



K49 Forensic Toxicology Findings in Blood and Urine From Female Victims of Alleged Sexual Assault

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After attending this presentation, attendees will acquire up-to-date information about the occurrence of ethanol and other drugs in blood and urine from female victims of alleged sexual assault in Sweden.

This presentation will impact the forensic community by providing data on the most common drugs found in female victims of alleged sexual assault in Sweden and will also aid forensic toxicologists in the interpretation of such cases.

Cases of alleged drug facilitated sexual assault (DFSA) have been increasingly reported in forensic science and medical journals since the 1980s. In news media the term “date rape” is often seen to describe such cases, although toxicologists and medical practitioners prefer the acronym DFSA, which implies use of a chemical agent to facilitate non- consensual sexual contact. The prevalence and the types of drugs encountered during investigations of alleged sexual assault are likely to differ between countries depending on social norms and the availability and popularity of recreational drugs. Ethanol, either alone or together with other drugs, has been a common finding in many previous surveys of DFSA from the United States and United Kingdom. Indeed, some victims suspect that their drinks had been spiked with a drug to explain the condition they found themselves in e.g., sudden incapacitation, sedation and subsequent drug-induced amnesia. Fast acting sedative- hypnotics such as gamma-hydroxybutyrate (GHB) and flunitrazepam have frequently been associated with so called “drink spiking”. However, compelling evidence that a person was incapacitated by voluntary or involuntary consumption of alcohol and/or drugs is not easy to obtain from results of toxicological analysis.

The population of Sweden is just over 9 million and forensic toxicology is done at one central laboratory. The results of toxicological analyses for ethanol and drugs are entered into a database (ToxBASE) along with age and gender of the individuals concerned. All cases registered between 2003 and 2007 where indications existed that a female had been subjected to some form of sexual assault were included in this study (N = 1,806). In many cases the police made a special request for toxicological analysis for certain substances because intoxication and “date rape” already formed a part of the investigation. During examination of the victim by a physician, which often occurred several hours after the event, specimens of blood and if possible urine were taken and sent for toxicological analysis. This entailed a broad screening by use of immunoassay methods (EMIT/CEDIA) on urine if available or on blood after protein precipitation. All positive results from screening were verified by more specific methods, involving isotope dilution gas chromatography-mass spectrometry. The analysis of a large number of prescription drugs was done by capillary column gas chromatography with a nitrogen-phosphorous detector. The concentrations of ethanol in blood and urine were determined by headspace gas chromatography and values below 0.1 g/L were reported as negative.

The present series of 1,806 cases consisted of blood only in 207 cases (11.5%), both blood and urine in 1,431 cases (78.7%), only urine in 170 cases (9.4%), and hair in 8 cases (0.4%). Accordingly, blood samples were available for toxicological analysis in 90% (N = 1,628) of cases of alleged sexual assault over the 5-year period. The number of cases of DFSA was highest during the warmer summer months (June-September) and the mean age of victims was 24 y (median 20 y), with ~60% being between 15 and 25 years. In 559 cases (31%) ethanol and drugs were negative, 772 cases (43% of total) contained ethanol alone, 215 cases (12%) contained ethanol with at least one other drug and 262 cases (15%) contained either licit (prescription) or illicit drugs (amphetamine, ecstasy, cannabis, cocaine, GHB). The mean, median and highest blood concentrations of ethanol (N = 806) were 1.24 g/L, 1.19 g/L and 3.7 g/L, respectively. Higher blood-ethanol was associated with increasing age of victims ($r = 0.365$, $p < 0.001$). Amphetamine (N = 86) and tetrahydrocannabinol (N = 100) were the most common illicit drugs identified in blood at mean (median) concentrations of 0.22 (0.10) mg/L and 0.0012 (0.0006) mg/L, respectively. A wide spectrum of prescription drugs was identified in these cases, including sedatives such as diazepam (N = 88), alprazolam (N = 55) and zopiclone (N = 35), but mostly at therapeutic concentrations. Among non-sedatives, antidepressants (SSRIs), paracetamol and opiates (codeine and tramadol) were the major findings. These drugs might have been used to treat a legitimate medical condition and have nothing to do with chemical submission or DFSA. However, finding high therapeutic concentrations of drugs with short half-lives, such as zolpidem and zopiclone, makes it more likely that sedation and DFSA was involved.

Ethanol was by far the dominant psychoactive substance identified in blood and urine samples in these DFSA cases and this agree well with studies from other countries (e.g. USA and UK). The high average blood-ethanol concentration of 1.24 g/L at time of sampling verifies that considerable amounts of alcohol had been consumed, especially if a back extrapolation of the concentration to time of attack is made. Relating the blood-concentrations of ethanol and/or drugs to the degree of incapacitation and helplessness of the victim is fraught with difficulties.

Drugs, Ethanol, Sexual Assault