



K32 Concentration Distributions of the Drugs Most Frequently Identified in Postmortem Femoral Blood Representing All Causes of Death

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The goal of this presentation is to provide quantitative information about the types of drugs most commonly identified in postmortem femoral blood samples representing all causes of death. Each drug was characterized by its mean, mean and upper 90, 95, and 97.5 percentile concentrations.

This presentation will impact the forensic science community by comparing the types of drugs used and abused in Sweden with other countries.

The compilation of drugs will prove useful to compare with future cases from the same population of death cases. This allows forensic practitioners "to flag" for an unusually high concentration of a certain drug, which might be important to consider as a contributing factor in the death.

Interpreting the concentration of drugs determined in postmortem blood in terms of toxicity and whether overdosing and drug poisoning was a likely cause of death is not always easy. The circumstances surrounding the death, the police reports, eye-witness statements, the findings at autopsy and not least the toxicology report all need to be considered. People differ widely in their response to the same dose of a drug depending on pattern of absorption, dosage form, route of administration, ethnicity, enzyme polymorphism and not least previous experience with the drug and the development of tolerance. Poly-pharmacy is widespread in today's society, which increases the risk of an adverse drug-drug or drug-alcohol interaction. The concentration of a single drug might be within an accepted therapeutic range, although toxicity is exaggerated owing to concomitant use of other psychoactive substances, or because of an idiosyncratic or allergic reaction. Some drugs share the same metabolic pathways and compete for binding sites on hepatic enzymes, whereas others have similar mechanisms of action in the brain occupying receptor sites or opening or blocking an ion-channel.

Many factors determine the types of drugs identified in post-mortem specimens, including life-style, social norms and customs, availability of pharmaceutical products, media reports and advertising as well as the prescribing practices of family physicians. The popularity of recreational drugs in society, the number of forensic autopsies performed and the comprehensiveness of the analytical toxicology performed are important considerations. Drugs available on prescription in one country might not even be registered in another, as exemplified by the hypnotic flunitrazepam, which is not approved in United States but is available on prescription in many European nations. Scheduled substances are generally more dangerous and carry a greater risk of toxicity compared with non-scheduled or over-the-counter (OTC) medication. The combined use of alcohol and central nervous system depressants, both licit and illicit, often require emergency hospital treatment.

An in-house database (TOXBASE) was used to compile a list of the drugs most frequently identified in over 25,000 forensic autopsies representing all causes of death. The age and gender of the deceased were noted as well as the types of drugs determined in femoral venous blood samples. Ethanol (> 0.1 g/L) topped the list of psychoactive substances (N = 8,108 thus 32% of cases) at mean, median and highest concentrations of 1.43 g/L, 1.20 g/L and 8.0 g/L, respectively. Acetaminophen was in second position in 11% of cases. Amphetamine and cannabis (identified as tetrahydrocannabinol in blood) were the major illicit drugs at 13th and 15th positions, respectively. Newer antidepressants, citalopram (nr 3), sertraline (nr 14), venlafaxine (nr 16) were prominent prescription drugs as were sedative-hypnotics exemplified by diazepam (nr 4), zopiclone (nr 5) and zolpidem (nr 18). Many findings of morphine and codeine in blood were heroin-related deaths as evidenced by the presence of heroin's unique metabolite 6-acetyl morphine. Finding a high morphine/codeine concentration ratio (> 2.0) in blood gives compelling evidence for a heroin-related death.

Results of post-mortem toxicology are complicated by poly-drug use, adverse drug-drug interactions, as well as a host of pre-analytical factors. This compilation of drugs and the concentration distributions should prove useful in helping toxicologists and medical examiners in deciding if a certain drug might be implicated as likely cause of death. There is only a 1 in 40 chance of the drug concentration being above the upper 97.5 percentile of the distribution. This information along with the autopsy findings and police reports will prove useful when the cause and manner of death are determined.

Autopsy, Drugs, Toxicology