

VERMONT FORENSIC LABORATORY

Alcohol Analysis Manual

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1.0 Purpose and Scope

- 1.1 This manual describes the analysis of samples for ethyl alcohol using headspace gas chromatography.
- 1.2 Samples to be analyzed may include calibration standards, whole blood controls, aqueous controls, and blood and beverage samples which are thought to contain alcohol.
- 1.3 The scope of this manual includes preparation of the internal standard and timing mix, retrieving and opening of evidentiary samples, preparation of vials for analysis, instrument set-up, data review and release, documentation, and quality control criteria.

2.0 Responsibility

- 2.1 All analysts having the responsibility for analysis of blood or other samples for alcohol content are responsible for following these procedures as written.
- 2.2 These procedures are reviewed periodically by the Alcohol Section staff. Revisions are made at that time or when there is an identified need to change this written manual to be compatible with changing needs in the analytical process. In the event that there are changes to be made to this manual, the analyst must report those changes in detail to the Alcohol Section Supervisor in a timely manner.
- 2.3 All analysts performing these procedures for the purpose of reporting analytical results for forensic purposes must be fully trained and demonstrate initial competency in the use of these procedures in accordance with the Alcohol Training Manual (ALC_P300). All analysts must show ongoing proficiency by successfully analyzing at least one proficiency test annually.
 - 2.3.1 Analysts trained in blood alcohol analysis do not need to take a separate beverage alcohol proficiency test annually. New analysts must complete an initial demonstration of competency.
- 2.4 Analysts will assure that an adequate amount of sample processing supplies are on hand at all times. Orders should be placed when supplies are low to ensure that new stock arrives before supplies are completely empty.

3.0 Emergency or High Priority Situations

- 3.1 The Commissioner of Public Safety, Laboratory Director or Alcohol Section Supervisor can designate samples as high priority.
- 3.2 High priority samples are analyzed as soon as possible after successful calibration.
- 3.3 Priority sample results are reviewed and released as soon as they are available,

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once they pass the quality assurance criteria.

4.0 Quality Assurance

4.1 It is expected that the analyst will report any unacceptable or anomalous behavior of any analytical system immediately to the Alcohol Section Supervisor. It is further expected that appropriate actions will follow as soon as possible and be properly documented.

4.2 Equipment

4.2.1 Balance

4.2.1.1 Measurements made using the Alcohol Section analytical balance are critical.

4.2.1.2 The analytical balance in room 266 will be checked on the day of use with NIST traceable weights. This check will be recorded in the daily check log located proximal to the balance.

4.2.1.3 The analytical balance in room 266 will be checked monthly with NIST traceable weights. This check will be recorded in the corresponding VFL Balances Equipment QA/QC Binder.

4.2.1.4 The analytical balance in room 266 will have its calibration evaluated and certified annually by an approved vendor. The resulting documentation will be maintained.

4.2.2 Pipettes

4.2.2.1 Measurements made by the Alcohol Section using pipettes are critical.

4.2.2.2 Pipettes used by the Alcohol Section, including fixed and variable volume pipettes have their calibration evaluated and certified semiannually by an approved vendor. The resulting documentation will be maintained.

4.2.2.3 If a pipette appears to be out of calibration between normally scheduled performance/calibration checks or as a result of these checks, the pipette will be sent to an authorized vendor for repair.

4.2.2.3.1 If a pipette is sent out of the lab for service, it will be performance checked upon return. This check will include weighing volumes of water with an analytical balance.

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- 4.2.2.3.2 For variable volume pipettes, ten measurements will be taken at 2 different volumes. For fixed volume pipettes, 5 measurements will be taken at the specified volume of the pipette. The pipette precision must be within $\pm 5\%$ CV and accuracy must be within $\pm 5\%$. For small volume pipettes (less than 20 μ L), pipettes must be within $\pm 10\%$ CV and $\pm 10\%$ accuracy.
- 4.2.2.3.3 Performance checks will be reviewed by the Alcohol Section Supervisor and filed in the VFL Pipettes Equipment QA/QC Binder.

