TRAINING UPDATE

Lab Location:	SGMC & WAH	**Date Distributed:**	1/20/2017
Department:	Core Lab	**Due Date:**	2/10/2017
		Implementation:	**2/1/2017**

DESCRIPTION OF PROCEDURE REVISION

Name of procedure:

Ethyl Alcohol by Dimension Vista® System SGAH.C108 v2

Note: this has been converted to a system SOP

Description of change(s):

Section	Reason
Header	Add WAH
3.2	Add process in stat mode
4,5,6	Remove individual section labeling instructions and add general one
6.1, 6.2	Update QC material and storage (already in use)
6.4, 6.5	Replace LIS with Unity Real Time
10.5	Move patient review from section 6
15	Update to new standard wording, Add reagent warning
17	Update QC product and reagent package insert revision date

This revised SOP will be implemented on February 1, 2017

Document your compliance with this training update by taking the quiz in the MTS system.

Technical SOP

Title	**Ethyl Alcohol by Dimension Vista® System**		
Prepared by	Ashkan Chini	Date:	6/25/2012
Owner	Robert SanLuis	Date:	2/5/2014

Laboratory Approval	**Local Effective Date:**	
Print Name and Title	**Signature**	**Date**
Refer to the electronic signature page for approval and approval dates.		

Review		
Print Name	**Signature**	**Date**

Form revised 2/02/2007

TABLE OF CONTENTS

1. TEST INFORMATION

Assay	Method/Instrument	Local Code
Ethyl Alcohol	Dimension Vista® System	ALCO

Synonyms/Abbreviations
ALC, Ethanol, ETOH

Department
Chemistry

2. ANALYTICAL PRINCIPLE

The ETOH method is based on an enzymatic reaction. Reagent 1 contains the buffering system. Reagent 2 contains alcohol dehydrogenase (ADH), the coenzyme nicotinamide adenine dinucleotide (NAD), buffer, preservatives, and stabilizers. The ADH catalyzes the oxidation of ethyl alcohol to acetaldehyde. During this reaction, NAD is reduced to NADH. The absorbance due to NADH (and thus the alcohol concentration) is determined using a two-filter (340–383 nm) bichromatic rate technique.

$$\text{Ethyl Alcohol} + NAD^{+} \xrightarrow{\text{ADH}} \text{acetaldehyde} + NADH$$

(absorbs at 340 nm)

3. SPECIMEN REQUIREMENTS

3.1 Patient Preparation

Component	Special Notations
Fasting/Special Diets	N/A
Specimen Collection and/or Timing	Normal procedures for collecting and storing serum and plasma may be used for samples to be analyzed by this method.
Special Collection Procedures	Use non-alcohol germicidal solution to cleanse the skin
Other	N/A

3.2 Specimen Type & Handling

Criteria		
Type -Preferred **-Other Acceptable**	Serum Plasma (Heparin)	
Collection Container	Serum: Red top tube, Serum separator tube (SST) Plasma: Mint green top tube (PST)	
Volume - Optimum **- Minimum**	1.0 mL 0.5 mL	
Transport Container and Temperature	Collection container or Plastic vial at room temperature	
Stability & Storage Requirements	Room Temperature:	8 hours
	Refrigerated:	3 days
	Frozen:	Not recommended
Timing Considerations	Serum or plasma should be physically separated from cells as soon as possible with a maximum limit of two hours from the time of collection.	

Form revised 2/02/2007

Criteria	
Unacceptable Specimens & Actions to Take	Specimens that are unlabeled, improperly labeled, or those that do not meet the stated criteria are unacceptable. Request a recollection and credit the test with the appropriate LIS English text code for "test not performed" message. Examples: Quantity not sufficient-QNS; Wrong collection-UNAC. Document the request for recollection in the LIS.
Compromising Physical Characteristics	Gross hemolysis. Reject sample and request a recollection. Credit the test with the appropriate LIS English text code explanation of HMT (Specimen markedly hemolyzed)
Other Considerations	Allow Red Top or SST to clot completely prior to centrifugation. To minimize the loss of alcohol in a sample due to evaporation, open and process samples in STAT mode. Specimens must be stored tightly closed.

