SAN DIEGO POLICE DEPARTMENT

CRIME LABORATORY

FORENSIC CHEMISTRY UNIT

ALCOHOL TRAINING MANUAL

Approved by: Janine Miller, Program Coordinator

November 24, 2021

INTRODUCTION

A new analyst will complete the following training blocks, which can be completed in any order depending upon the training needs of the unit. The Supervisor or Technical Lead may assign trainers throughout the training period. A formerly trained, or experienced Alcohol Analyst may complete the training blocks in a more abbreviated form with approval of the Supervisor and the Quality Assurance Manager. Completion of each training sign off is at the discretion of the Supervisor and the Technical Lead. Additional training materials or programs can be assigned if necessary. At the end of training, a new analyst will be authorized to perform all areas of alcohol analysis and testimony.

Additional reading beyond the suggested reading list is at the discretion of the trainee and their trainer(s). It is recommended that during the training period, the trainee meet with qualified analysts on a regular basis to discuss the articles they are reading.

BLOOD ALCOHOL

Date:	Trainer:	Trainee:

General Alcohol
- Title 17
- Applicable criminal and civil laws
- Value and purpose of Forensic Alcohol Testing
- Legal definition of Alcohol
- Units

Date:	Trainer:	Trainee:

General Forensic Science Considerations
- Evidence Handling
- Preservation of Evidence
- Interdisciplinary Issues
- Human Factors
- Confidentiality

Date:	Trainer:	Trainee:

General Safety
- Safety Data Sheets (SDS)
- Eyewash/Shower Locations
- Bloodborne pathogens
- First Aid Certification
- Spill Kits

Date:	Trainer:	Trainee:

Sample Collection and Storage
- Room 138
  - Types of samples
  - Collection guidelines
  - Improperly collected samples
- FileOnQ
- Vault
- Seals
- Discrepancies
- Evidence storage in lab

Date:	Trainer:	Trainee:

Headspace GC/FID
- Instrument and software
- Henry's Law
- Maintenance and logs

Date:	Trainer:	Trainee:

Calibration Procedures
- Standards and certificates

Positive and negative controls
Internal standard method
Requirements for acceptability
Calibration curve printout explanation

Date:	Trainer:	Trainee:

Calibration Procedure Demonstration

Date:	Trainer:	Trainee:

Calibration Procedure Practice
Full set of passing calibrators and controls

Date:	Trainer:	Trainee:

Evidence Sampling Procedures
Worksheets and notetaking
Number of blood tubes out at any one time
Labeling of evidence
Homogenization
Safe evidence handling
Sampling
Consumption of samples
Requirements for acceptability
Other substances

Date:	Trainer:	Trainee:

Evidence Sampling Procedure Demonstration

Date:	Trainer:	Trainee:

Reporting
Averages and rounding
Database
Official reports (driving and other)
Case packet
Technical review
Administrative review
Biotox

Evidence Sampling Practice

Set of blood samples will be run and must meet all acceptability requirement (calibrators and controls must also meet all acceptability requirements). Blood sample values must fall within +/- 0.005% for values under 0.100% and within 5% for values of 0.100% or higher, of reported values.

Date:	Trainer:	Trainee:	
			One set of five blood samples as described above.
Date:	Trainer:	Trainee:	
			One set of a minimum of 13 blood samples as described above.
Date:	Trainer:	Trainee:	
			A minimum total of 25 blood samples, as described above, have been run
Date:	Trainer:	Trainee:	
			General Uncertainty of Measurement Current estimate Factors
Date:	Trainer:	Trainee:	
			Individual Uncertainty of Measurement Completed runs as per current Alcohol Procedure Manual.
Date:	Trainer:	Trainee:	
			Quality Assurance Yearly maintenance Quarterly checks Expiration dates QISs
Date:	Trainer:	Trainee:	
			Court Testimony and Presentation of Evidence Lab Policies and general court procedures Service of Subpoena SDLaw Prop 115's Criminal and Civil law procedures Communication log

