LSD Toxicity: A Suspected Cause of Death

E. ALLEN GRIGGS, M.D.*, and MICHAEL WARD**

Somerset and ,Frankfort, Kentucky

An extremely high liver tissue level of lysergic acid diethylamide (LSD) was measured in a 34-year-old male in whom autopsy showed no anatomic cause of death. Death from LSD overdose apparently has not been previously confirmed toxicologically. The possibility that this case represents death due to toxic effect of LSD is discussed.

Case Report partially clothed 34-year-old male was observed while engaged in bizarre behavior, and was subsequently accosted during an attempted break-in in November, 1975. He fled the scene and was found dead in a deserted warehouse, one month later. An autopsy was performed to ascertain, the cause of death.

Autopsy Findings

The body was well preserved, measuring 179.0 cm in length and weighed 69 kg. The skin and exposed mucous membranes contained multiple excoriations consistent with rodent bites. No venipuncture wounds were present and no external signs of significant trauma were noted. The larynx was intact with no evidence of obstruction or fracture. The distal trachea contained mild mucosal erythema. The lungs were dry and well expanded; their combined weight was 650 gms. There was no evidence of aspiration of gastric contents. The stomach and intestine were empty, and contained no gross evidence of prior medication. Their mucosal surfaces demonstrated moderate autolysis. The heart weighed 305 gms and demonstrated very slight right atrial dilatation.

*Associate Pathologist, Lake Cumberland Medical Center, Somerset **From Toxicology Laboratory, Bureau for Health Services, Frankfort Received at KMA: 12-13-76 The abdominal viscera were the site of mild autolysis and moderate congestion. The brain was swollen, weighing 1450 gms, with slight widening of gyri, narrowing of sulci, and meningeal vascular congestion. Evidence of herniation was absent. The subarachnoid fluid was clear.

Histologic study revealed minimal autolysis, considering the long postmortem interval. Sections of the brain showed mild cerebral swelling with focal cortical neuronal degeneration. Sections of the larynx and trachea revealed mucosal congestion, and those of the lungs displayed congestion and occasional focal acute interstitial hemorrhages. Sections of the liver displayed venous congestion with focal early centrilobular necrosis and scattered intranuclear vacuolization of hepatocytes. There was no evidence of a generalized hemorrhage diathesis.

Toxicology Studies

Lysergic acid diethylamide (LSD) was detected in liver tissue by spectrophotometric fluorometry and quantitated at 0.312 mgm/ dl, utilizing the procedure of Axelrod.1 The presence of the drug was confirmed by thin layer chromatography using a methanol-chloroform solvent. Plates were examined under ultraviolet light at 357 nm, and P-dimethylaminobenzaldehyde used as a developing spray.2 Diethylamine contamination was excluded. No other drugs were detected in the liver by gas chromatography, thin layer chromatography, or ultraviolet spectrophotometry. No ethyl alcohol was detected in the blood by gas chromatography.

Comment

Metabolic studies of LSD in humans are incomplete and no direct evidence concerning lethal doses exists. The LD50 varies among other mammalian species from 0.1 mgm/kg, I.V., in Asiatic elephants to 46 mgm/kg in mice, the variation ascribed to metabolic differences ^{.3,4} From these data an interpolated lethal dose for humans of 0.2 mgm/kg, or 14 mgm, has been calculated.' In regard to tissue levels, 1 mgm of LSD/kg, **I.V.**, produces a liver level of 0.67 ug/gm in the cat.5

Utilizing these data for means of general comparison-as tissue level studies in humans have not been reported-the subject of this report would have received an LSD dose equivalent to 320 mgm, I.V., or 23 times the previously calculated lethal human dose. This amount is 1600 -800 times the usual "street" dose of 200 - 400 ug, p.o.4

LSD-altered neuronal activity with glial cell vacuolization in tissue culture has been reported, as well as changes in various enzyme actions in brain homogenates.6 Also, an LSD effect on 5hydroxy tryptamine-containing neurons appears likely, and studies localize this action to the raphe neurons of the brain stem.7

Documented pathopharmacologic effects of LSD overdose in humans include tachycardia, hyperpyrexia, and blood pressure and respiratory depression.\$ Grand mal seizures have been reported.9 Platelet dysfunction with mild generalized bleeding has been described.10

In a recent clinical series, 3 of 8 patients with massive LSD overdose underwent respiratory arrest requiring intubation and ventilatory assistance. 10

In the present case, a careful dissection revealed no gross anatomic cause of death. Hence, it appears possible that this man expired from CNS-mediated respiratory arrest due to the direct toxic effect of massive LSD overdose.

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