NOTE: Labeling requirements for all reagents, calibrators and controls include: (1) Open date, (2) Substance name, (3) Lot number, (4) Date of preparation, (5) Expiration date, (6) Initials of tech, and (7) Any special storage instructions. Check all for visible signs of degradation. When placed onboard the analyzer, the instrument captures the date / time loaded and calculates and tracks the opened expiration.

4. REAGENTS

The package insert for a new lot of kits must be reviewed for any changes before the kit is used. A current Package Insert is included as a Related Document.

4.1 Reagent Summary

Reagents	Supplier & Catalog Number
Ethyl Alcohol	Siemens, Flex® reagent cartridge, Cat. No. K5022

4.2 Reagent Preparation and Storage

Reagent	Ethyl Alcohol
Container	Reagent cartridge
Storage	Store at 2-8° C
Stability	• Reagent is stable until expiration date stamped on the reagent cartridges. • Sealed wells on the instrument are stable for 30 days. • Once wells 1 – 5 and 8 – 12 have been entered by the instrument, they are stable for 5 days.
Preparation	All reagents are liquid and ready to use.

5. CALIBRATORS/STANDARDS

5.1 Calibrators/Standards Used

Calibrator	Supplier and Catalog Number
CHEM 3 CAL	Siemens Dimension Vista®, Cat. No. KC130A

5.2 Calibrator Preparation and Storage

Calibrator	CHEM 3 CAL
Preparation	Calibrator is ready for use. No preparation is required.
Storage/Stability	• Store at 2 – 8 ° C • **Unopened calibrator** is stable until expiration date stamped on the box. • **Opened Calibrator:** once the stopper of the vial is punctured, assigned values are stable for 24 hours when stored on board the Dimension Vista System.

5.3 Calibration Parameter

Criteria	Special Notations
Reference Material	CHEM 3 CAL
Assay Range	3 – 300 mg/dL
Suggested Calibration Level	See Reagent Package Insert for lot specific assigned values in mg/dL
Frequency	• Every new reagent cartridge lot. • Every 30 days for any one lot • When major maintenance is performed on the analyzer. • When control data indicates a significant shift in assay.
Calibration Scheme	2 levels, n = 3

5.4 Calibration Procedure

Auto Calibration:

1. Place the required calibrator vials in a carrier. Make sure the barcode labels are entirely visible through the slots.
2. Place the carrier in the loading area.
3. Position the carrier with the labels facing away from the user.
4. Press the **Load** button.
5. Automatic calibration requires that calibrators be on the instrument. As the time for processing approaches, the instrument reviews onboard inventory for the appropriate calibrators.

Manual Calibration:

1. Verify that calibrators and reagents are in inventory on the instrument.
2. Press **System > Method Summary > Calibration**.
3. Select a method from the sidebar menu. Press the **Order Calibration** button on the screen.
4. Verify that the information on the screen is correct. Verify that the calibrator lot is correct using the drop-down menu.
   a. When calibrating using Vials press **OK**.
   b. When calibrating using Cups, check the Use Cups box. This displays the rack and cup position fields. For additional cups use the positions in ascending order. Be sure to use the number of calibration levels and cups as specified in the method IFU. Scan the rack barcode and place calibrator cups in an adapter in position 1 on a rack. Press **OK** and load the rack on the instrument.
5. The status field in the calibration screen changes sequentially to Awaiting Scheduling, Preparing Calibrators and Processing.

5.5 Tolerance Limits

IF……	THEN……
If result fall within assay-specific specification, and QC values are within acceptable limits,	proceed with analysis
If result falls outside assay-specific specification, or QC values are out of Acceptable limits,	troubleshoot the assay and/or instrument and repeat calibration

6. QUALITY CONTROL

6.1 Controls Used

Controls	Supplier and Catalog Number
Liquichek™ Ethanol/Ammonia Control Levels 1, 2 and 3	Bio-Rad Laboratories Cat. No. 271, 272 and 273

6.2 Control Preparation and Storage

Control	Liquicheck Ethanol/Ammonia Controls
Preparation	Before loading vials onto the instrument, gently swirl the contents to ensure homogeneity.
Storage/Stability	Unopened controls are stable until the expiration date at 2-8° C. Once the control is opened, all analytes will be stable for 20 days at 2-8°C.