Date:	Trainer:	Trainee:	
			Observation of Court Testimony (blood)
Date:	Trainer:	Trainee:	
			Competency Samples (passing score = 100%) Minimum of four blood samples
Date:	Trainer:	Trainee:	
			Written Exam (passing score = 80%) Minimum of four blood samples
Date:	Trainer:	Trainee:	
			Moot Court (May be omitted if analyst already has testimony experience)
Date:	Trainer:	Trainee:	
			Commencement of casework Completion of training outline Submission/Approval memo to QA manager

Required Reading:

Date:	Trainee:	
		Alcohol Manual
Date:	Trainee:	
		Title 17
		Garriott's Medicolegal Aspects of Alcohol
Date:	Trainee:	
		Chapter: Blood, Serum, Urine
		Chapter: Methods of fluid analysis
		Chapter: Quality Assurance
Date:	Trainee:	
		Chapter: Collection and storage of samples for alcohol analysis
Date:	Trainee:	
		Shajani; The Stability of Ethanol in Stored Forensic Blood Samples, *Can. Soc. Forens. Sci. J. Vol. 22, No. 4 (1989)*

Date:	Trainee:	
		Shan; A Study of Blood Alcohol Stability in Forensic Antemortem Blood Samples, *Forensic Science International 211, (2011), 47-50*
Date:	Trainee:	
		Winek; The Effect of Storage at Various Temperatures on Blood Alcohol Concentration, *Forensic Science International 78, (1996), 179-185*
Date:	Trainee:	
		Glover; The Effect of Heat on Blood Samples Containing Alcohol, *The DRE: City of Phoenix, Spring 2003, Vol. 15, Issue 2*
Date:	Trainee:	
		Chang; The Stability of Ethyl Alcohol in Forensic Blood Specimens, *Journal of Analytical Toxicology, Vol. 8 March/April 1984*
Date:	Trainee:	
		Winek; Effect of Short-Term Storage Conditions on Alcohol Concentrations in Blood from Living Human Subjects, *Clinical Chemistry, Vol. 29, Issue 11, 1959-1960 (1983)*
Date:	Trainee:	
		Jones; Blood Analysis by Headspace Gas Chromatography: Does a deficient sample volume distort ethanol concentration?, *Med. Sci. Law (2003) Vol. 43, No. 3*
Date:	Trainee:	
		Winek; Comparison of Plasma, Serum, and Whole Blood Ethanol Concentrations, *Journal of Analytical Toxicology, Vol. 11, Nov/Dec 1987*
Date:	Trainee:	
		Dubowski; Recent Developments in Alcohol Analysis, *Alcohol, Drugs, and Driving, Vol. 2, Number 2 (1986)*
Date:	Trainee:	
		Shajani; Blood Alcohol Analysis: Comparison of Whole Blood Analysis by Gas Chromatography with Serum Analysis by Enzymatic Method, *Can. Soc. Forens. Sci. J. Vol. 22, No. 4 (1989)*
Date:	Trainee:	
		Macchia; Ethanol in Biological Fluids: Headspace GC Measurement, *Journal of Analytical Toxicology, Vol. 19, July/August (1995)*
Date:	Trainee:	
		Barnhill; Comparison of Hospital Laboratory Serum Alcohol Level Obtained by an Enzymatic Method of Whole Blood Levels

Forensically Determined by Gas Chromatography, *Journal of Analytical Toxicology, Vol. 31, January/February (2007)*

