



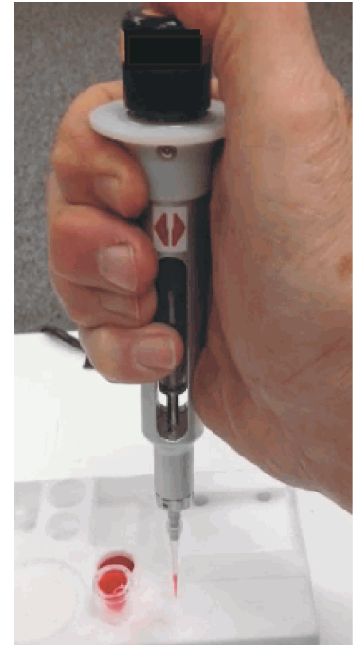
Differential Pipetting

Whitehead Institute Ploegh Lab study shows that the new Differential Pipettor delivers 20 μL *contact-free* as precisely and accurately as its trusted Gilson P20 Pipetman does with its touchoff-and-drag dispense.

by Donald Schwartz, M.D., President and Scientific Director






1/21/2015 R1/8/2016

I showed the Differential Pipettor to Hidde Ploegh to see if his lab could use its unique capabilities for tiny volume pipetting with contact-free dispensing. After an inauspicious start, he focussed on a Fixed Volume unit in its inner core aluminum sleeve form, without the molded handle (to the right). The core mechanism in this model is not only visible but also lightly touchable during operation to tout its ruggedness. Hidde took this core unit and did several pipettings of about 1 μL , likely running the mechanism real time in his mind's eye, and said "*its cool*". I don't know if the "its cool" pronouncement also reflected the pleasing thermal cooling feel of the aluminum, but the term struck me as so very apt that we added it to our brochure.



Hidde turned it over to his Lab Manager, Robert Miller, to see what they might make of it. Robert bought two units (regular molded handle models), paid for them in 7 days (without taking the 2% discount) and enlisted Florian Schmidt ("Flo"), a post-doctoral fellow very experienced in pipetting, to do an initial comparison study. The study that followed is, I believe, the first quantitative back-to-back 20 μL comparison between our Differential Pipettor™ and a premium conventional reference standard pipettor that was done outside of our facility by other hands.

MATERIALS and METHODS: We decided to start at the high, 20 μL volume end. Flo selected a Gilson P20 Pipetman with disposable USA Scientific TipONE 1-200 μL filter tips, a system he knew well, as the trusted reference pipettor. The challenger was our adjustable 2-20 μL model Differential Pipettor DP20 with its LS3 Little Squirt tips, which Flo had never used before. Volume measurements were made by the Artel PCS Pipette Calibration System, a ratiometric photometry method. Flo dispensed the aspirated dye sample with the Gilson P20 Pipetman by carefully touching the tip to the inside wall of the PCS vial at an angle and dragging away during dispensing (per standard good touchoff dispensing practices and PCS instructions). He dispensed the aspirated dye sample with the Differential Pipettor by pointing the tip towards the center of the vial and blowing the sample off (from no particular height) without any contact between the tip and the vial wall or vial liquid. Measurements were done in quick succession, the PCS printing out real time statistics at the end of each run.

| Run # | 1 | 2 | 3 | 4 | 5 |
|----------------------------------|---|---|--|---|---|
| Time | 14:13 | 14:37 | 14:44 | 14:50 | 14:55 |
| Operator | Flo | Flo | Flo | Flo | Flo |
| Pipettor | Pipetman P20 | Differential Pipettor DP20 | Pipetman P20 | Differential Pipettor DP20 | Differential Pipettor DP20 |
| Tip | TipONE | LS3 | TipONE | LS3 | LS3 |
| Dispensing method | Touchoff and-Drag | Contact-free Blastoff | Touchoff and-Drag | Contact-free Blast off | Contact-free Blastoff |
| |  |  |  |  |  |
| Mean Volume | 19.87 uL | 19.54 µL | 19.93 µL | 19.54 µL | 19.99 µL |
| Absolute Inaccuracy | -0.13 µL | -0.46 µL | -0.07 µL | -0.46 µL | -0.01 µL |
| Relative Inaccuracy | -0.63 % | -2.31 % | -0.37 % | -2.29 % | -0.07 % |
| Standard deviation | 0.059 uL | 0.043 µL | 0.036 µL | 0.027 µL | 0.038 µL |
| % CV precision | 0.30 % | 0.22 % | 0.18 % | 0.14% | 0.19% |
| Temperature deg C | 21.4 C | 22.4 C | 22.6 C | 22.8 C | 23.0 C |
| Total points run | 12 | 12 | 10 | 10 | 18 |
| Outside 2SD outliers discarded | 0 | 0 | 1 | 0 | 0 |
| Points used in final calculation | 12 | 12 | 9 | 10 | 18 |

RESULTS and DISCUSSION: Performance of both pipettors was great. At the end of Run 4, the PCS printouts showed that the identical Differential Pipettor mean volumes in runs 2 and 4 were 0.46 µL lower than the target 20 µL, so the volume adjustment knob was turned up a tad less than 1/4 turn (resolution being 2 µL/turn) for a final 5th run, which gave substantially perfect accuracy. One might get the impression that the Pipetman P20 was a bit more accurate and the Differential Pipettor a bit more precise, but statistically the data only shows that the precision and accuracy of both pipettors is excellent and substantially the same. Very importantly, an experienced pipetting person -- using a top-of-the-line conventional pipettor and tips with which he was very familiar -- got fully comparable precision and accuracy with a new Differential Pipettor that he had never seen before and which delivered contact-free.

ACKNOWLEDGMENTS and CREDITS: I thank Hidde Ploegh, Director of the Ploegh Lab at the Whitehead Institute, for graciously affording us this opportunity, and thank Robert Miller and Florian Schmidt. PCS® is a registered trademark of Artel, Inc. 25 Bradley Drive, Westbrook, Maine. Differential Pipettor™, Differential Pipetting™, Blastoff™ and Little Squirt™ are trademarks of Differential Pipetting, Inc. Pipetman® is a registered trademark of Gilson S.A.S. TipONE® is a registered trademark of USA Scientific.