



INDIANA UNIVERSITY

BORKENSTEIN  
COURSE

Center for Studies  
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Breath Alcohol Instrumentation  
& Quality Assurance

by  
J. Robert Zettl, B.S., M.P.A.

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**Topic: Breath Alcohol Instrumentation & Quality Assurance**

**Reading Assignments:**

1. Medical -Legal Aspects of Alcohol, Fifth Edition. Edited by James C. Garriott, Lawyers and Judges Publishing Company, Inc.

Chapter 7. Methods for Breath Analysis – Patrick Harding, B.S. and J. Robert Zettl B.S., M.P.A.

All pages

Chapter 9. Quality Assurance – Graham R. Jones, Ph.D. and Laura Liddicoat, B.S.

All Pages.

Chapter 17. Alcohol Testing in the Workplace – Kurt M. Dubowski, Ph.D., LL.D., Yale H. Caplan, Ph.D. and Dennis Canfield, Ph.D.

Section's 17.4 and 17.5 - All Pages

2. Forensic Science Handbook, Volume 1, Second Edition, Richard Saferstein, Ph.D. Editor. Prentice Hall, Upper Saddle River, New Jersey 07458.

Chapter 12. The Determination of Alcohol in Blood and Breath – Yale H. Caplan, PhD, DABFT and J. Robert Zettl, BS, MPA, DABFE.

All Pages

3. Methodology and Quality Assurance in Forensic Breath Alcohol Analysis – R. G. Gullberg, Forensic Science Review, Volume Twelve, Number One/Two, January 2000.

4. Professor Robert F. Borkenstein – An Appreciation of His Life and Work – D. M. Lucas, Forensic Science Review, Volume Twelve, Number One/Two, January 2000.

5. Medicolegal Alcohol Determination – Breath-or Blood-Alcohol Concentrations? – A. W. Jones, Forensic Science Review, Volume Twelve, Number One/Two, January 2000.
6. Measuring Alcohol in Blood and Breath for Forensic Purposes – A Historical Review – A. W. Jones, Forensic Science Review, Volume Twelve, Number One/Two, January 2000.
7. Common Legal Challenges and Responses in Forensic Breath Alcohol Determination – Rodney G. Gullberg, Forensic Science Review, Volume Sixteen, Number Two, July 2004.
8. Forensic Issues in Alcohol Testing, Steven B. Karch, MD, Editor. CRC Press, Taylor and Francis Group, Boca Raton, Florida, 2007. Chapter 5, “Alcohol Determination in Point of Collection Testing”, J. Robert Zettl, BS, MPA, FABFE.
9. Quality Assurance in Breath-Alcohol Analysis - Kurt M. Dubowski, Ph.D., Journal of Analytical Toxicology, Volume 18, October 1994.
10. Vapor-Alcohol Control Tests with Compressed Ethanol-Gas Mixtures: Scientific Basis and Actual Performance - Kurt M. Dubowski and Natalie A. Essary, Journal of Analytical Toxicology, Volume 20, October 1996.
11. Confirmation of Ethanol Compressed Gas Standard Concentrations by an NIST-Traceable, Absolute Chemical Method and Comparison with Wet Bath Alcohol Simulators - Lance D. Silverman, Ken Wong and Stephen Miller, Journal of Analytical Toxicology, Volume 21, September 1997.
12. Evaluation of a Portable Evidential Breath Alcohol Analyzer – Gerasimos Razatos, Ruth Luthi, Sarah Kerrigan, Forensic Science International, 153 (17-21), 2005.
13. Model Specifications for Devices to Measure Breath Alcohol - Federal Register, Volume 67, Number 192, October 03, 2002.
14. Model Specifications for Calibrating Units for Breath Alcohol Testers; Conforming Products List of Calibration Units for Breath Alcohol Testers. Federal Register, Volume 72, Number 121, Monday June 25, 2007.
15. Study Summary and Findings for Passive Alcohol Sensors. Google Passive Alcohol Sensors.
16. A Note on the Use of Passive Alcohol Sensors during Routine Traffic Stops. Traffic Injury Prevention, Volume 9, Issue 6, December 2008. Taylor & Francis. ISSN 1538-9588.