Date:	Trainee:	
		Blume; The Effect of Microbial Contamination of the Blood Sample on the Determination of Ethanol Levels in Serum, *American Journal of Clinical Pathologists, Vol. 6, 700-702*
Date:	Trainee:	
		Chang; The Effect of Temperature on the Formation of Ethanol by Candida Albicans in Blood, *Journal of Forensic Sciences, Vol. 34, No. 1, Jan 1989, 105-109*
Date:	Trainee:	
		Petkovic; Ethanol Concentration in Antemortem Blood Samples Under Controlled Conditions, *Alcohol & Alcoholism, Vol. 43, No. 6, Pp 658-660, 2008*
Date:	Trainee:	
		Dubowski; Contamination of Blood Specimens for Alcohol Analysis During Collection, *Abstracts & Reviews in Alcohol & Driving, Vol. 4, No. 2, April-June 1983*
Date:	Trainee:	
		Vance; Comparison of Immediate and Delayed Blood Alcohol Concentration Testing, *Can. Soc. Forens. Sci. J. Vol. 22, No. 4 (1989)*

Trainee: _____ Date:_____

Trainer: _____ Date:_____

QA Manager: _____ Date:_____

BREATH ALCOHOL

Date:	Trainer:	Trainee:	
			Completion of Intoxilyzer Operator Training Course
			Title 17
			Breath General

- Purpose of Forensic Alcohol Testing
- General process of absorption, distribution, and elimination
- Theory of breath alcohol analysis
- Breath testing methods
  - Types of instruments
  - NHTSA - Conforming products list

			Intoxilyzer Instruments

- General Operation
  - Theory
  - Infrared source
  - Blood-breath ratio (g/2100L)
  - Sample collection requirements
- Quality Assurance Program
  - GEBS
  - Simulators
  - Uncertainty of Measurement
  - Yearly quality assurance
- Maintenance
  - Logs
  - Room 138

CMI, Inc.

COBRA

Data uploads/weekly checks

Reviewing data

Data printouts

			Practical Experience (six months)
			PAS Purpose Evidential v. screening device
			Observation of Criminalists in Court (Breath Case)
			Written Examination (minimum passing score of 80%)
			Practical Instrument Exam (passing score of 100%)
			Required Reading: Breath Alcohol Instrument Operator Training Manual Breath Alcohol Method Manual Alcohol Policy Manual Title 17 Garriott's Medicolegal Aspects of Alcohol, 5th ed (or similar chapter in other editions) Chapter 7: Methods for Breath Analysis

Sterling

The Rate of Dissipation of Mouth Alcohol in Alcohol Positive Subjects

J Forensic Sci., May 2012, Vol. 57, No.3

Jones

Variability of the Blood/Breath Alcohol Ratio in Drinking Drivers

J Forensic Sci., 1996, 41(6):916-921

Moore

Putting the Ratio to Rest

IACT publication, May 1994

Gainsford

A Large-Scale Study of the Relationship Between Blood & Breath Alcohol Concentrations in New Zealand Drinking Drivers

J Forensic Sci., January 2006, Vol. 51, No. 1

Jaffe

Variability in the Blood/Breath Alcohol Ratio and Implications for Evidentiary Purposes

J Forensic Sci., September 2013, Vol. 58, No. 5

Simpson

Accuracy and Precision of Breath Alcohol Measurements for Subjects in the Absorptive State

Clin. Chem., 33/6, 753-756 (1987)

Gullberg

Statistical Evaluation of Truncated Breath-Alcohol Test Measurements

J Forensic Sci., JFSCA, Vol. 33, No. 2, March 1988, pp. 507-510

Jones

Physiological Aspects of Breath Alcohol Measurement

Alcohol, Drugs and Driving, Vol. 6, 1990, pp. 1-25

Hlastala

The Alcohol Breath Test - A Review

American Phys. Soc., 1998, pp.401-408

Dubowski

Quality Assurance in Breath-Alcohol Analysis

Journal of Analytical Toxicology, Vol. 18, October 1994

Hodgson

The Validity of Evidential Breath Alcohol Testing

Can. Soc. Forensic Sci. J. Vol. 41 No. 2 (2008)

Ignacio-Garcia

A Comparison of Standard Inhalers for Asthma with and without Alcohol as the Propellant on the Measurement of Alcohol in Breath

