CLINICAL TOXICOLOGY, 15(4), pp. 405-409 (1979)

3,4-Methylenedioxyamphetamine Overdose

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INTRODUCTION

In Canada, 3,4-methylenedioxyamphetamine (MDA) continues to be a popular illicit drug. This popularity, evidenced by over 1000 police submissions of MDA to federal laboratories in 1978, has not, however, resulted in numerous MDA fatalities. On the contrary, few fatalities have been reported where either MDA was the sole causitive agent or where combinations of MDA and other drugs have resulted in death [1].

MDA was first synthesized by Mannich and Jacobsohn in 1910 [2], and the effect of the drug on perception was reported by Alles in a series of self-experiments [3]. Subsequently, MDA has patented as an anorexiant [4] but gained acceptance as a recreational drug due to its perceptual effects in the 1960s. This popularity has continued to the present day. Although the suggested anorectic dosage is 8 to 50 mg, the psychotropic dosage has been reported to be 88 to 126 mg [3, 5]. The amphetamine-like effects of MDA have been attributed to the (S)-MDA isomer whereas (R)-MDA has been shown to be responsible for the hallucinogenic response [6]. Virtually all illicit MDA would be the racemic form.

CASE REPORT

A 35-year-old male was witnessed ingesting a substance by his companions. Subsequently, the subject began to demonstrate erratic behavior. Marked pyrexia was apparent. The decedent was taken to a local hospital but was pronounced dead on arrival.

TOXICOLOGIC ANALYSIS

Extraction of Tissues

Twenty-five milliliter portions of blood, urine, and stomach contents were made distinctly alkaline (pH 12-13) with sodium hydroxide and extracted with 150 ml chloroform. The chloroform was dried by filtering through phase-separating filter paper and extracted with 10 ml 0.5N sulfuric acid. A 15-ml portion of bile was heated on a steam bath with 10 ml dilute hydrochloric acid, filtered, and the filtrate made alkaline with sodium hydroxide. The filtrate was extracted with 150 ml chloroform which was then extracted with 0.5N sulfuric acid. Fifty grams of liver were homogenized, made distinctly alkaline with sodium hydroxide, and shaken with 400 ml ether. The ether was washed with 50 ml water, dried, and extracted with 10 ml 0.5N sulfuric acid.

Ultraviolet Spectrophotometry

Ultraviolet spectra of the 0.5N sulfuric acid extracts were obtained with a Beckman Acta C III spectrophotometer in 1 cm quartz cells. MDA exhibits absorption maxima at 233 and 285 nm, characteristic of compounds possessing the 3,4-methylenedioxyphenyl chromophore [7]. The MDA was quantified by comparing the absorption to that of a MDA hydrochloride standard in 0.5N sulfuric acid.

Gas Chromatography/Mass Spectrometry

The tissue extracts in 0.5N sulfuric acid were made alkaline with sodium hydroxide, back-extracted into chloroform which was evaporated, and the residue taken up in 100 μl ethanol. MDA was identified by gas chromatography/mass spectrometry. Mass spectra were obtained with a Finnigan 3100 quadrupole mass spectrometer interfaced to a Finnigan 9500 gas chromatograph by a glass jet separator. The gas chromatograph contained a 6 ft × 1/4 in. internal diameter glass column packed with 3% OV-1 on 80-100 mesh Chromosorb W (HP). Helium was used as the carrier gas. The mass spectrum of MDA is illustrated in Fig. 1.

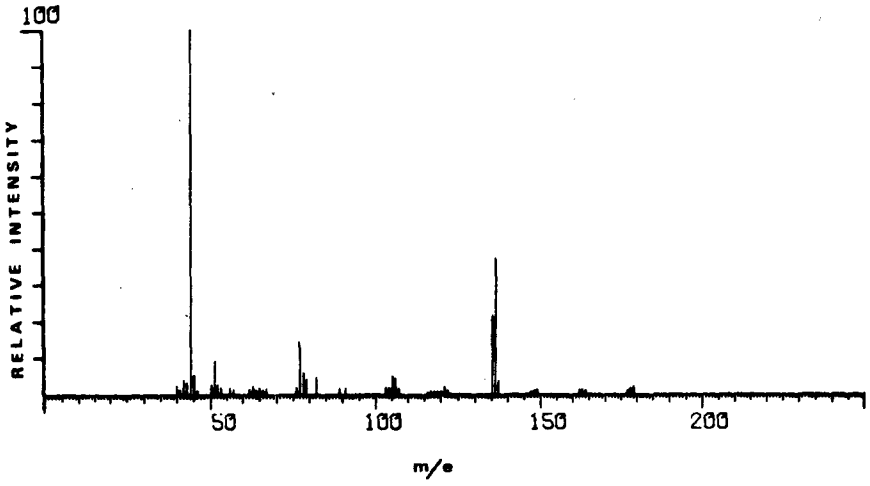

FIG. 1. Mass spectrum of MDA.

TABLE 1. 3,4-Methylenedioxyamphetamine Levels Found[a]

Tissue	MDA
Blood	0.23
Liver	1.1
Bile	0.7
Urine	17.5
Stomach contents	0.25

[a]Values in mg/100 ml or gm, stomach contents in mg total.

Results

The levels of MDA found are shown in Table 1. Tests for alcohol and other drugs proved negative.

DISCUSSION

Although the levels of MDA found, particularly in the blood, are lower than most fatal levels previously reported [1, 8, 9], death has been attributed to an MDA overdose in one previous study where the blood MDA level was lower [10].

Amphetamine has been shown to be metabolized to N-hydroxyamphetamine, phenylacetone ketoxime, and phenylacetone in vivo [11, 12]. Two MDA metabolites, in vitro, have been shown to be 3,4-methylenedioxybenzyl methyl ketone [13]. In this study, examination of the neutral chloroform or ether fraction of the blood, tissue, or urine extracts did not show the presence of any of the reported metabolites. This probably indicates lack of chronic MDA usage.

SUMMARY

MDA was indicated in the death of a 35-year-old male. Blood, tissue, and urine concentrations of MDA were measured by ultraviolet spectrophotometry after identification by gas chromatography/mass spectrometry. The concentrations found were within the range of previously reported fatal MDA levels.

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