4.3 Instrumentation

- 4.3.1 All maintenance performed, including routine and preventative maintenance as well as troubleshooting activities, should be recorded in the Instrument Maintenance Log.
- 4.3.2 The Instrument Maintenance Log and the listed resources are located in Room 265.
- 4.3.3 **Agilent 6890N Gas Chromatograph:**
 - 4.3.3.1 Gas supply levels are checked daily as described in Sections 9.4.1-9.4.3.
 - 4.3.3.2 Refer to Agilent 6890 Gas Chromatograph Maintaining Your GC Section 8 for information regarding maintaining the FID.
 - 4.3.3.3 Repair and maintenance information for non-routine maintenance of the gas chromatograph can be found in the following sources:
 - 4.3.3.3.1 Agilent 6890 Gas Chromatograph Maintaining Your GC
 - 4.3.3.3.2 Agilent 6890N Gas Chromatograph Troubleshooting
 - 4.3.3.3.3 Agilent 6890 Series Gas Chromatograph Operating Manual Volume I: General Information
 - 4.3.3.3.4 Agilent 6890N Gas Chromatograph User Information
 - 4.3.3.4 Maintenance and troubleshooting information for the software controlling the gas chromatograph can be found in the ChromPerfect Spirit Installation and User's Manual.
 - 4.3.3.4.1 Monthly, archive the data, alarm, and error log files.

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4.3.4 Teledyne-Tekmar HT3 Headspace Autosampler

4.3.4.1 Refer to the Teledyne-Tekmar HT3 Static/Dynamic Headspace System User Manual Section 7.2 for routine maintenance.

4.3.4.2 Repair and maintenance information for non-routine maintenance of the headspace autosampler can be found in the Teledyne-Tekmar HT3 Static/Dynamic Headspace System User Manual.

4.4 Reference Materials

4.4.1 Calibration Standards

4.4.1.1 NIST traceable aqueous ethanol standards are used for calibration. Calibration standards with concentrations of 0.005, 0.020, 0.080, 0.200, and 0.400 g/100mL are purchased from an ISO 17025 certified supplier. The certificates of analysis for all calibration standards are kept on file with the Alcohol Program.

4.4.1.2 Prior to using a new lot of calibration standard, one vial from the lot should be run as a sample (in duplicate) to verify the lot falls within the manufacturer's specifications. A new shipment of the same lot does not require verification.

4.4.1.3 After a new lot of calibration standard is verified, the data package from the verification run will undergo a Technical Review and be kept on file with the Alcohol Program.

4.4.1.3.1 Refer to Sections 12.1.3 and 12.1.4 for review parameters.

4.4.1.4 Calibration standards will be stored at 4°C.

4.4.2 Aqueous Ethanol Control

4.4.2.1 A NIST traceable aqueous ethanol standard is used for a within-run control in runs containing aqueous samples. An aqueous ethanol standard with a concentration of 0.080 g/100mL (of a different lot than the calibration standard) is purchased from an ISO 17025 certified supplier. The certificates of analysis for all aqueous ethanol controls are kept on file with the Alcohol Program.

4.4.2.2 Prior to using a new lot of aqueous ethanol control, one vial from the lot should be run as a sample (in duplicate) to verify the lot falls within $\pm 5\%$ of the manufacturer's certified concentration. A new shipment of the same lot does not require verification.

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4.4.2.3 After a new lot of aqueous ethanol control is verified, the data package from the verification run will undergo a Technical Review and be kept on file with the Alcohol Program.

4.4.2.3.1 Refer to Sections 12.1.3 and 12.1.4 for review parameters.

4.4.2.4 Document the results of each analysis of the aqueous ethanol control in the Aqueous Control Chart.

4.4.2.5 Aqueous ethanol controls will be stored at 4°C.

4.4.3 Whole Blood Ethanol Control

4.4.3.1 A whole blood ethanol control is used for a within-run control in runs containing whole blood samples. A whole blood control with a concentration of approximately 0.080 g/100mL is purchased from a reputable supplier. The manufacturer control sheets for all whole blood ethanol controls are kept on file with the Alcohol Program.

4.4.3.2 Prior to using a new lot of whole blood ethanol controls or a new shipment of a previously received lot, ten (10) replicates of the control will be analyzed and the acceptable parameters determined.

4.4.3.2.1 The acceptance range will be $\pm 10\%$ from the calculated average.

4.4.3.3 After the parameters for a new lot or shipment of whole blood ethanol control have been determined, the data package from the analyses will undergo a Technical Review and be kept on file with the Alcohol Program.

