



Criminalistics Section – 2010

A110 Errors Associated With Pipetting Warm and Cold Liquids

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After attending this presentation, attendees will have a greater understanding of how warm and cold reagents can unknowingly be under- or over-pipetted, respectively, with more error coming with smaller volumes.

The presentation will impact the forensic science community by shedding more light on how error can creep into a process, even at the pipetting stages.

The material presented herein discusses errors associated with pipetting warm or cold liquids when using typical, air displacement-based pipettes. Many common laboratory procedures require the handling and quantitative dispensing of reagents at various temperatures. Mechanical action micropipettes are most often used for this routine task. The construction of these pipettes, however, makes their performance susceptible to variations in temperatures of the samples dispensed. This susceptibility to thermal effects is reflected in pipette calibration standards (i.e., ISO 8655-6 and ASTM E1154), stipulating stringent control of temperatures ($20 \pm 0.5^\circ\text{C}$) during pipette calibration, and also requiring that all materials, including the liquids, be thermally equilibrated prior to the calibration. However, many common assay protocols require the dispensing of reagents that are not in the specified temperature equilibrium.

Two common examples are tissue culture applications, which employ reagents and buffers at 37°C , and assays with nucleic acid-based reagents at 4°C or lower. The work presented herein investigates the accuracy of micropipettes from three different manufacturers, in the most commonly used range of $2\ \mu\text{L}$ to $1000\ \mu\text{L}$, when used to pipette aqueous samples at various temperatures. The data showed that pipetting errors were more pronounced at the low volume ranges where the cold reagents were over-pipetted and the warm reagents were under-pipetted. **Pipetting Errors, Assay Errors, Confidence in Pipetting**