Comparison of Gravimetric Method with Checkit® Capillary Method for Measuring Dispensed Volumes in ALHS

NEXT ADVANCE
Innovative Lab Products for the Life Sciences

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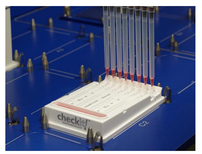
Overview

- Common methods to validate the accuracy of dispensed volumes in ALHS are gravimetric or colorimetric. These methods use indirect measurements, require calibrated consumables, strict environmental conditions, personnel training or capital investments.
- Checkit® Go capillary method bypasses the above limitations.
- Here, we compare the validation data obtained from gravimetric method as stipulated by ISO 23783 guidelines with Checkit®.
- The results confirm that the Checkit® method is comparable to the classical gravimetric method for validating the accuracy of dispensed volumes.
- Thus, Checkit® Go is COMPARABLE to the gravimetric method in validating the accuracy of ALHS, without the limitations of the common methods.

Introduction



Here we explore Checkit® for verifying ALHS volume accuracy as an easy, direct, and cost effective alternative to other methods.

Objective:

Compare Checkit® Go method with classic gravimetric method for validating the accuracy of dispensed volumes.

Methods

Environmental conditions followed as stipulated by ISO 23783:

	Range	Change During Test
Water Temperature	17℃ to 30℃	≤1℃
Air Temperature	17℃ to 30℃	≤3℃
Relative Humidity	45% to 70%	≤10%

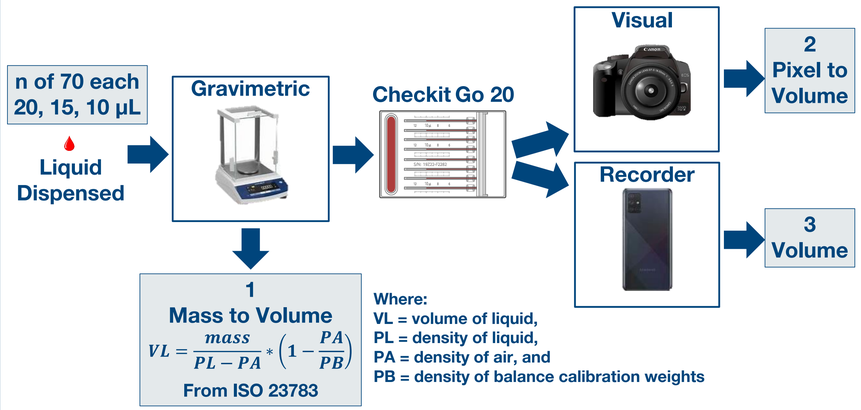
PART I: Density Calculations

- A red dye solution, as provided in the Checkit® Go kit, was prepared with lab dH_2O and its density was determined (n=10).
- The density of dH_2O was also calculated alongside the dye solution as the control group (n=10).

PART II: Capillary Volume

- Volume of individual glass capillaries used in Checkit® Go 20 was found using dH_2O and diluted red dye solution (n=10 each).
- The mean and SDs of the volumes were determined and a paired T-Test was performed to compare volumes between the groups.

PART III: Comparing Gravimetric Method and Checkit®



Where:
VL = volume of liquid,
PL = density of liquid,
PA = density of air, and
PB = density of balance calibration weights

- Volume measurements were compared using mean absolute percent errors (MAPE) [a measure of errors between paired observations of measurement techniques]

$$MAPE = \frac{Sum\ of\ Absolute\ Error}{sample\ size} * 100$$

Results

ISO 23783 guidelines were followed for each step of validation.

PART I: Density Calculations

- Calculated density of the red dye solution is COMPARABLE to lab dH_2O.

n=10	Density
Dye Solution	0.99354 g/mL
Distilled H_2O*	0.99351 g/mL

Published density of degassed H_2O: 0.998160 g/mL

PART II: Capillary Volume

- Volume calculation in the capillary tubes by gravimetric method is COMPARABLE to estimated theoretical volume.
- T-Test confirmed there was no significant difference in calculated volumes of dH_2O and red dye solution.

n=10	dH_2O	Diluted Red Dye Solution
Mean Volume by Dimensions (µL)	22.14	
Mean Volume by Density (µL)	22.20	22.20
Standard Deviation	0.08	0.07
Percent Error	0.24%	0.28%
p = 0.8426	α = 0.05	

PART III: Comparing Methods

- Both methods of determining dispensed volumes are COMPARABLE with MAPEs <1% in paired comparisons.
- Study will be continued with other Checkit® Go models along with a statistical analysis to determine data significance.

Mean Absolute Percent Errors			
Volume n=70	20 µL	15 µL	10 µL
Gravimetric vs Visual	0.93%	0.74%	0.74%
Gravimetric vs Recorder	0.98%	0.77%	0.92%
Visual vs Recorder	0.16%	0.25%	0.70%

Conclusion

Dispense volume validation by Checkit® Go is COMPARABLE to the gravimetric method.

In addition, Checkit® is easy to use, measures volumes directly, cost-effective, and independent of environmental factors.

Questions?

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Demo Checkit® Go at Booth 1259