4.4.3.3.1 Refer to Sections 12.1.3 and 12.1.4 for review parameters.

4.4.3.4 Document the results of each analysis of the whole blood ethanol control in the Whole Blood Control Chart.

4.4.3.5 Whole blood ethanol controls will be stored at 4°C.

4.5 In-House Preparations

4.5.1 Solutions prepared in-house for use in casework will be performance checked prior to use in casework. Specifications for these checks are defined in Section 5.0 below.

5.0 Solution Preparation (Procedure performed in room 266)

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5.1 Reagents

- 5.1.1 Ethanol (200 proof ACS/USP grade)
- 5.1.2 Acetaldehyde (ACS reagent grade)
- 5.1.3 Acetone (ACS reagent grade)
- 5.1.4 Isopropanol (ACS reagent grade)
- 5.1.5 Methanol (ACS reagent grade)
- 5.1.6 N-Propanol (ACS reagent grade)
- 5.1.7 t-Butanol (ACS reagent grade)
- 5.1.8 diH₂O

5.2 Apparatus

- 5.2.1 Class A volumetric flasks
- 5.2.2 Pasteur pipettes
- 5.2.3 1L screw cap bottle
- 5.2.4 Glass vials with septa and screw caps
- 5.2.5 Analytical Balance

5.3 Internal Standard Preparation

- 5.3.1 Add approximately 500ml of diH₂O to a 1L volumetric flask.
- 5.3.2 Add 0.5g N-Propanol.
- 5.3.3 Add 0.15g t-Butanol.
- 5.3.4 Bring to volume with diH₂O and shake well to dissolve solids.
- 5.3.5 Transfer to a labeled 1L bottle.
- 5.3.6 Document the solution in the Reagent Preparation Log.
 - 5.3.6.1 The lot number is IS-MMDDYYYY, where MMDDYYYY is the date of preparation.
 - 5.3.6.2 Solution expires one year from date of preparation.
 - 5.3.6.3 Solution is stored at room temperature.
- 5.3.7 One vial of a newly prepared internal standard solution is analyzed and deemed acceptable for use in casework when only two peaks are present in a prepared blank sample. These two peaks must be present with retention times consistent with n-propanol and t-butanol.

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5.3.8 The data package from the analysis will be reviewed and documentation of passing QC recorded in the Reagent Preparation Log. Analytical packets will be kept on file with the Alcohol Program.

5.4 Timing Mix Preparation

- 5.4.1 Add a small amount of diH₂O to a 100mL volumetric flask.
- 5.4.2 Add ~0.06g Acetaldehyde.
- 5.4.3 Add ~0.12g Methanol.
- 5.4.4 Add ~0.06g Acetone.
- 5.4.5 Add ~0.08g Isopropanol.
- 5.4.6 Add ~0.08g Ethanol.
- 5.4.7 Bring to volume with diH₂O.
- 5.4.8 Transfer to a glass vial with a septum and screw cap. Label the vial.
- 5.4.9 Document the solution in the Reagent Preparation Log.
 - 5.4.9.1 The lot number is TMX-MMDDYYYY, where MMDDYYYY is the date of preparation.
 - 5.4.9.2 Solution expires one year from date of preparation.
 - 5.4.9.3 Solution is kept refrigerated.
- 5.4.10 One vial of a newly prepared timing mix solution is analyzed and deemed acceptable for use in casework when each chemical in the mixture is detected with baseline separation and the retention times are consistent with the components of the mixture.
- 5.4.11 The data package from the analysis will be reviewed and documentation of passing QC recorded in the Reagent Preparation Log. Analytical packets will be kept on file with the Alcohol Program.

5.5 Aqueous Blank Preparation

- 5.5.1 Deionized water will be used as an aqueous blank.
- 5.5.2 Document the preparation in the Reagent Preparation Log.
 - 5.5.2.1 The preparation date is the date the deionized water is bottled.
 - 5.5.2.2 The lot number is BL-MMDDYYYY, where MMDDYYYY is the date of preparation.
 - 5.5.2.3 The aqueous blank is kept refrigerated.

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5.5.2.4 Prepared aqueous blank is approved for use until consumed or contamination is suspected.

