Ethanol Conversions

1 Introduction

The measurement of ethanol (EtOH) in a person's body for instances involving legal matters (e.g., driving under the influence (DUI)) can be performed within breath or within body fluids (e.g., whole blood, urine, blood-plasma/serum). When samples are sent to the Division of Scientific Services (DSS) laboratory for toxicological testing, the specimens are usually in the form of whole blood or urine. There are times, however, when blood samples are drawn within medical facilities and the blood is analyzed for medical purposes. Subsequent medical reports on the blood samples often have ethanol concentration values listed as plasma-ethanol concentration instead of whole-blood ethanol concentration. Since legal statutes are worded to reflect whole-blood ethanol concentrations, mathematical conversions are often needed on the values within the medical reports in order for the ethanol quantitation values to be useful within the judicial system.

2 Scope

Quantitative values indicating serum ethanol concentrations found within medical reports will be mathematically converted to equivalent whole-blood ethanol concentration values using a currently accepted method within the forensic toxicology discipline. No chemical analyses of specimens will be conducted within this procedure. Numerical values used for conversions will be solely based on blood-serum values and are typically received from medical (or similar) documentation. Since it is highly unlikely that an original medical report will be sent in for a blood-ethanol conversion request, the term 'medical report' in this procedure is synonymous with medical report copy.

Serum alcohol to blood alcohol conversion can be performed either using a range on conversion factors or using a single conversion factor. The conversion factor used within this procedure (1.16) is an average of the low (1.12) and high (1.18) conversion values found reported within reference articles with an administrative addition of 0.01 (e.g., $(1.12 + 1.18)/2 = 1.15 + 0.01 = 1.16$).

3 Principle

A blood-serum ethanol concentration value to be converted to a whole-blood ethanol concentration can be submitted either electronically or by paper copy. The value to be converted must be in the form of a valid medical (or similar) report. Oral requests of conversions will not be performed unless properly approved by the Deputy Director, or higher.

4 Equipment/Materials/Reagents

a. JusticeTrax program

b. Calculator (or equivalent)

5 Preparation of Reagents, Standards, and/or Controls

Not applicable

6 Calibration

Not applicable

7 Sampling

Not applicable

8 Procedure

8.1 Valid documentation

Only one (1) blood-ethanol conversion will be done per laboratory report. Multiple medical reports of individuals will be handled as separate requests and each will have their own DSS laboratory report. The page of the medical report which contains the value to be converted should be from a medical facility. The applicable documentation must contain the [medical] facility's name, address, and the patient's name. The complete medical report need not be submitted for a blood-ethanol conversion to be performed.

8.2 Correct name(s)

Ensure that the patient's name (i.e., suspect) has been entered correctly into the Laboratory Information Management System (LIMS) and that the name within the medical documentation concurs with JusticeTrax (JT) data. If multiple medical report pages are received, the serum value to be converted must be on a page which contains the [correct] patient(i.e., suspect) name. Initials, patient identification numbers, or any identifier other than the patient's name will not be accepted as valid identification.

8.3 Ethanol value to be converted

Find the correct value to be converted within the medical report (i.e., serum). Ensure that the value is for ethyl alcohol and that the units are milligrams (mg) per deciliter (dL) which is sometimes listed as: mg/dL or MG/DL. If the ethanol concentration value is not in a mg/dL unit format, mathematically convert the value to a value equivalent to a 'mg/dL' unit format. Show calculations so that they may be reviewed for accuracy. This can be done directly on the medical report and will be considered case notes.

8.4 Conversion (ensure value is truncated and only 2 decimal places)

Convert the serum ethanol concentration value to a whole blood ethanol concentration value in gram percent (g%) units. This will be done automatically using the JT system. If the incoming value for serum ethanol is in a concentration format other than what is typically submitted, the Examiner may manually convert the calculation prior to entering the value into the JT system.

For verification purposes or when necessary (e.g., when JT is unavailable), the calculation can be done by multiplying the serum ethanol (mg/dL) value by 0.000862 (or by dividing the serum (mg/dL) value twice: once by 1.16 (to convert serum EtOH to whole blood EtOH), and then again by 1000 (to convert from mg to g)). This will give a resulting whole blood ethanol value in units of gram per 100 milliliters (g/100mL), which is equivalent to the unit of gram percent (g%, or gm%).

$$\frac{28\text{mg}}{\text{dL}} \times 0.000862 = \frac{0.02\text{g}}{100\text{mL}} = 0.02\text{g\%} = 0.02\text{gm\%}$$

If the serum ethanol value is reported in units of gram per deciliter (g/dL), the conversion can be done by dividing that number by 1.16. This will give a resulting whole blood ethanol value in units of gram per 100 milliliters (g/100mL), which is equivalent to the unit of gram percent (g%, or gm%).

$$\frac{0.333\text{g}}{\text{dL}} \div 1.16 = \frac{0.28\text{g}}{100\text{mL}} = 0.28\text{g\%} = 0.28\text{gm\%}$$

All final ethanol concentration values will be truncated to the second decimal place (i.e., hundredths place). Conventional rounding rules will not be applied to these mathematical

conversions. The number of significant digits is not the same as the number of decimal places. If a plasma ethanol value consists of a number with more than three decimal places, then the converted value will still only be to two decimal places.

For any value within the submitted medical documentation which has a range associated with it (e.g., <), the converted value will carry the same range (e.g., <28mg/dL converts to <0.02gm%).

9 Uncertainty of Measurement

The uncertainty of measurement should be found within the serum measurement values from the medical documentation. No uncertainty will be reported resulting from the single point conversion within this procedure.

The report will have the following statement, "The conversion from serum ethanol to blood ethanol concentration found within this report is based on a single point conversion factor, as opposed to a conversion factor range."

10 Limitations

Not applicable

11 Safety

Not applicable

12 References

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1	06/22/2015	New Document