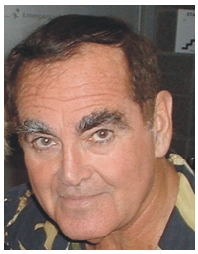
Differential Pipetting



OVERVIEW: What do our 12 SCIENCE section articles show about how our Differential Pipetting does from 20 µL down to 0.2 µL?

by Donald Schwartz, M.D., President and Scientific Director March 19, 2015

SCIENCE 1,2,4, 9 and 11 provide premium low-volume data in elegant studies that clarify some basic pipetting principles. The other articles compare our precision and accuracy with that of top conventional pipettors and describe some general handling characteristics.

The absence of outliers or missed aspirations is striking. Karen's 30 samples (Science 10) had no outliers and she said "*there were no missed or partial aspirations and I could see from the first few runs that precision was excellent and reported it as awesome*". Travis's picture-perfect 6 sets of 10 Differential Pipettor pipettings over the entire 0.75µL - 10µL range (Science 7) had no outlier. Both of George's Science 11 outliers had been in the two conventional reference pipettors, and when I asked his opinion of my draft of this Overview and he saw all the studies he seized on the common thread and said "*The absence of outliers is most important. That is where you get a result indicating that someone is pregnant when she isn't, or a false negative PSA or tumor marker and the physician doesn't do the follow on direct clinical exam he should have*". And "*Once the tech recognizes that outliers are virtually non-existent the whole pipetting task becomes easier and one is freed from the mental stress of keeping focussed and checking all the views and tips for missed or grossly short aspirations*", which also often leads to duplicate and triplicate practices. The absence of outliers or missed aspirations reflects greater stability than with conventional pipettors, owing much to the very rugged sealing. The large and husky seals of optimal material that are possible in the Differential Pipetting design are vastly more resistant to leaking or breaking seal, whereas conventional pipettors face the far more difficult challenge of sealing over the thin piston they are locked into. Many people look carefully at the tips after each aspiration and examine them to be sure that there is not a missed or short-sample, sometimes doing things in duplicate or triplicate to protect against this -- stressful, time-consuming and expensive things that are not needed with the Differential Pipettor. The absence of outliers reflected in these studies may actually be the most obvious testament to the superior core technology and overall performance.

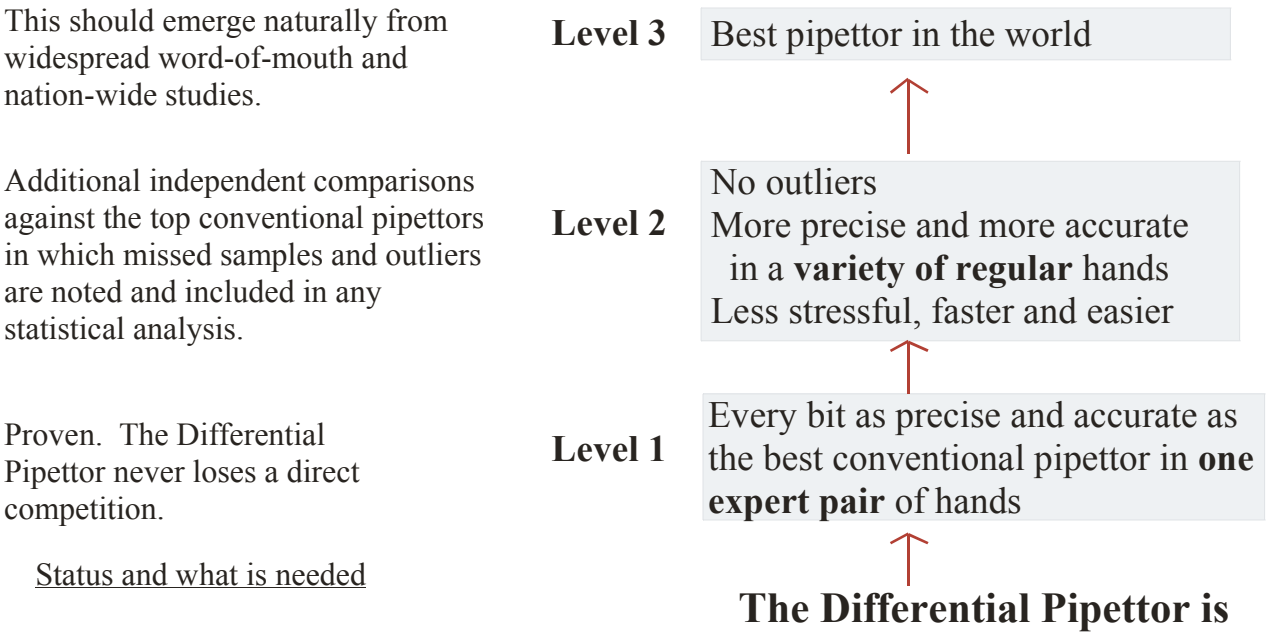
Precision matches the best-of-the-best. Typically, the expert pipetting person runs 10 - 15 pipettings with a familiar trusted conventional pipettor, and then 10-15 with a Differential Pipettor he never saw before and the precision comes out excellentand the same for both. It is quite striking to all involved to see this -- how the excellent Differential Pipettor precision fully matches the best-of-the-best reference pipettors in expert and familiar hands.