5.5.3 One vial of a newly prepared bottle of aqueous blank is analyzed and deemed acceptable for use in casework when no peaks above threshold are observed when analyzed without the addition of internal standard solution.

5.5.4 The data package from the analysis will be reviewed and documentation of passing QC recorded in the Reagent Preparation Log. Analytical packets will be kept on file with the Alcohol Program.

6.0 Evidence Handling

6.1 Evidence Storage and Retention

6.1.1 Samples having requested alcohol analysis are stored in an evidence intake refrigerator (Room 155A) until brought to Room 266 for analysis. Samples in personal custody, but not currently being analyzed, are stored in the refrigerator in Room 266.

6.1.2 Subsequent to analysis, all samples are to be returned along with their packaging to the evidence refrigerator (Room 155A) for storage making sure to re-seal any tube that was opened for analysis.

6.1.3 Evidentiary blood tubes are kept for at least 90 days subsequent to analysis. They may be disposed of after that time in accordance with the Evidence Handling Manual (EH_P100).

6.2 Opening Evidentiary Blood Kits and blood tube labeling

6.2.1 Sample kits must be opened and the corresponding blood tubes labeled one at a time at the lab bench.

6.2.2 Compare the receipt information (certified mail number if applicable) and laboratory identification number on the shipping box with the information in FA.

6.2.3 Take note of any identifying information written on any seals, on the blood tubes or on the kit. If there is a discrepancy between that information and what is listed in FA, make a note in FA. If there is a question regarding the identification of a sample, contact the Supervisor of the Alcohol Program.

6.2.4 Note the lot number and expiration date listed on the kit in FA if it has not already been entered. It is permissible to use an expired kit; the expiration date refers to the vacuum of the blood tubes. If the tubes filled, regardless of the expiration date, the sample is deemed acceptable.

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6.2.5 Note in FA the number of tubes in the kit and whether or not each tube was sealed.

6.2.5.1 Any unsealed tubes will be sealed with evidence tape, dated and initialed.

6.2.6 Label each blood tube with the corresponding identification number (Ex: VFL# A1-1, A1-2, A1-3).

6.2.7 Repack the packaging material.

7.0 Headspace Vial Preparation

7.1 Standards and Controls

7.1.1 Internal Standard

7.1.2 Aqueous Blank

7.1.3 Timing Mix

7.1.4 Calibration standards

7.1.5 Whole Blood Ethanol Control

7.1.6 Aqueous Ethanol Control

7.1.7 Evidentiary samples

7.2 Apparatus

7.2.1 Vortex

7.2.2 500 μ L and 1000 μ L fixed volume and 200-1000 μ L adjustable pipettes

7.2.3 Pipette tips

7.2.4 Wide bore, aerosol barrier pipette tips

7.2.5 20mL round bottom headspace autosampler vials

7.2.6 Septum caps

7.2.7 Crimping tool

7.2.8 Vial racks and tube racks

7.2.9 Hood

7.3 Procedure

7.3.1 Remove the aqueous blank, timing mix, standards, whole blood and/or aqueous ethanol control, and evidentiary samples to be analyzed from the

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refrigerator in Room 266 and allow them to come to room temperature prior to preparation (approximately 30 minutes).

- 7.3.2 Check the “opened” date on the current vial of whole blood ethanol control (Level 1 0.08 EtOH from Cliniqa or equivalent). If the vial has been open for more than one month, dispose of it in the biohazard waste and retrieve a new vial. Allow the control to come to room temperature prior to sampling.
- 7.3.2.1 Ensure that the whole blood ethanol control has been verified prior to use.
- 7.3.3 Evaluate all evidentiary samples submitted for quantity and condition of the sample. Each sample should contain at least 2mL of blood or beverage and be fluid enough to aliquot.
- 7.3.3.1 For blood samples, select one blood tube from the set for analysis and place it in a tube rack.
- 7.3.4 Label one 20mL round bottom headspace auto sampler vial for each of the following:
- 7.3.4.1 Aqueous blank.
- 7.3.4.2 Timing mix.
- 7.3.4.3 Each of the five calibration standards (A-E).
- 7.3.4.4 Whole blood and/or aqueous ethanol control in duplicate.
- 7.3.4.5 Each of the evidentiary samples to be analyzed in duplicate. Label the vials with the respective VFL item number.
- 7.3.4.6 A sufficient number of Calibration Check samples.
- 7.3.4.6.1 A calibration check sample using STD C is analyzed in duplicate after, at a minimum, every 10th vial following calibration and at the end of every run.
- 7.3.5 Transfer 1000µL of internal standard to each headspace vial.
- 7.3.6 Add 500µL of each solution to its corresponding headspace vial.
- 7.3.6.1 When transferring the whole blood sample and evidentiary samples, use a wide bore, aerosol barrier pipette tip and work in the hood.
- 7.3.6.2 Prior to aliquotting, vortex each blood sample to homogenize it.
- 7.3.7 Using a cap crimping tool, seal the vials with a septum cap.

