

Ethanol and ethyl glucuronide (EtG) in blood and urine after controlled real-life drinking scenarios

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Introduction: Several strategies have been developed to estimate the time of ethanol intake in cases of suspected driving under the influence. For example, a recent intake is indicated by a urine alcohol concentration (UAC)/blood alcohol concentration (BAC) ratio <1.3 or an increasing UAC between samples taken 60 min apart. Ethyl glucuronide concentration in blood (B-EtG) has also been suggested as a marker in such assessments using the BAC/B-EtG ratio or the difference in B-EtG between two consecutive samples 30 min apart. Our objectives were to study these parameters in a controlled setting of scenarios by a high initial dose followed by a low or medium second dose and evaluate if currently used limits are valid.

Methods: Twenty-three healthy volunteers (61% male, median age 24, median BMI 24) were given two doses of ethanol; initially 0.85 g/kg and an after-drink of 0.25 g/kg or 0.51 g/kg, 2h or 5h after the 1st. Blood and urine samples were taken continuously up to 15h after the first dose. Ethanol in blood and urine was analyzed using Headspace Gas Chromatography. EtG was analyzed by Supercritical Fluid Chromatography Mass Spectrometry.

Results: The UAC/BAC 1h after 2nd dose was <1.3 in all subjects except two. With an after-drink 2 and 5 h after the 1st, the difference in UAC, in two samples taken 1h and 2h after 2nd dose was >0 in 67% and 30% of the subjects, respectively. The BAC/B-EtG 1h after 2nd dose and the B-EtG difference in samples taken 30 min apart indicated a recent intake in all subjects having a 2nd dose after 2h. When the after-drink was taken 5h after the 1st dose, the BAC/B-EtG 1h after 2nd dose and B-EtG in two samples 30 min apart did not indicate a recent intake at a low dose (0.25g/kg). When the 2nd dose was 0.51 g/kg the same markers indicated a recent intake in 75% of the subjects.

Conclusion: Our findings suggest that the parameters used with current limits are valid when the after-drink is within 2h. However, both a low and medium after-drink 5h behind, can be misinterpreted.