Journal of Aerosol Medicine, Vol. 18, Number 1 (2005)

Harding

The Effect of Dentures and Denture Adhesives on Mouth Alcohol Retention

Journal of Forensic Sciences, Vol. 37, No. 4, July 1992

Gullberg

Breath Alcohol Analysis in One Subject with Gastroesophageal Reflux Disease

Journal of Forensic Science, Vol. 46, No. 6 (2001)

Jones

Variability of the Blood/Breath Alcohol Ratio in Drinking Drivers

Journal of Forensic Science, Vol. 41, No. 6 (1996)

Trainee: _____ Date:_____

Trainer: _____ Date:_____

QA Manager: _____ Date:_____

IMPAIRMENT

Date: **Trainer:** **Trainee:**

Ethanol

- Alcohol beverages
- Chemical information
- Class of drug
- Standard drink

Distribution of Alcohol in the Body

- Absorption
  - Peak Absorption
  - Full Absorption
  - Factors of Absorption
  - Venous/Arterial Distribution
- Elimination
- Blood/Breath Comparison

Widmark Formula

- Origins and updates
- Calculation of rise per standard drink
- Rho Factor - Male v. Female
- Retrograde Extrapolation

Effects of Alcohol

- Impairment
  - Mental Impairment
  - Physical Impairment
- Standard Field Sobriety Tests

Use by Officers

NHTSA validation studies

Challenges

			Alcohol & Driving How does alcohol affect a person's ability to drive safely? At what point are all person impaired for the purposes of driving?
			Complete Correlation Study (min. of 4 drinking subjects) Create a proposal, coordinate all aspects of the study, perform calculations, and conclude with a written summary of the data.
			Observe FSTs in the field at a checkpoint or saturation patrol
			Opinion Practical (Passing Score of 80%)
			Impairment Examination (Passing Score of 100%)

COURT TESTIMONY

Date:	**Trainer:**	**Trainee:**	
			Alcohol Expert's Role
			Monthly rotation and expectations
			Opinion Practice
			Challenges to breath testing Instrument Software Underlying principles Ratios

Other interferants

Mouth alcohol

			Observation of Criminalists in Court
			Court decisions regarding chemical tests

Bullcoming v. New Mexico (2011)

California v. Lopez (2009)

California v. Trombetta (1984)

McNeal v California (2009)

Melendez-Diaz v. Massachusetts (2009)

Missouri v. McNeely (2013)

			Discovery
			Moot Court
			Forensic Alcohol Analyst Designation

Required Reading:

Jones

Forensic Science Aspects of Ethanol Metabolism

Forensic Science Progress 5, 1991, pp. 33-89

Winek, Wahba, Dowdell, Friel, Logan, Baur

Determination of Absorption time of Ethanol in Social Drinkers

Forensic Science International, Vol. 77, 1996, pp. 169-177

Jones et al

Peak Blood-Ethanol Concentration and the Time of its Occurrence after Rapid Drinking on an Empty Stomach

Journal of Forensic Science, Vol. 36, No. 2, 1982, pp. 376-385

Friel et al.

An Evaluation of the Reliability of Widmark Calculations Based on Breath Alcohol Measurements

Journal of Forensic Science, Vol. 40, No. 1, January 1995, pp. 91-94

Gullberg

Comparing Roadside with Subsequent Breath Alcohol Analyses and Their Relevance to the Issue of Retrograde Extrapolation

Forensic Science International, Vol. 57, 1992, pp. 193-201

Rodney G. Gullberg

Variation in Blood Alcohol Concentration Following the Last Drink

Journal of Police Science and Admin., Vol. 10, No. 1, 1982, pp. 289-296

Jones, Neri

Evaluation of Blood-Ethanol Profiles after Consumption of Alcohol

Together with a Large Meal

Canadian J. of Forensic Sciences, Vol. 24, No. 3, Sept. 1991, pp. 165-173

Moskowitz, Burns, Williams

Skills Performance at Low Blood Alcohol Levels

Journal of Studies on Alcohol, Vol. 46, No. 6, 1985, pp. 482-485

DOT/NHTSA (Stuster and Burns)