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7.3.8 Prepared samples can be held at room temperature before analysis is begun for a maximum of 48 hours. Samples are typically analyzed within 24 hours of preparation.

8.0 Beverage Analysis

- 8.1** A blank and ethanol control in a similar matrix should be prepared and analyzed along with the evidentiary samples.
- 8.2** Beverage samples may need to be diluted with diH₂O appropriately so that all results fall between the lowest and highest calibration points.
- 8.3** After dilution, prepare samples as described in Section 7.0 above.
- 8.4** Sample results must be reported as percent volume per volume. Review results as described in Section 12.0 below.
- 8.4.1 Correct the result for the dilution factor used. Divide this corrected value by 0.789, the density of ethanol at 20°C, to obtain the percent volume per volume units.
- 8.5** Any sample that is greater in concentration than the highest standard must be diluted and reanalyzed. The dilution recipe must be noted in the worksheets.

9.0 Instrumental Analysis

9.1 Principle of Measurement

- 9.1.1 Alcohol and related volatile organic compounds are determined in blood by Headspace Gas Chromatography with Flame Ionization Detection. The sample, a mixture of an internal standard solution, a surrogate and the sample to be analyzed, is heated in a vial sealed with a septum. This is allowed to equilibrate so that proportional amounts of the volatile compound are present in the liquid and headspace. A portion of the vapor above the heated sample is transferred to a sample loop and injected onto the column of the gas chromatograph.
- 9.1.2 In the flame ionization detector (FID), the vaporized alcohol or other volatile compound mixed with hydrogen enters a jet where it is burned in an air atmosphere. The jet itself serves as one electrode and a second electrode is placed above the flame. A potential is applied across these electrodes. When molecules enter the flame, ionization occurs yielding a current flow which after proper amplification, may be displayed on the computer terminal. The FID is a mass-sensitive detector and its response is proportional to the total number of ions entering the detector per unit time.

9.2 Equipment & Materials

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- 9.2.1 All equipment and materials are located in room 265 unless otherwise stated.
- 9.2.2 Agilent Technologies 6890N gas chromatograph with flame ionization detector.
- 9.2.3 Teledyne-Tekmar HT3 headspace autosampler.
- 9.2.4 Desktop PC and printer with ChromPerfect Spirit Chromatography and HT3 TekLink Software Packages.
- 9.2.5 Compressed Hydrogen-UHP Grade.
- 9.2.6 Compressed Helium-UHP Grade.
- 9.2.7 Compressed Air.

9.3 Data System Setup

- 9.3.1 Set up the ChromPerfect Spirit Chromatography data system as described in the Instrument Maintenance Log.
- 9.3.2 Once the instrument is calibrated, ensure a copy of the calibration file is saved.

9.4 Chromatograph Setup

- 9.4.1 Assure that the Helium carrier gas is turned on with an appropriate delivery pressure (approximately 45 psi) and that the amount remaining in the supply cylinder is at 500 psi or greater. If not, replace the tank.
- 9.4.2 Assure that the Air tank is turned on with an appropriate delivery pressure (approximately 45 psi) and that the remaining cylinder pressure is at 200 psi or greater. If not, replace the tank.
- 9.4.3 Assure that the Hydrogen tank is turned on with an appropriate delivery pressure (approximately 18 psi) and that the remaining cylinder pressure is at 200 psi or greater. If not, replace the tank.
- 9.4.4 Ensure that the FID flame is lit and the GC status is "Ready for injection".
- 9.4.5 Review all operating parameters and adjust as necessary to assure they agree with the settings listed in the Instrument Maintenance Log.

