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TO: All State's Attorneys and Criminal Justice agencies

FROM: Charles E. Eder, State Toxicologist

DATE: December 27, 2013

RE: Toxicology Alcohol/Volatiles Analytical Report – Measurement Uncertainty

Effective **January 1, 2014**, the Toxicology Alcohol/Volatiles Analytical Report will be updated to include a measurement uncertainty for reported ethanol concentrations.

Measurement uncertainty determination is based on evaluation of an analytical method's data and components used. Expanded measurement uncertainty is reported as a confidence interval. For example, an ethanol concentration may be reported as 0.136 ± 0.011g/100mL (coverage probability of 99.73%). This means there is a high probability (>99%) if reanalysis is performed a similar result will be obtained within the given confidence interval. A common example of describing a confidence interval relating to a scientifically obtained result is a bathroom scale. A person steps on a scale and it reads 285 pounds. Not liking the reading, the person steps off and steps back on the scale and it reads 286 pounds. Still not happy about the reading, one more attempt is made and the scale reads 284 pounds. If a measurement uncertainty is determined for this bathroom scale, the result of the example described may be reported as 285 ± 5 pounds (coverage probability of 99.73%). Scientifically, if all steps of an analytical procedure are followed and the sample is reanalyzed, a similar number will be obtained no matter how many times it is analyzed.

The reporting section of the Approved Method to Conduct Blood Alcohol Analysis will be updated to include measurement uncertainty. An understanding of the expanded measurement uncertainty is important for interpretation of a reported result. Please see examples below.

Blood Ethanol Concentration Analysis Example #1:
Duplicate aliquot results: 0.0852 g/100mL and 0.0836 g/100mL
Reported value: 0.083 g/100mL
Average of two results: 0.084 g/100mL
Measurement Uncertainty: 0.084 ± 0.007 g/100mL (coverage probability of approximately 99%)
Results Range: 0.077 to 0.091 g/100mL (highest probability around 0.084 g/100mL)
Note: Taking the measurement uncertainty into consideration, there is a possibility that the concentration of ethanol may be below the 0.080 g/100mL level stated for a penalty in the ND Century Codes.

Blood Ethanol Concentration Analysis Example #2:
Duplicate aliquot results: 0.0877 g/100mL and 0.0884 g/100mL
Reported value: 0.087 g/100mL
Average of two results: 0.088 g/100mL
Measurement Uncertainty: 0.088 ± 0.007 g/100mL (coverage probability of approximately 99%)
Results Range: 0.081 to 0.095 g/100mL (highest probability around 0.088 g/100mL)
Note: Taking the measurement uncertainty into consideration, the concentration of ethanol does not fall below the 0.080 g/100mL level stated for a penalty in the ND Century Codes.

Where applicable, an addendum page containing the measurement uncertainty will be included with the Toxicology Alcohol/Volatiles Analytical Report.