



K31 Suicide Cases by Insulin Administration at Tarrant County Medical Examiner's Office

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After attending this presentation, attendees will be briefed on suicide cases by exogenous insulin administration and the measurement of insulin and C-peptide using a new immunoassay in postmortem blood specimen.

This presentation will impact the forensic community by validating this new immunoassay on an automated platform and establishing the normal ranges of insulin, C-peptide, and insulin/C-peptide ratio.

An immunoassay on an automated platform was validated for determination of insulin and C-peptide in postmortem blood specimens. The insulin and C-peptide assays are FDA approved clinical assays by Siemens on the ADVIA Centaur automated platform. This is a common instrument used by many clinical and hospital laboratories. All reagents were commercially available from Siemens, including calibrators and diluents. Both assays are approved for serum specimens. The manufacturer warns that both assays may have interferences from hemolysis. Postmortem blood specimens typically have gross hemolysis and it is impossible to obtain a clean serum specimen. Thus, postmortem specimen must be pre-treated to reduce the interference enough to obtain reliable values. Dilution of the specimen is the most convenient method that may reduce this interference. Standard addition involves adding a standard in buffer to the specimen, while serial dilution adds assay buffer. Two cases were investigated so far this year. In each case, the sample is a diluted specimen of postmortem whole blood.

The normal range by the automated immunoassay for insulin is 2.6 to 25.0 mU/L and for C-peptide is 0.9 to 4.3 ng/mL. Great than 1 ratio of insulin/ C-peptide is suggestive of exogenous insulin administration.

Case #1: A 52-year-old male with a history of depression and suicide threat was found unresponsive in his parked car. Two empty boxes of humulin insulin were found in the car. The decedent's abdomen reveals numerous injection sites. The postmortem whole blood testing shows exogenous insulin overdose. Subclavian blood insulin is 595 mU/L, C-peptide is 1.66 ng/ml, the ratio of insulin/ C-peptide is 7.56.

Case # 2: A 68-year-old female with a history of diabetes, dementia, depression, and suicidal thought was found unresponsive in her bed. A ¼ empty bottle of insulin was found at home along with a note to her daughter stated, "I love you." The postmortem femoral whole blood testing shows that insulin is 106 mU/L, C-peptide is 1.00 ng/ml, the ratio of insulin/ C-peptide is 2.24.

Values provided by the automated immunoassay platform were compared to values in aliquots of the same samples analyzed by the Mayo Clinical Laboratories (MCL). Twenty samples were tested by both methods. The correlations were 0.992 and 0.996 for insulin and C-peptide, respectively; there was no statistical difference between methods for either analyte. The mean (SD), as mU/L, for insulin was 21.8 (20.6) by MCL and 22.9 (23.5) by automated immunoassay; and for C-peptide, as ng/mL, 2.35 (2.56), and 2.65 (2.99). Thus, the automated platform provided equivalent values to MCL for both analytes.

The recoveries for insulin serial dilution on specimens from both cases ranged from 86% to 115%; the buffer to specimen ratio was 1:4 to 1:16. The recoveries for C-peptide standard addition on specimens from both cases ranged from 85% to 112%; the calibrator to specimen ratio was 1:2. In both cases presented here, the insulin concentrations were too high to use standard addition, while the C-peptide concentrations were too low to use serial dilution.

For the determination of insulin in hemolyzed postmortem specimens, samples can be serially diluted for reliable concentrations. For C-peptide, standard addition can provide reliable concentrations. The dilution was sufficient to reduce the interference caused by the gross hemolysis that occurred postmortem. The above results and case studies indicate that insulin/C-peptide ratio of great than 1 is suggestive of exogenous insulin administration as the cause of death.

Suicide, Insulin, Insulin/ C-Peptide Ratio