MASS SPECTROMETRIC IDENTIFICATION OF SOME SULPHUR CONTAINING PHENALKYLAMINE DESIGNER DRUGS*

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ABSTRACT: The most recent development in Europe is the marketing of sulphur containing phenalkylamine designer drugs. Because of the potential abuse of these new designer drugs, identification of these compounds is necessary. In this study, the mass spectrometric characteristics of two alkylthiophenalkylamine compounds are described.

KEY WORDS: 2C-T-2; MTA; GC/MS.

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INTRODUCTION

The continuous search for new phenalkylamine designer drugs has provided the drugs-of-abuse market with compounds such as substituted 3,4-methylenedioxy-phenalkyl and 2,5-dimethoxy-phenalkylamine analogues. The most recent development in Europe is the marketing of sulphur containing phenalkylamine designer drugs. Examples of sulphur containing designers are 4-ethylthio-2,5-dimethoxyphenethylamine (2C-T-2) and para-methylthioamphetamine (MTA). 2C-T-2 showed affinity for both 5-HT_{2a} and 5-HT_{2c} receptor subtypes resulting in hallucinogenic effects [6]. MTA proved to be a potent selective serotonin releaser and may increase the secretion of several hormones through stimulation of the serotonergic transmission [4, 5].

Both compounds have been found on the European drugs-of-abuse market in so-called "S-5 tablets", however 2C-T-2 has also been seen in other tablets [1].

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Information provided on the packings of the "S-5 tablets" only indicated the presence of natural alkaloids and vitamines. The intake of one tablet should result into Ecstacy symptoms. At this moment, the use of 2C-T-2 and MTA is not regulated by any Dutch legislation authorities. Because of the potential abuse of these new designer drugs, identification of these compounds is necessary. In this study, the mass spectrometric characteristics of these alkylthiophenalkylamine compounds are described.

MATERIALS AND METHODS

Materials

Concentrated hydrochloric acid (37% w/v), diethyl ether, ethyl acetate, methanol, and potassium hydroxide were purchased from Merck Nederland (Amsterdam, the Netherlands). Trifluoroacetic anhydride (TFAA) was obtained from Pierce Europe (Oud-Beijerland, The Netherlands). N-methyl-N-trimethylsilyl-trifluoroacetamide (MSTFA) and N-methyl-bis(trifluoroacetamide) (MBTFA) were obtained from Machery-Nagel (Düren, Germany). If not specified, the reagents and chemicals were of analytical grade. 2C-T-2 was isolated from marketed tablets obtained from so-called "smart-drug shops". 2C-B and HMA were synthesized according to Shulgin and Shulgin [7] and de Boer et al. [2], respectively. MTA was synthesized according to the synthesis of 4-methoxyamphetamine [7].

Isolation of 2C-T-2

After grinding the tablets to powder, demineralized water was added. With a few drops of potasium hydroxide (25% w/v), the pH of this aqeous solution was set at 9. The basic solution was extracted with diethyl ether. The organic phase was separated from the aqeous layer and after addition of a few drops of concentrated hydrochloric acid (37% w/v), the diethyl ether layer was evaporated to dryness.

Derivatization

Prior to GC/MS analysis, the compounds were converted into their N,O-trifluoroacetyl (N,O-TFA) and/or N-trifluoroacetyl-O-trimethylsilyl (N-TFA-O-TMS) derivatives. Derivatization into N,O-TFA derivatives was performed with 50 ml of ethyl acetate and 50 ml TFAA added to the respective residues and heated for 20 min at 60°C. Excess of reagent was removed under nitrogen at 50°C and finally the residue was redissolved in 100 ml of ethyl acetate. Derivatization into N-TFA-O-TMS derivatives was performed with MSTFA heated for 10 min at at 80°C followed by MBTFA heated for 5 min at 80°C [3].

GC/MS analysis

GC/MS analysis was performed on a Hewlett Packard 5790A Gas Chromatograph equipped with a CP-Sil 8 CB Low Bleed/MS column 30 m x 0.25 mm i.d., film thickness 0.25 mm, coupled to a Hewlett Packard 5970A Mass Selective Detector and a Hewlett Packard 7673A Automatic Sampler (Hewlett Packard, Palo Alto, CA, USA). The injection volume was 1 ml. The operating temperatures for the GC were 280°C for the injector and the oven was programmed from 100°C (1 min) to 290°C (10 min) at 20°/min. The carrier gas was helium. The mass spectra were taken full scan in the electron ionization (EI) mode (m/z 50 to 600).

Fig. 1. Mass spectrum of 2C-T-2-N-TFA.

Fig. 2. Mass spectrum of 2C-B-N-TFA.

RESULTS AND DISCUSSION

The first compound 2C-T-2 is a 2,5-dimethoxyphenethylamine analogue substituted at the 4-position. In general, these analogues have EI mass spectra with closely related

Fig. 3. Mass spectrum of MTA-N-TFA.

Fig. 4. Mass spectrum of HMA-N-TFA-O-TMS.

fragmentation patterns. Figures 1 and 2 show the EI mass spectra of the N-TFA derivatives of 2C-T-2 and 4-bromo-2,5 dimethoxyphenethylamine (2C-B), respectively.

The second compound is para-methylthioisopropylamine, also known as MTA. The EI mass spectra of non-derivatized MTA and the N-TFA derivative of MTA proved to be almost identical to those of 4-hydroxy-3-methoxyamphetamine (HMA). However, derivatization with MSTFA/MBTFA resulted in end-products which could be distinguished by GC/MS analysis (Figures 3 and 4).

CONCLUSION

The EI mass spectra of the N-TFA derivatives of 2C-T-2 and MTA are characteristic. Therefore, these sulphur containing phenalkylamine designer drugs can be identified using GC/MS analysis.

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