



E4 Expert Evidence and the “Ultimate Issue” in Criminal Trials: The Interpretation of Low Levels of GHB in Urine Samples Donated by Late Presenting Drug Facilitated Sexual Assault Complainants

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After attending this presentation, attendees will understand the interpretation of low levels of GHB in urine requires the toxicologist to take a holistic approach to the data.

Gamma hydroxybutyrate (GHB) is a drug that has been implicated in a number of cases of drug facilitated sexual assault. The interpretation and evidential significance of a finding of low levels of the drug in the urine of a complainant may be confounded by its rapid elimination after ingestion, and its presence as a normal constituent of urine and its presence in very high concentrations in the rare inborn error of metabolism succinic semialdehyde dehydrogenase (SSADH) deficiency. We developed a sensitive method for the analysis of GHB with a wide linear assay range.

In order to establish a reference range we used urine samples which had been submitted to the laboratory for pregnancy testing. Only samples from non pregnant women were used; at the time the sample was to have been disposed of a 10 millilitre portion was saved frozen. The only data attributable to the sample that was collected was the date of donation and the age of the donor. Ethical approval for the study was given by the Chair of the local research ethics committee. We were able to analyse a total of 50 such urine samples.

We found that there was a significant negative association of the urine GHB concentration with age; as the age of the donor increased, so the concentration of GHB in the urine sample tended to fall. This fall paralleled the fall in urinary creatinine with age. Correcting the urinary GHB concentration for the urinary creatinine concentration abolished the age related association.

Association of GHB (mg/l), Creatinine (mmol/l) and GHB/Creatinine with Age					
	Coefficient	Standard Error	Probability	95% CI	Coefficient
GHB Slope	-0.0117	0.0054	0.0338	-0.0225 to -0.0009	
Intercept	0.8659	0.1570	<0.0001	0.5501 to 1.1817	
Creatinine Slope	-0.3138	0.1188	0.0112	-0.5529 to -0.0748	
Intercept	22.9150	3.4832	<0.0001	15.908 to 29.922	
GHB/Creatinine Slope	0.252	0.8014	0.7546	-1.3602 to 1.8642	
Intercept	42.7017	23.4944	0.0755	-4.5628 to 89.966	

These results suggest that GHB is actively secreted in the renal tubules and is not present in urine merely as a result of ultrafiltration in the glomeruli.

Our data also suggest that if a normal woman, without (SSADH) deficiency, has a urinary GHB concentration of greater than 5mg/l or 1mg GHB/mmol creatinine then one can be confident that she has ingested GHB.

The interpretation of low levels of GHB in urine requires the toxicologist to take a holistic approach to the data; attempting such interpretation in isolation as is occasionally requested by investigators or advocates overly concerned by the common law rule that an expert should not opine on a matter that goes to the “ultimate issue” in the case is not in the interests of justice. ¹

Gamma Hydroxybutyrate, GHB, Sexual Assault