9.5 Autosampler Setup

- 9.5.1 Review all operating parameters and adjust as necessary to assure they agree with the settings listed in the Instrument Maintenance log.

10.0 Estimation of Uncertainty of Measurement

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- 10.1** An estimation of the uncertainty of measurement of the ethanol concentration in blood samples has been performed.
- 10.2** The estimated uncertainty of measurement at a 99.7% level of confidence for blood ethanol analysis is $\pm 8.2\%$.
- 10.3** Calculate the confidence interval for each result by multiplying the measured result by 0.082. This value will be reported along with the measured result.
- 10.4** The confidence interval will be reported in the following format:
 - 10.4.1 $0.XXX \pm 0.YYY \%$ (g/100mL) ethanol
- 10.5** The reported result is the result at the time of analysis, and does not account for changes in sample composition which may occur subsequent to or before examination.
- 10.6** The estimated uncertainty of measurement will be updated at least annually or if any significant change in the expanded uncertainty is detected.

11.0 Quality Control and Corrective Action

- 11.1** All analytical sequences must contain:
 - 11.1.1 An aqueous blank sample.
 - 11.1.1.1 Ethanol in the Blank must show quantitation of $<0.005\text{g}/100\text{mL}$.
 - 11.1.2 A timing mix sample.
 - 11.1.2.1 All compounds should be represented by separate peaks with no coelution.
 - 11.1.3 Five calibration standards having certified ethanol concentrations expressed to three decimal places of the following concentrations:
 - 11.1.3.1 STD A $\sim 0.005\%$
 - 11.1.3.2 STD B $\sim 0.020\%$
 - 11.1.3.3 STD C $\sim 0.080\%$
 - 11.1.3.4 STD D $\sim 0.200\%$
 - 11.1.3.5 STD E $\sim 0.400\%$
 - 11.1.4 Duplicate samples of an ethanol control.
 - 11.1.4.1 Analytical runs containing evidentiary blood samples must have a whole blood ethanol control. Analytical runs containing evidentiary beverage samples must have an ethanol control in the same matrix as the beverage samples. The two sample analyses

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must be within 5% of the mean result for that sample and the mean of the two replicates must be within 10% of the accepted value.

11.1.5 A calibration check sample using STD C, which is analyzed in duplicate after, at a minimum, every 10th vial following calibration and at the end of every run.

11.1.5.1 Each result should be within $\pm 5\%$ of the mean of the two replicates and the mean should be within $\pm 10\%$ of the known value. If not, then all analyses from the last acceptable CCS must be repeated. An exception to this is if one replicate has recovery of less than 10% or greater than 150%, which would be indicative of preparation error. In this case, the remaining replicate can be used as a valid calibration check.

11.1.6 All evidentiary samples will be run in duplicate.

11.1.6.1 The two sample analyses must be within 5% of the mean result for that sample. If not then the analysis must be repeated (two new preparations from the sample) and the two new replicates must be within 5% of the mean result for that sample. The number of samples used to report the average will be determined on a case by case basis, but cannot be less than two.

11.1.6.2 If two or more dilutions are prepared for a single sample (ex. for beverage alcohol analysis), the replicate average for each dilution shall be calculated. Each replicate average must be within 5% of the mean of the overall average. If not, an additional two aliquots of the diluted sample are analyzed. The number of replicates used to report the average will be determined on a case by case basis, but cannot be less than two.

11.2 Calibration standards must be within 10% of their certified values except STD A which must be within 20% of its certified value.

11.3 The correlation coefficient of the calibration line must be 0.99 or greater and the average error must not be greater than 10%. If not, the calibration must be repeated.

11.4 A calibration curve will be run each day samples are analyzed. Additional samples may be analyzed on a calibration provided that a set of calibration check samples are analyzed before and after samples and that the samples are run within 24 hours of the original calibration.

11.5 Surrogate compound concentrations must be between 0.900 and 1.100, inclusive, in each sample.

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11.6 Any sample that is greater in concentration than the highest standard must be diluted and reanalyzed. The dilution recipe must be noted in the worksheets.

11.7 Samples that arrive containing less than 2mL of blood may be analyzed with approval from the Alcohol Program Supervisor.

