



W27 Ethanol in Forensic Casework: Strategies for Analysis and Interpretation

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Learning Overview: The goals of this presentation are to provide the attendees with knowledge regarding ethanol absorption, distribution, and elimination in humans and to provide a scientific basis for the interpretation of postmortem ethanol findings, as well as for the estimation of Blood Alcohol Concentrations (BACs) from given doses and from analytical results in the living.

Impact on the Forensic Science Community: This workshop will impact the forensic science community by: (1) providing current knowledge in the field of ethanol interpretation, thus enhancing the qualifications of forensic toxicologists practicing clinical and postmortem toxicology; and (2) increasing the competency of other disciplines, such as medical examiners and lawyers/attorneys.

The focus of this workshop is interpretation of ethanol (and some other volatiles) and its direct metabolites and markers in driving under the influence cases, violent crimes, and autopsy cases.

It is accepted that a toxicologist may report an extrapolated ethanol concentration in a blood sample collected from a living person. The context is usually traffic accidents or sexual assaults in which the blood sample is obtained several hours after the incident. A prerequisite is that all ethanol has been absorbed and that the person is in the elimination phase. A common approach for back extrapolation of ethanol concentrations is to use population-derived elimination rates. However, using population data to calculate an individual BAC provides only an estimation. Both underestimation and overestimation are equally important to recognize depending on the type of case. Therefore, the toxicologist must not only appreciate these shortcomings but also communicate them to the court.

The intra- and inter-individual variation in ethanol kinetics after single and repeated intake of different types of alcohol will be discussed using data from both controlled studies and case work.

A toxicologist may also be asked to estimate the dose of ethanol from body burden calculations or calculate the maximum BAC arising from a certain dose. Again, these calculations are subject to intra- and inter-individual variation in absorption and distribution caused by drinking behavior, gastric emptying, volume of distribution, and other factors that all should be considered when making such estimations. The scientific basis for estimations of dose and BACs will be discussed in this context.

Ethanol is produced postmortem when bacteria and fungi ferment substrates, primarily glucose, to produce energy. The glucose is metabolized to pyruvate, then converted to acetaldehyde. The acetaldehyde is then reduced to ethanol and transported out of the microbe. Ethanol is the main product of microbial fermentation. However, acetaldehyde, acetone, acetate, 1-butanol, and N-propanol are examples of other volatiles produced.

In the presentation on postmortem ethanol analysis and interpretation, presenters will discuss the formation of ethanol and other volatiles and discuss strategies for investigating this using different matrices and direct ethanol metabolites, such as ethylglucuronide and ethylsulphate and considering the formation of other compounds. Results from controlled studies as well as data from cases will form the basis for the strategies proposed.

Alcohol, Ethanol, Interpretation