17. The Determination of Blood Alcohol Concentration by Transdermal Measurement. A White Paper by J. Robert Zettl, B.S., M.P.A. Commissioned by Alcohol Monitoring Systems, Inc. Highlands Ranch, Colorado, July 2002.
18. Validity of Transdermal Alcohol Monitoring: Fixed and Self-Regulated Dosing. Alcoholism Clinical and Experimental Research, Volume 27, No. 1. Joseph T. Sakai, Susan K. Mikulich-Gilbertson, Robert J. Long and Thomas J. Crowley.

## **Web Resources:**

### **Alcohol and Traffic Safety-Related Sites on the Internet**

<b>American Academy of Forensic Sciences</b>	<b><u><a href="http://www.aafs.org">www.aafs.org</a></u></b>
<b>AAA Foundation for Traffic Safety</b>	<b><u><a href="http://www.aafts.org">www.aafts.org</a></u></b>
<b>Alcohol Countermeasure Systems</b>	<b><u><a href="http://www.acs-corp.com">www.acs-corp.com</a></u></b>
<b>Canadian Safety Council</b>	<b><u><a href="http://www.safety-council.org">www.safety-council.org</a></u></b>
<b>CMI, Inc.</b>	<b><u><a href="http://www.alcoholtest.com">www.alcoholtest.com</a></u></b>
<b>Drug and Alcohol Testing Industry Association</b>	<b><u><a href="http://www.datia.com">www.datia.com</a></u></b>
<b>Draeger Breathalyzer Division</b>	<b><u><a href="http://www.draeger-breathalyzer.com">www.draeger-breathalyzer.com</a></u></b>
<b>Guth Laboratories</b>	<b><u><a href="http://www.guthlabs.com">www.guthlabs.com</a></u></b>
<b>Health and Human Services Drug Testing</b>	<b><u><a href="http://www.health.org/workpl.htm">www.health.org/workpl.htm</a></u></b>
<b>Insurance Institute for Highway Safety</b>	<b><u><a href="http://www.carsafety.org">www.carsafety.org</a></u></b>
<b>International Association for Chemical Testing</b>	<b><u><a href="http://www.iactonline.org">www.iactonline.org</a></u></b>
<b>Inter. Council on Alcohol, Drugs and Traf Safty</b>	<b><u><a href="http://raru.adelaide.edu.au/icadts/">raru.adelaide.edu.au/icadts/</a></u></b>
<b>Intoximeters, Inc.</b>	<b><u><a href="http://www.intox.com">www.intox.com</a></u></b>
<b>Lifeloc</b>	<b><u><a href="http://www.lifeloc.com">www.lifeloc.com</a></u></b>
<b>National Com for Clinical Laboratory Stds</b>	<b><u><a href="http://www.nccls.org">www.nccls.org</a></u></b>
<b>National Highway Traffic Safety Admin</b>	<b><u><a href="http://www.nhtsa.dot.gov">www.nhtsa.dot.gov</a></u></b>
<b>National Institute of Health</b>	<b><u><a href="http://www.nih.gov">www.nih.gov</a></u></b>
<b>National Institute on Alc Abuse and Alcoholism</b>	<b><u><a href="http://www.niaaa.nih.gov">www.niaaa.nih.gov</a></u></b>
<b>NSC, Committee on Alcohol &amp; Other Drugs</b>	<b><u><a href="http://www.nsc.org">www.nsc.org</a></u></b>
<b>NPAS DataMaster</b>	<b><u><a href="http://www.npas.com">www.npas.com</a></u></b>
<b>PAS Systems International</b>	<b><u><a href="http://www.sniffalcohol.com">www.sniffalcohol.com</a></u></b>
<b>Road Side Testing Assessment</b>	<b><u><a href="http://www.rosita.org">www.rosita.org</a></u></b>
<b>Scott Specialty Gasses</b>	<b><u><a href="http://www.scottgas.com">www.scottgas.com</a></u></b>
<b>Society of Forensic Toxicologists</b>	<b><u><a href="http://www.soft-tox.org">www.soft-tox.org</a></u></b>
<b>Sub Abuse &amp; Mental Health Services Admin</b>	<b><u><a href="http://www.samhsa.gov">www.samhsa.gov</a></u></b>
<b>Transportation Research Board</b>	<b><u><a href="http://www.nas.edu/trb">www.nas.edu/trb</a></u></b>
<b>U. S. Dept of Health and Human Services</b>	<b><u><a href="http://www.hhs.gov">www.hhs.gov</a></u></b>
<b>U. S. Department of Transportation</b>	<b><u><a href="http://www.dot.gov">www.dot.gov</a></u></b>