11.7.1 Effort should be made to preserve at least 500µL of sample for independent testing.

12.0 Data Review

12.1 Procedure

12.1.1 Upon successful completion of analysis, the analyst must perform a primary data review of their package prior to submitting the complete package to the assigned reviewer for technical review.

12.1.2 The complete data package includes:

12.1.2.1 The Blood Alcohol Data Review Checklist (QA_F100_13).

12.1.2.2 All chromatograms generated during the analytical process.

12.1.2.3 The ethanol calibration line graph and data.

12.1.2.4 The analytical run sequence.

12.1.2.5 The FA worksheet.

12.1.2.6 A VFL report.

12.1.3 Analyst Review

12.1.3.1 Ensure the criteria defined in Section 11.0 above are met.

12.1.3.2 Ensure that all samples are quantified against the correct calibration version and method as listed on the calibration report.

12.1.3.3 Perform all calculations and ensure that proper rounding rules have been followed.

12.1.3.3.1 Individual sample results and confidence intervals are recorded to three decimal places in the report.

12.1.3.3.1.1 Beverage results are reported to three significant figures.

12.1.3.3.2 If the fourth value to the right of the decimal is 7 or greater, round up. If it is less than 7, truncate.

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12.1.3.4 All samples with an average concentration of <0.005 % (g/100mL) will be reported as "Item...AVG was below the laboratory's reporting threshold for ethanol."

12.1.4 Technical Review:

12.1.4.1 The assigned reviewer must perform a review of the complete data package as described in 12.1.3.

12.1.4.2 Ensure that the forms are complete and accurate.

12.1.4.3 All calculations performed that are not part of a validated worksheet or program must be confirmed.

12.1.4.4 When data review is complete and no data quality issues have been identified, the reviewer notes on the Blood Alcohol Data Review Checklist (QA_F100_13) his/her initials and the date reviewed.

12.1.4.5 If data quality issues have been identified during review, the reviewer must attempt resolution through discussion with the analyst and/or Alcohol Section Supervisor. If issues cannot be resolved, it may be necessary to prepare and analyze new aliquots of the submitted sample.

12.1.4.6 Upon completion of the technical review, an administrative and director review will be completed by the Alcohol Section Supervisor, or their designee using the Blood Alcohol Data Review Checklist (QA_F100_13).

12.2 In order for a data package to pass quality assurance all of the review criteria must be met.

12.3 Apparent errors and/or omissions are referred to the analyst for resolution. The reviewer will assess the need for corrective action and either return the data to the analyst for further resolution or release the data.

12.3.1 In the absence of the analyst, errors or omissions can be referred to the Alcohol Section Supervisor. The Supervisor will identify needed corrective action and assign staff to implement the action.

12.4 If the scheduled reviewer is not available, the analyst can request data review from any other qualified analyst or the Alcohol Section Supervisor.

13.0 Backup Procedures

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- 13.1** If the secure storage refrigerator in room 155A is not functioning, the refrigerator in room 266 may be used to store samples, or vice versa.
- 13.2** If the Vermont Forensic Laboratory lacks analytical ability for greater than 10 business days, submitters will be notified of the lack of analytical ability and provided the option of submission of samples for outside analysis at a qualified laboratory.

14.0 References

- 14.1** Alcohol Training Manual (ALC_P300)
- 14.2** VFL Balances Equipment QA/QC Binder.
- 14.3** VFL Pipettes Equipment QA/QC Binder.
- 14.4** Instrument Maintenance Log.
- 14.5** Agilent 6890 Gas Chromatograph Maintaining Your GC.
- 14.6** Agilent 6890N Gas Chromatograph Troubleshooting.
- 14.7** Agilent 6890 Series Gas Chromatograph Operating Manual Volume I: General Information.
- 14.8** Agilent 6890N Gas Chromatograph User Information.
- 14.9** ChromPerfect Spirit Installation and User's Manual.
- 14.10** Teledyne-Tekmar HT3 Static/Dynamic Headspace System User Manual.
- 14.11** Aqueous Control Chart.
- 14.12** Whole Blood Control Chart.
- 14.13** Reagent Preparation Log.
- 14.14** Evidence Handling Manual (EH_P100).
- 14.15** Blood Alcohol Data Review Checklist (QA_F100_13).