6.3 Frequency

Analyze all levels of QC material after every calibration and each day of testing (notated on the QC frequency sheets posted on the instruments).

Refer to the Dimension Vista® QC Schedule in the Laboratory policy Quality Control Program and in the Dimension Vista® Quick Reference Guide.

6.4 Tolerance Limits

Step	Action
1	Acceptable ranges for QC are programmed into the instrument's Quality Control software system and Unity Real Time, and may be posted near the instrument for use during computer downtime.
2	**Run Rejection Criteria** • Anytime the established parameters are exceeded (if one QC result exceeds 2 SD), the run is considered out of control (failed) and patient results must not be reported. • The technologist must follow the procedure in the Laboratory QC Program to resolve the problem.
3	**Corrective Action**: • All rejected runs must be effectively addressed through corrective action. Steps taken in response to QC failures must be documented. Patient samples in failed analytical runs must be reanalyzed according to the Laboratory QC Program. Supervisors may override rejection of partial or complete runs only with detailed documentation and criteria for overrides that are approved by the Medical Director. Consult corrective action guidelines in Laboratory QC Program. Follow corrective action guidelines in the Laboratory QC Program. • Corrective action documentation must follow the Laboratory Quality Control Program.
4	**Review of QC** • QC must be reviewed weekly by the Group Lead or designee and monthly by the Supervisor/Manager or designee. • If the SD and/or CV are greater than established ranges, investigate the cause for the imprecision and document implementation of corrective actions.

6.5 Documentation

- QC tolerance limits are programmed into the instrument and Unity Real Time; it calculates cumulative mean, SD and CV and stores all information for easy retrieval.
- Quality control records are reviewed daily at the bench, weekly by the Group Lead or designee, and monthly by the Supervisor/Manager or designee.
- Refer to complete policies and procedures for QC documentation and for record retention requirements in the Laboratory QC Program.

6.6 Quality Assurance Program

- Each new lot number of reagent or new shipment of the same lot of reagent must be tested with external control materials and previously analyzed samples. Performance of the new lot must be equivalent to the previous lot; utilize published TEA for acceptability criteria.
- Training must be successfully completed and documented prior to performing this test. This procedure must be incorporated into the departmental competency assessment program.
- The laboratory participates in CAP proficiency testing. All proficiency testing materials must be treated in the same manner as patient samples.
- Monthly QC must be presented to the Medical Director or designee for review and signature.
- Monthly QC mean and SD are sent to Bio-Rad Laboratories for peer group comparison.
- Consult the Laboratory QC Program for complete details.

7. EQUIPMENT and SUPPLIES

7.1 Assay Platform

Dimension Vista® System

7.2 Equipment

- Refrigerator capable of sustaining 2–8°C.
- Freezer capable of sustaining range not to exceed -20 to -70°C.
- Centrifuge

7.3 Supplies

- Aliquot Plates
- System Fluids
- Assorted calibrated pipettes (MLA or equivalent) and disposable tips

8. PROCEDURE

ETOH Flex® reagent cartridge Cat. No. K5022 is required to perform this test.

Ethyl Alcohol is performed on the Dimension Vista® System after the method is calibrated (see Reference Material in Calibration section) and Quality Controls are acceptable.

NOTE: For all procedures involving specimens, buttoned lab coats, gloves, and face protection are required minimum personal protective equipment. Report all accidents to your supervisor.

8.1	Sample Processing
1.	A sample rack holding tubes or cups is placed on the rack input lane.
2.	The sample shuttle moves the rack to the barcode reader which identifies the rack and samples to the system.
3.	The rack moves into the sample server and to the rack positioner.
4.	At the same time, aliquot plates move from the aliquot loader into position.
5.	The aliquot probe aspirates the sample from the tubes or cups and dispenses it into the wells of the aliquot plates.
6.	After each aspirate-dispense action, the probe is thoroughly rinsed inside and out to prevent sample carryover.
7.	When sample aspiration is completed, the sample server moves the rack back to the sample shuttle, where it is placed on the output lane and can be removed by the operator.