## Breath Alcohol Instrumentation & Related Products Internet Sites

<b>Air Products</b>	<b><a href="http://www.airproducts.com">www.airproducts.com</a></b>
<b>Alcohol Countermeasure Systems</b>	<b><a href="http://www.acs-corp.com">www.acs-corp.com</a></b>
<b>Draeger</b>	<b><a href="http://www.draeger-breathalyzer.com">www.draeger-breathalyzer.com</a></b>
<b>Intoxilyzer</b>	<b><a href="http://www.alcoholtest.com">www.alcoholtest.com</a></b>
<b>Intoximeters</b>	<b><a href="http://www.intox.com">www.intox.com</a></b>
<b>Guth Labs.</b>	<b><a href="http://www.guthlabs.com">www.guthlabs.com</a></b>
<b>Lifeloc</b>	<b><a href="http://www.lifeloc.com">www.lifeloc.com</a></b>
<b>Lion Laboratories</b>	<b><a href="http://www.lionlaboratories.com">www.lionlaboratories.com</a></b>
<b>NPAS/DataMaster</b>	<b><a href="http://www.npas.com">www.npas.com</a></b>
<b>Scott Gas</b>	<b><a href="http://www.scottgas.com">www.scottgas.com</a></b>

## Publications

The Review and Assessment of Methods and Technologies for Detecting and Testing Drugs in Drivers - Texas Transportation Institute Project – NHTSA Project DTNH22-07-R-00047. Project Participant/Toxicology – 2008. PENDING

Medical-Legal Aspects of Alcohol, 5<sup>th</sup> Edition, James C. Garriott Editor. Lawyers & Judges Publishing Company, Inc. 2008. Chapter 8, “Methods for Breath Analysis”, Patrick Harding, B. S. and J. Robert Zettl, BS, MPA.

Forensic Issues in Alcohol Testing, Steven B. Karch, MD, Editor. CRC Press, Taylor and Francis Group, Boca Raton, Florida, 2007. Chapter 5, “Alcohol Determination in Point of Collection Testing”, J. Robert Zettl, BS, MPA, FABFE.

“Should a Positive THC Metabolite (THC-COOH) Found in Urine be used in a Driving Under the Influence Legal Proceeding”. ICADTS/TIAFT, Seattle, WA August 2007 Poster Presentation.

“Can a Positive THC Metabolite in Urine (THC-COOH) be used to Prove Impairment in a DUID (Driving Under the Influence of Drugs) Cannabis Case”. Society of Forensic Toxicologists, Austin, Texas October 2006 Platform Presentation.

Forensic Science Handbook, Vol. 1, 2<sup>nd</sup> Ed. Richard Saferstein Editor. Prentice Hall, 2002. Chapter 12, “The Determination of Alcohol in Blood and Breath”, Yale H. Caplan, Ph.D., DABFT and J. Robert Zettl, BS, MPA, DABFE.

Intoxication Test Evidence, 2<sup>nd</sup> Ed., Edward F. Fitzgerald Editor, Thomson & West, 2006. Chapter 36, “The Current State of Breath Testing: The Experts Comment”.

Drug Abuse Handbook, 2nd Ed., Steven Karsh, Ph.D. Editor. CRC Press, 2006. Chapter 11, Section 11.4, “Alcohol Determination in Point of Collection Testing”, J. Robert Zettl, B.S., M.P.A., DABFE.

