

Automation Low Retention Tips

Comparison of low retention (LR) tips via a simple and fast gravimetric method

Abstract

Thermo Scientific Low Retention (LR) tips are specifically designed for applications requiring high accuracy and reproducibility. The delivery of highly viscous liquids with a standard polypropylene tip tends to be problematic because a significant amount of residual liquid typically remains in the tip after dispensing the liquid. This application note illustrates the comparison of multiple manufacturers' LR tips vs. non-LR tips while handling a viscous solution. The data demonstrates that the Thermo Fisher LR tips retained less volume compared to other manufacturers' LR tips and non-LR tips.

Introduction

In many molecular biological applications, the increased level of sensitivity of the detection and quantification methods call for extreme reliability and reproducibility of pipetting viscous samples. In DNA and protein analysis methods, the reagents and the samples often contain detergents. Pipetting liquids that contain detergents can be problematic during aspiration of standard tips. It is common for residues of liquid to remain in the tip due to the difference in the surface tension between the samples and the plastic tips. This systematic loss of sample significantly contributes to the variability in complex reactions such as PCR, RT-PCR, and DNA sequencing, along with loss of valuable samples and expensive reagents.

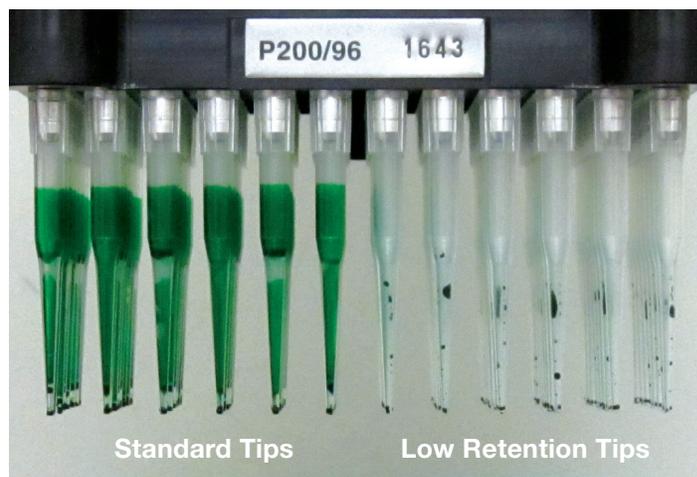


Figure 1: Biomek FX 96 channel head with 250uL tips. The low retention on the right has virtually no sample left behind while the standard tip on the left has a comparable amount of sample retained within.

Thermo Scientific LR tips are designed to address the aforementioned liquid handling problems. These tips are more hydrophobic than standard tips, further reducing surface tension and consequently enabling more accurate and precise pipetting.

Furthermore, unlike other LR technologies that are employed in the market, our approach has proven to be non-leaching and thus suitable for molecular biology use. Thermo Scientific LR tips retain half of the residual liquid compared to competitor products.

Materials

- Four 250µl tips were tested:
 - P/N: 919-262 (standard 250µl Thermo Scientific tip)
 - P/N: 919-262-05 (LR 250µl Thermo Scientific tip)
 - Manufacturer A (LR)
 - Manufacturer B (LR)
- A Beckman Biomek FX with 96 Channel pipetting head.
- Green food dye (for illustrative purposes).
- Weighing scale capable of weighing in grams with resolution of 0.0001.

Method

Gravimetric testing was used to measure the liquid residue remaining in the LR and non-LR tips from Thermo Scientific and two competitors, after dispensing 200µL of green food dye.

- Weigh all tips on scale and record mass in grams. This is the “DRY” mass of the tips.
- With 96-channel head on the Biomek FX instrument, aspirate green dye and then dispense the dye completely ensuring that you use the blow out feature on your instrument. Volume to aspirate will be the maximum volume considered normal for the part number and must also match the volume used from establishing the non-LR standard.
- Weight all the tips together, record value. This is the “WET” mass of the tips.
- Calculate the percent retention as follows:
 - Average retained mass per rack:

$$\frac{\text{Total WET mass} - \text{Total DRY mass}}{\text{Number of Racks}}$$

- Percent (%) Retention:

$$\frac{\text{Avg. retained mass per rack of LR tip} \times 100}{\text{Avg. retained mass per rack of non-LR tip}}$$

Results

Comparison of Residual Liquid Amounts

The performance of low retention tips made by two other manufacturers was compared with the Thermo Fisher’s low retention and non-low retention tips. 200µl of the green food coloring dye was pipetted using the 96-channel head in a Biomek FX. The remaining liquid amount in the tips after dispensing was measured by a gravimetric method. The test was repeated with 5 racks of the 96 tips/rack with two other manufacturers.