8.2	Specimen Testing
1.	For QC placement and frequency, refer to the Dimension Vista® QC Schedule in the Laboratory QC Program.
2.	Follow the instructions, outlined in the Dimension Vista® Operator's Manual
3.	The instrument reporting system contains error messages to warn the user of specific malfunctions. Results followed by such error messages should be held for follow-up. Refer to the Dimension Vista® system manual "Error messages" section for troubleshooting.
4.	Follow protocol in Section 10.5 "Repeat criteria and resulting" for samples with results above or below the Analytical Measurement Range (AMR). Investigate any failed delta result and repeat, if necessary.
5.	Append the appropriate English text code qualifier messages to any samples requiring a comment regarding sample quality and/or any other pertinent factors.

Test Conditions	
Sample Volume:	4 µL
Reagent 1 Volume:	98 µL
Reagent 2 Volume:	55 µL
Reaction Time:	4 minutes
Test Temperature:	37° C
Wavelength:	340 & 383 nm
Type of measurement:	Bichromatic rate

NOTE: In the event that the test system becomes inoperable, notify supervision or designee for further direction. Patient specimens must be stored in a manner that maintains the integrity of the specimen.

9. CALCULATIONS

The instrument automatically calculates the concentration of ethyl alcohol in mg/dL.

10. REPORTING RESULTS AND REPEAT CRITERIA

10.1 Interpretation of Data

None required

10.2 Rounding

No rounding is necessary. Instrument reports results as a whole number.

10.3 Units of Measure

mg/dL

10.4 Clinically Reportable Range (CRR)

3 – 1,200 mg/dL

10.5 Review Patient Data

Each result is reviewed for error messages. Refer to the Dimension Vista system manual “Error messages” section for troubleshooting. Resolve any problems noted before issuing patient reports.

10.6 Repeat Criteria and Resulting

All repeats must replicate the original result within the total allowable error (TEa) of the assay. Refer to TEa listing for specific information.

Values that fall within the AMR or CRR may be reported without repeat. Values that fall outside these ranges must be repeated.

IF the result is …	THEN…
< 3 mg/dL	Assure there is sufficient sample devoid of bubbles, cellular debris, and/or fibrin clots. Report as: < 3 mg/dL
≥ 300 mg/dL	**On Board Automated Dilution:** Results ≥ 300 mg/dL will automatically have repeat testing performed into the instrument using dilution factor of 4. No multiplication is necessary.
> 1,200 mg/dL	If the recommended dilution does not give results within the clinically reportable range, report as: "> 1,200 mg/dL-REP" Bring to the attention of your supervisor prior to releasing result.

Message	Code
Verified by repeat analysis	Append –REP to the result.

11. EXPECTED VALUES

11.1 Reference Ranges

< 5 mg/dL

11.2 Critical Values

> 400 mg/dL

11.3 Standard Required Messages

None established

12. CLINICAL SIGNIFICANCE

Ethanol (ethyl alcohol, alcohol) is the most common toxic substance encountered. Ethanol's deleterious effects have been linked with birth defects (fetal alcohol syndrome), cardiac conditions, high blood pressure, liver disease and mental deterioration.
The rate of ethanol absorption is dependent on the emptying time of the stomach. Since ethanol distributes evenly throughout the body water, its concentration in blood following a known dose may be estimated indirectly by measuring concentrations in serum, plasma or

urine. Ethanol is rapidly metabolized so that a moderate dose will clear from the blood in approximately one hour.

13. PROCEDURE NOTES

- **FDA Status:** FDA Approved/cleared
- **Validated Test Modifications:** None

The instrument reporting system contains error messages to warn the operator of specific malfunctions. Any report slip containing such error messages should be held for follow-up. Refer to your Dimension Vista Operator's Guide.

