Ethyl Glucuronide in Vitreous Humor: a Useful Marker of Antemortem Ethanol Ingestion?

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AIMS: Ethyl glucuronide (EtG) has shown to be a sensitive and specific biomarker for alcohol intake. Its detection in blood and others postmortem body fluids and tissues, barring vitreous humor (VH), has been reported as an aid in interpretation of antemortem alcohol ingestion. The aims of this preliminary study was to evaluate the feasibility and the usefulness of EtG determination in VH samples, as a marker of antemortem alcohol ingestion, in a selection of forensic autopsy cases where ethanol determination turned out to be negative in both blood and VH.

METHODS: Postmortem VH and blood samples were collected from subjects fulfilling the following inclusion criteria: no report of putrefaction of the corpse; no evidence of ocular diseases, traumatic lesions, morphological alterations; collection of specimens within 48 h after death; absence of blood in collected VH specimens. Only negative VH and blood samples for ethanol were further analyzed for EtG. Ethanol levels were measured by headspace gas chromatography (GC) equipped with a flame ionisation detector (cut-off 0.1 g/L). EtG levels were determined by liquid chromatography - mass spectrometry (LC-MS) in APCI conditions and using D₅-EtG as internal standard (cut-off 0.10 mg/L).

RESULTS: Twenty-five VH and blood samples were analyzed for EtG. Four blood and corresponding VH samples were both positive for EtG. Three VH samples, whose corresponding blood samples were negative, turned out to be positive for EtG. Positive blood samples (4 out of 25, 16%) showed EtG concentrations ranging from 0.45 to 1.33 mg/L, with a mean value of 1.05 mg/L. In positive VH samples (7 out of 25, 28%) EtG concentrations ranged from 0.15 to 1.50 mg/L, with a mean value of 0.71 mg/L.

CONCLUSIONS: For the first time to the best of our knowledge, this preliminary study showed the feasibility of EtG detection in VH samples. The exclusive presence of EtG in some of the examined VH samples could be interpreted assuming a relatively prolonged EtG half-life in VH, due to its hydrophilicity that prevents permeation across the posterior blood-eye barrier. In spite of further indispensable investigations to elucidate its role, EtG in VH could be considered a marker of antemortem ingestion of alcohol with a longer detection window with respect to blood, and useful to supplement or replace EtG determination in urine, which may be at times diluted or not available postmortem.

Keywords: Ethyl glucuronide, Ethanol, Vitreous humor