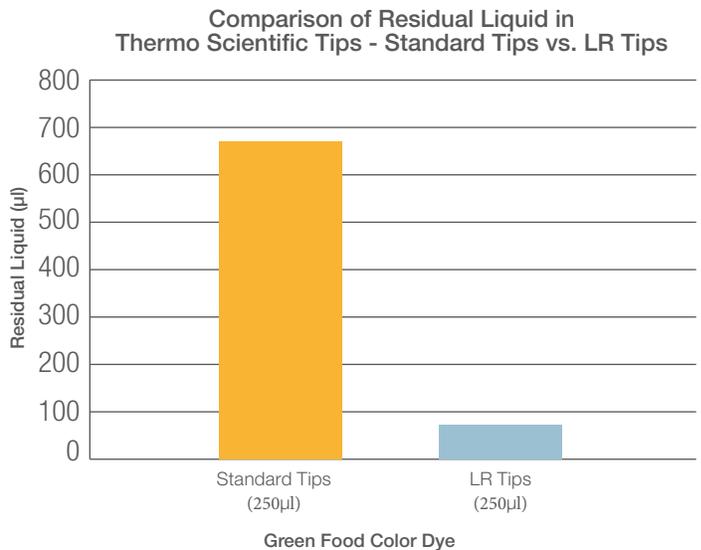


Fig 2: Gravimetric Test Method was applied to calculate the average residual volume with Thermo Scientific standard vs. Thermo Scientific LR tips.

Comparison of Percent (%) Retention in Thermo Scientific LR Tip vs. Man. A LR Tip vs. Man. B LR

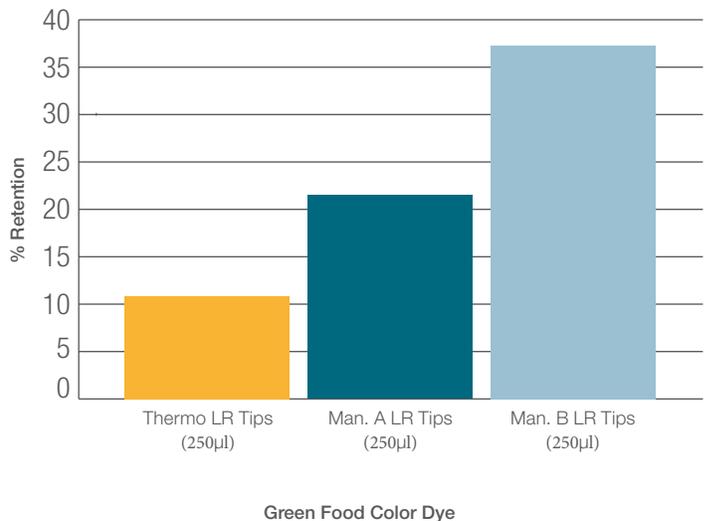


Fig 3: Percent Retention here demonstrates that Thermo Scientific tips outperform the competition.

Conclusion

The Thermo Scientific low retention tips retained the least amount of residue, by 10% over Manufacturer A and by 25% for Manufacturer B. The test results also show that the LR tips clearly reduce the liquid residue in the tips, by 90%. Thus, the use of the Thermo Fisher LR tips resulted in the better pipetting reproducibility, supporting benefits of these tips in molecular biology applications.

Ordering Information

Automation pipette tip made to fit the Beckman automated liquid handling systems		
Beckman	Packaging	Product Code
20µL Clear, Sterile, ART Filtered, LR	96 Tips/Rack, 10 Racks/Pack, 5 Packs/Case	918-021-05
20µL Clear, Sterile, LR	96 Tips/Rack, 10 Racks/Pack, 5 Packs/Case	918-261-05
20µL Clear, Non-Sterile, LR	96 Tips/Rack, 10 Racks/Pack, 5 Packs/Case	918-262-05
50µL Clear, Non-Sterile, LR	96 Tips/Rack, 10 Racks/Pack, 5 Packs/Case	916-262-05
130µL Clear, Sterile, ART Filtered LR	96 Tips/Rack, 10 Racks/Pack, 5 Packs/Case	919-021-05
250µL Clear, Sterile, LR	96 Tips/Rack, 10 Racks/Pack, 5 Packs/Case	919-261-05
250µL Clear, Non-Sterile, LR	96 Tips/Rack, 10 Racks/Pack, 5 Packs/Case	919-262-05

In the United States:

For customer service, call 1-800-766-7000
 To fax an order, use 1-800-926-1166
 To order online: thermofisher.com

In Canada:

For customer service, call 1-800-234-7437
 To fax an order, use 1-800-463-2996
 To order online: thermofisher.ca

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