

An alternative treatment gone wrong, a case of three 3-bromopyruvate deaths.

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Introduction

In a private clinic, three patients underwent alternative cancer therapy with 3-bromopyruvate (3-BP). On the last day of treatment, an overdose of 3-BP was administered intravenously. Initially, the patients suffered from severe nausea and asthenia, followed by lethargy, loss of muscle coordination and a status epilepticus. The patients were admitted to hospitals, where they all died.

Methods

Forensic autopsies and toxicological analyses were performed. Antemortem samples were available in case 1 and 2. From the crime scene glass infusion bottles were collected. Routine forensic toxicology was conducted on postmortem collected material. 3-BP and glutathione-pyruvate were analyzed by LC-MS/MS. Bromide was quantified by photometry and IC-ICPMS. Methylglyoxal was determined in antemortem plasma in case 1 and 2 by LC-MS/MS.

Results

All three cases showed a symmetrical haemorrhagic infarction of the basal ganglia. The presence of 3-BP could not be determined in blood and tissue samples, due to reactivity of the compound. No glutathione-pyruvate was detected. Bromide concentrations in antemortem blood, heart blood, liver tissue and vitreous humor in case 1 were 14 mg/L, 12 mg/L, 5 mg/kg and 12 mg/L respectively. In case 2 46 mg/L, 30 mg/L, approx. 15 mg/kg, 28 mg/L respectively. In case 3 bromide concentrations in heart blood, liver tissue, urine and brain tissue were 10 mg/L, 6,4 mg/kg, 5,7 mg/L and 5,6 mg/kg respectively. Methylglyoxal concentrations in antemortem plasma samples of case 1 were 2320 nmol/L and 1590 nmol/L and in case 2, 400 nmol/L and 1230 nmol/L. The extrapolated levels in the infusion solutions would have been sufficient for an administration of 8 to 13 mg 3-BP/kg body weight to the patients.

Conclusion

In the case of 3-BP, only indirect markers of exposure can be measured. In our cases, the bromide and methylglyoxal concentrations in the body fluids and organs as well as the 3-BP concentrations in the residual fluids of the infusion bottles indicate an overdose of 3-BP. All patients showed the same clinical picture and a hemorrhagic cerebral infarction. Based on the toxicologic and pathologic findings, we concluded that brain damage and swelling caused by 3-BP administration was the cause of death.