Validation of the Standardized Field Sobriety Test Battery at BAC's <0.10%

DOT-HS-808-839, August 1998

DOT/NHTSA (Tharp, Burns, and Moskowitz)

Development and Field Test of Psychophysical Tests for DWI Arrest

DOT-HS-805-864

DOT/NHTSA

A Review of the Literature on the Effects of Low Doses of Alcohol on Driving-Related Skills

DOT-HS-809-028, April 2000

DOT/NHTSA

Driver Characteristics and Impairment at Various BAC's

DOT-HS-809-075, August 2000

Jones et al.

The Course of the Blood-Alcohol Curve after Consumption of Large Amounts of Alcohol under Realistic Conditions

Canadian Society of Forensic Sciences Journal, No. 3, 2006, pp. 125-140

Seidl et al

The Calculation of Blood Ethanol Concentrations in Males and Females

Internal Journal of Legal Medicine, 2000 (114): 71-77

Breen et al.

The Effect of a "One for the Road" drink of hard liquor, beer, or wine on peak breath alcohol concentration in a social drinking environment with food consumption.

Med Sci Law 1998 38(1):62-69

P.Zador

Alcohol-Related Relative Rish of Fatal Driver Injuries in Relation to Driver Age and Sex

Journal of Studies on Alcohol and Drugs, 1991, 52(4):302-310

Jackson et al.

The Contribution of Alcohol on Serious Car Crash Injuries

Epidemiology 15(3):337-344. 2004

Keall

The contribution of alcohol to night time crash risk and other risks

of night driving

Accident Analysis and Prevention, 37 (2005) 816-824

Marple-Horvat et al.

Alcohol Badly Affects Eye Movements Linked to Steering, Providing for Automatic In-Car Detection of Drink Driving.

Neuropsychology 33:849-858. 2008

Jones

Concentration-Time Profiles of Ethanol in Arterial and Venous Blood and End-Expired Breath During and After Intravenous Infusion

Journal of Forensic Science, Vol. 42, No. 6 (1997)

Phillips

The Relationship between Serious Injury and Blood Alcohol Concentration (BAC) in Fatal Motor Vehicle Accidents: BAC = 0.01% is Associated with Significantly More Dangerous Accidents than BAC = 0.00%

Addiction, Vol. 106, Issue 9 (2011)

SCRI/DOT/NHTSA

The Robustness of the Horizontal Gaze Nystagmus Test, 2007

Maskell

Evidence based survey of the distribution volume of ethanol: Comparison empirically determined values with anthropometric measures

Forensic Science International, Vol. 294, (2019) pp.124-131

Barbour

Simplified estimation of Widmark 'r' values by the method of Forrest

Science & Justice, Vol. 41, No. 1: 53-54 (2001)

Moskowitz

Acute tolerance to behavioral impairment by alcohol in moderate to heavy drinkers

NHTSA, Final Report, April 1974

Haubenreisser

Tolerance development in humans with task practice on different limbs of the blood-alcohol curve

Psychopharmacology (1983) 81:350-353

Moskowitz

The Mellanby Effect in Moderate and Heavy Drinkers

NHTSA, NIAAA report, p. 184-189

Nicholson

Variability in Behavioral Impairment Involved in the Rising and Falling BAC Curve

Journal of Studies on Alcohol, Vol. 53, No. 4, 1992

Maskell P., Jones A.W., et al

Evidence based survey of the distribution volume of ethanol: Comparison Of empirically determined values with anthropometric measures

Forensic Science International, 294 (2019) 124-131

Trainee: _____ Date:_____

Trainer: _____ Date:_____

QA Manager: _____ Date:_____