Intoximeter EC/IR I and II and Alco-Sensor IV Operators and Senior Operators Training Curriculum. State of Wyoming Department of Health, Chemical Test Program. Cheyenne, Wyoming. On-Going Project.

Robert F. Borkenstein Course on Alcohol: Testing, Research and Litigation. Indiana University, Bloomington, IN. “Breath Test Instrumentation Current State of the Art”. On-Going Project.

The Determination of Blood Alcohol Concentration by Transdermal Measurement, A White Paper. J. Robert Zettl, BS, MPA. 2002.

The Intoxilyzer Model 5000’s Precision and Accuracy in Direct Breath Testing for Alcohol and Its Ability to Trap and Store Ethanol on Silica Gel Columns for Subsequent Retesting. The American Academy for Forensic Sciences, February 1987, San Diego, California.

Evaluation of the Intoximeters Model IR 3000 for Breath Alcohol Analysis and Storage of Breath Samples on Magnesium Perchlorate. Denver, Colorado, 1987.

A Long-Term Field Experience with Breath Ethanol Collection Employing Silica Gel. Journal of Analytical Toxicology, Vol. 10, September/October 1986.

Trapping and Storing of Ethanol on Silica Gel Columns for Subsequent Analysis Using the Intoxilyzer 4011 AS. Mid-Atlantic Conference of Forensic Scientists, Washington, D.C., May 1985.

Quantitative Determination of the Effects of Alcohol on Reaction Responses. Proceedings of the 21<sup>st</sup> Meeting of the International Association of Forensic Toxicologists, September 1984, Brighton, U.K. L. Kier, J. Kier, G. Kataoka, R. Zettl.

The Colorado Program, Trapping and Storing of Ethanol on Silica Gel Columns for Subsequent Analysis. Southwestern Association of Forensic Scientists, May 4, 1984, Phoenix, AZ.

Evaluation and Analysis of the Advantages to a State Alcohol Test Program on Trapping of Breath Alcohol Samples. Colorado Department of Health, Alcohol Test Program. J. R. Zettl, M. T. Davia, D. Dupree and K. Niswonger. 1982. Combined Forensic Science Group. Lexington, Kentucky.

The Trapping of Ethanol and Subsequent Analysis of Silica Gel Columns Using the CMI Intoxilyzer. Proceeding of the National Conference on Occupant Protection and Alcohol Countermeasures, Detroit, Michigan, April 1, 1982.

Evaluation of the ToxTrap Silica Gel Device for Trapping Breath Alcohol Samples Using the Intoxilyzer Model 4011 and 4011AS. Denver, Colorado, 1981-82.

The Trapping and Storing and Subsequent Analysis of Ethanol In-Vitro Samples Previously Analyzed by a Non-Destructive Technique. Journal of Forensic Sciences, October 1981.

Affect upon Concentration Over Time After Daily Use of a Know Breath Alcohol Concentration in a Simulator. Intoxilyzer Model 4011. Denver, Colorado, 1980.

Indium Encapsulation Research and Evaluation Study. Denver, Colorado, 1976

Evaluation of the Nalco Pressurized Breath Alcohol Device. Denver, Colorado, 1975.

Affects of Various Preservatives on Blood Alcohol Concentration After Long Term Storage, Kier Study. Denver, Colorado, 1975.

Affects of Altitude vs. Sea Level upon Breath Analyzer Results as Compared to Blood Alcohol Concentrations. Berthoud Pass, Colorado Experiment. 1974.

Affects of Sodium Fluoride Upon Blood Alcohol Concentrations when Using Headspace Chromatography as a Means of Determining Concentration. Denver, Colorado, 1973.

Colorado Department of Public Health, Laboratory Division Breath and Blood Alcohol Test Criteria. Colorado Law Enforcement Academy Training. Recruit and In-Service Staff. Golden, Colorado, 1972-80.

Colorado Breath Alcohol Program. Health Laboratory Science, Vol. 8, No. 3, July 1971.

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