

TCAS

Toxicology Consultants & Assessment Specialists, LLC

FORENSIC TOXICOLOGY

ENVIRONMENTAL TESTING

TOXIC EXPOSURES

RISK ASSESSMENT

CAUSATION EVALUATION

Alcohol Toxicology

For more than 28 years, TCAS has regularly provided consultative and professional services involving alcohol toxicology. One of the world's most commonly abused drugs, ethanol (ethyl alcohol) is a leading contributor to morbidity across cultures. Although low to moderate alcohol consumption has some recognized health benefits (in particular with respect to cardiovascular issues), excessive alcohol consumption represents a "Top-10" risk which continues to contribute to the worldwide burden of disease.¹

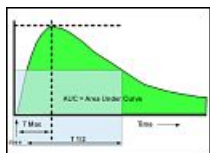
From a toxicological perspective, excessive consumption of alcoholic beverages has the potential to result in numerous, well-documented toxicological endpoints. Alcohol can cause inflammation of the liver with eventual scarring and cirrhosis. Excessive alcoholic beverage consumption is also associated with an increased risk for malignancies at different sites.² Additionally, ethyl carbamate and acetaldehyde (commonly associated with alcoholic beverage fermentation) have been formally classified by the International Agency for Research on Cancer (IARC) as "Group 1 Human Carcinogens."^{3,4}



TCAS provides alcohol-related toxicological assessment services.^(a)

Blood-Alcohol Assessments

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Establishing blood-alcohol concentration (BAC) on a toxicological basis involves compiling relevant factors relating to the manner in which the body processes and eliminates alcohol. These include (but are not limited to) subject's age, body weight, recent consumption rates and medical history, review of circumstances, evidence supporting or refuting subject statements, timeline of events, absorption time, subject's observed behavior and/or judgment defects, review of field sobriety test(s) and/or impairment assessments, blood or breath tests (if any) and calculation of ethanol loss due to metabolic elimination factors based on generally-accepted metabolic rates.⁵

TCAS has produced numerous reports with respect to alcohol intoxication and validation of blood-alcohol content for both plaintiffs and defendants as well as postmortem forensic evaluations with respect to blood-alcohol content, drug interaction effects and toxicity. Please [contact our office](#) for additional information.

Impairment and Field Sobriety Assessments

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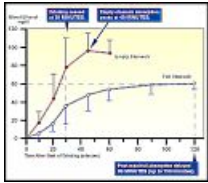
Impairment and field sobriety tests are most frequently performed by law enforcement personnel, often under less than ideal circumstances. Whereas many tests produce accurate results, some do not for a variety of reasons. In an accident or DWI case, the expert toxicologist must assess the objective blood ethanol results and retrograde levels at the time of the accident as well as various judgmental and behavioral facts potentially pertaining to alcoholic intoxication. Additional factors include assessment of the laboratory results, scientific validity of the analysis methodology and interpretation of results. These include the respective degrees of (a) loss of critical judgment, (b)

decreased sensory response, (c) emotional instability, (d) decreased inhibitions, (e) impaired memory and comprehension, (f) increased reaction time and (g) muscular incoordination as well as applicability of local, state, and federal statutes.

TCAS has performed numerous impairment and field sobriety validation assessments for both plaintiffs and defendants in both criminal and civil matters. Please [contact our office](#) for additional information.

Retrograde Extrapolation

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A toxicological retrograde extrapolation for alcohol provides a BAC estimate from blood or breath sample(s), typically obtained at a different time than that of collection. Factors governing the accuracy of the extrapolation can include (but are not limited to) the time of event, time of test(s), type and quantity of beverages consumed, food consumed,⁶ age, gender, weight, medical history, elimination factors, metabolic rate and supporting circumstantial evidence. The quality of extrapolated results will only be as good as the information provided to the toxicologist who must apply scientifically credible methods to develop a timeline consistent with the prevailing body of toxicological literature. All causative and contributing factors are applied in developing the extrapolation including relevant deposition transcripts, medical records, police reports and (in some cases) review or inspection of an accident scene. The resulting timeline, based on weight-of-evidence (WOE), estimates the changes in BAC concentration over specific time periods and is supported by an objective written report (or affidavit) detailing the methodology and results of the toxicological assessment. Please [contact our office](#) for additional information.

Dram Shop

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The term "dram shop" relates to laws governing liquor establishments serving alcoholic beverages. Most states hold licensed premises responsible for injuries and property damage caused by visibly-intoxicated patrons. The expert toxicologist must assess many factors including quantity of alcohol consumed, measured blood-alcohol concentration, age, physical condition, medical history, behavior, sequence of events, metabolism, elimination, etc. Other factors include actions of the liquor establishment, compliance with local regulations, actions by patrons and personnel and circumstances of the incident(s). Dram shop laws vary widely by state in the U.S. Compliance with local regulations is essential for any scientifically credible toxicological assessment to be admissible in court.⁷

TCAS has performed numerous dram shop assessments and has provided toxicological guidance and expert testimony on behalf of both defendants and plaintiffs in both criminal and civil matters. Please [contact our office](#) for additional information.

Endogenous Alcohol

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Endogenous alcohol is a phenomenon documented within the toxicological literature in which severely-burned bodies produce postmortem alcohol from microflora deposits on the open tissues which cause rapid alcoholic fermentation to occur. This rapid-fermentation phenomenon has been studied and published in articles by the Federal Aviation Administration (FAA) following the autopsies of hundreds of plane crash victims known not to have consumed alcohol. It was also observed in USS Iowa turret gunnery disaster victims in 1989 and other severe burn cases.

TCAS has considerable forensic experience in this area with respect to both defendants and plaintiffs. A [recent case involving endogenous alcohol](#) illustrates how correct interpretation of postmortem urine and vitreous alcohol concentrations can have a significant impact on litigation. Please [contact our office](#) for additional information.

Notes and References

1. Ezzati *et al.*, "[Comparative Quantification of Health Risks](#)," Vol. 1, 2004
 2. IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. Alcohol consumption and ethyl carbamate. "[IARC Monographs on the Evaluation of Carcinogenic Risks in Humans](#)," 2010;96:3-1383.
 3. IARC, "Monographs on the Evaluation of Carcinogenic Risks to Humans," [Agents Classified by the IARC Monographs, Volumes 1-109](#) (2014)
 4. IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, "Personal habits and indoor combustions," Volume 100 E, A review of human carcinogens. [IARC Monographs on the Evaluation of Carcinogenic Risks in Humans](#) 2012;100(Pt E):373-472.
 5. Goldfrank *et al.*, "Goldfrank's Toxicological Emergencies," Fifth Edition, 1994, Appleton & Lange, Norwalk, CT, pg. 814.
 6. Jones *et al.*, "Food-Induced Lowering of Blood-Ethanol Profiles and Increased Rate of Elimination Immediately After a Meal," Journal of Forensic Sciences, JFSCA, Vol. 39, No.4, July 1994, pg. 1088.
 7. National District Attorneys Association, "[Alcohol Toxicology for Prosecutors: Targeting Hardcore Impaired Drivers](#)," 2015
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 - e. Liquor store photo by Amy Hennen, Aurora, SD
 - f. Photo adapted from National Park Service, [Firefighter Training Class](#), "Structural Fire Management Program"
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A Message from Dr. William R. Sawyer Chief Toxicologist, TCAS, LLC



"The known adverse effects of alcohol on the human body are well-documented, but establishing or refuting causation to reasonable toxicological certainty requires application of weight-of-evidence using generally-accepted, peer-reviewed calculation methods."

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