to the VetalarTMV and Ketalar® samples, suggesting they had not been diverted from veterinary or hospital supplies, nor purchased from Sigma-Aldrich. Therefore, they are the products of illegal synthesis.

Biography

Majdah Alotaibi is an Assistant Lecturer at the University of Tabuk, Saudi Arabia and she is in the final year of her PhD at the University of Bath, UK. Her project is focussed on “Impurity profiling of illicit drugs” using different techniques, HPLC, NMR, LC-MS, ESI-MS, and GC-MS.

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