People find the unit easy to use. They readily get the hang of the unidirectional "downward-only" thumb movement and the contact-free point-and-push dispensing and prefer it to the more familiar bi-directional movement model that we give them to try. Ella (Science 6) says "*it was very efficient and faster*", Karen (Science 10) says "*the unidirectional unit came to feel very natural and is very fast and easy on the hand*" and George (Science 11) says "*the downward only movement ..... came readily to feel natural*".The lesser hand movement and greater speed outweigh any initial awkwardness in learning the movement. An informed smile literally tends to replace an initial puzzled look quite quickly.

The absolute volume levels, reflecting accuracy, may differ a little from a reference unit because of different calibration procedures. But the main differences, particularly at the smallest volumes, come from tip external "wickoff" and other phenomena from conventional touchoff-and-drag delivery, and we believe the contact-free Differential Pipettor values are more accurate. See SCIENCE 1,4 and 9.

On top of the rugged sealing, the long stroke from the differential displacement contributes to the precision. Another major reason is that the contact-free dispensing does not require careful user technique. Dispensing with conventional pipettors usually requires contacting the delivery site, typically with "touchoff-and-drag", a technique for the low µL levels that is very user dependent and introduces variation in results between different users. It seems to have been obvious to the people who participated in the SCIENCE studies that the Differential Pipettor dispensing was not only simple but involved little if any technique. For example, George (Science 11) said "*the point-and-push for contact-free delivery probably reduces user technique variability inherent to conventional pipettor touch-based dispensing*", and Travis and I concurred (Science 7) that "*if many different people were using this in different environments, the absolute values and precision would therefore be expected to* ***come out tighter*** *than with conventional pipettors on the basis of dispensing alone....*". For example, an expert pipetting person with a trusted top quality conventional pipettor can indeed pipet 1 µL with under 2% CV, just like the manufacturer's specifications for that unit say (SCIENCE 7 runs 7 and 10), and just like we can with Differential Pipetting. But entrust that task to several different pipetting people (all of whom are not necessarily expert) and their results will probably range between 2% and 10% with a regular pipettor, but they should all be under 2% CV with the Differential Pipettor. Several people involved in these and other studies have asserted to me that user technique variation is built in to conventional pipetting techniques and that it is indeed logical that the differential pipettor should give much tighter results -- "more accurate and more precise in a variety of hands".

The SCIENCE series data and reports support that we are on Level 1 and indicate that we are moving through Level 2. Confirmation of Level 2 will set a course to recognition of Level 3.



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