The expected maximum observed standard deviations for repeatability using n = 5 replicates at the following ethyl alcohol concentrations are:

ETOH Concentration	Acceptable S.D. Maximum
98 mg/dL	9 mg/dL
241 mg/dL	17 mg/dL

14. LIMITATIONS OF METHOD

14.1 Analytical Measurement Range (AMR)

3 – 300 mg/dL

14.2 Precision

Material	Mean mg/dL	Standard Deviation (%CV)	
		Repeatability	Within-Lab
Multiqual Ethanol/Ammonia Control			
Level 1	42	1.0 (2.5)	1.4 (3.3)
Level 2	106	2.1 (2.0)	2.7 (2.6)
Level 3	270	4.0 (1.5)	5.6 (2.1)
Serum Pool	107	2.1 (2.0)	3.1 (2.9)

14.3 Interfering Substances

HIL Interference:
The ETOH method was evaluated for interference according to CLSI/NCCLS EP7-A2. Bias, defined as the difference between the control sample (does not contain interferent) and the test sample (contains interferent), is shown in the table below. Bias exceeding 10% is considered "interference".

Substance tested	Substance Concentration	ETOH mg/dL	Bias %
Hemoglobin (hemolysate)	1000 mg/dL	92	<10
Bilirubin (unconjugated)	80 mg/dL	96	<10
Bilirubin (conjugated)	80 mg/dL	95	<10
Lipemia Intralipid®	3000 mg/dL	101	<10

14.4 Clinical Sensitivity/Specificity/Predictive Values

Not available

15. SAFETY

Refer to your local and corporate safety manuals and Safety Data Sheet (SDS) for detailed information on safety practices and procedures and a complete description of hazards.

16. RELATED DOCUMENTS

1. Dimension Vista® Clinical Chemistry System Operator's Manual
2. Dimension Vista® Calibration/Verification Procedure
3. Dimension Vista® Cal Accept Guidelines
4. Dimension Vista® Calibration summary
5. Dimension Vista® Sample Processing, Startup and Maintenance procedure
6. Laboratory Quality Control Program
7. QC Schedule for Siemens Dimension Vista®
8. Laboratory Safety Manual
9. Safety Data Sheets (SDS)
10. Dimension Vista® Limits Chart (AG.F200)
11. Quest Diagnostics Records Management Procedure
12. Dimension Vista® System Error Messages Chart
13. Centrifuge Use, Maintenance and Functions Checks (Lab policy)
14. Hemolysis, Icteria and Lipemia Interference (Lab policy)
15. Repeat Testing Requirement (Lab policy)
16. Current Allowable Total Error Specifications
    at http://questnet1.qdx.com/Business_Groups/Medical/qc/docs/qc_bpt_tea.xls
17. Current package insert ETOH Flex® Reagent Cartridge K5022

17. REFERENCES

1. Package Insert, ETOH Flex® Reagent Cartridge K5022, Siemens Healthcare Diagnostics Inc., 04/29/2013.
2. Package Insert, CHEM 3 CAL, Siemens Healthcare Diagnostics Inc., 3/2015.
3. Package Insert, Liquichek Ethanol/Ammonia Controls, Bio-Rad Laboratories, 11/2015.

18. REVISION HISTORY

Version	Date	Section	Reason	Reviser	Approval
000	2/5/14		Update owner	L Barrett	R SanLuis
000	2/5/14	5	Change in Calibrator, update information	A Chini	R SanLuis
000	2/5/14	16	Update titles	L Barrett	R SanLuis
000	2/5/14	17	Update calibrator package Insert	A Chini	R SanLuis
000	2/5/14	Footer	Version # leading zero's dropped due to new EDCS in use as of 10/7/13.	L Barrett	R SanLuis
1	1/9/17	Header	Add WAH	L Barrett	R SanLuis
1	1/9/17	3.2	Add process in stat mode	L Barrett	R SanLuis
1	1/9/17	4,5,6	Remove individual section labeling instructions and add general one	L Barrett	R SanLuis
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1	1/9/17	15	Update to new standard wording, add warning	L Barrett	R SanLuis
1	1/9/17	17	Update QC product and insert dates	L Barrett	R SanLuis

19. ADDENDA

None