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Enantiomeric profiling of ketamine in street samples for recreational use

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Abstract

Background: While ketamine (KET) has gained increasing scientific attention for its novel therapeutic applications, there has also been a parallel global rise in its non-medical, recreational use. [1]. Due to its effects on the central nervous system—such as dissociation, perceptual alterations, and its well-known anesthetic properties—KET is frequently used recreationally for its psychoactive effects. [2]. As concerns over its use outside the medical settings and its potential for addiction continue to grow, many governments have classified KET as a strictly regulated substance in numerous countries. This chiral compound was traditionally found in its racemate form. However, the prevalence of enantiomerically pure forms, or different enantiomeric compositions has been increasing in recreational samples. Enantiomers exhibit distinct potency and affinity for the N-methyl-D-aspartate receptor with (S)-KET exhibiting fourfold greater affinity for NMDA receptors [2,3]. The discrimination of the enantiomeric fraction (EF) present in seized and or consumed samples is essential due to the different biological activities of enantiomers, which may have potential toxicity implications for consumers. Additionally, it may allow for the determination of origin, precursors used, and possible synthesis processes, relevant for forensic investigation. **Objectives:** The present work aims to determine the enantiomeric fraction (EF) of KET in recreational samples using an enantioselective liquid chromatography method [4]. **Methods:** A previously developed enantioselective method using liquid chromatography coupled with diode-array detection was adapted for the analysis of powder samples provided by consumers [4]. Enantiomers were separated using an analytical Lux® 3 µm cellulose-4 column (150 × 4.6 mm internal diameter) under isocratic elution conditions. The optimized method employed a mobile phase of ammonium acetate in ultrapure water (with 0.1% diethylamine) and acetonitrile (70:30, v/v), with a flow rate of 1 mL/min and detection at 220 nm. **Results:** The findings revealed that all analyzed samples remained in racemic form, highlighting the continued dominance of this composition in illicit drug markets. **Conclusions:** Given the distinct pharmacological and toxicological properties of KET enantiomers, further monitoring of enantiomeric profiling in seized substances is crucial for forensic investigations, public health assessments, and regulatory measures.

Keywords: chiral psychoactive drugs

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