Quantifying and comparing the flexibility of inoculating loops

Introduction

Inoculating loops are crucial tools in microbiology. These tools have calibrated loops at the ends, and they are used for inoculation, serial dilution, plating, transferring, and more. While a metal inoculating loop flamed for sterilization was the previous standard, sterile single-use plastics now offer an alternative to meet various needs. These single-use inoculating loops are available in both flexible and rigid forms and help reduce the risk of cross-contamination. Depending on the application, a scientist might need a more flexible or more rigid inoculating loop. For example, during streaking, a less rigid, more flexible inoculating loop can be helpful to ensure complete coverage of the agar plate while having a lower risk of scraping the surface. A more rigid inoculating loop, on the other hand, can be more helpful with stabs or when picking colonies. While an individual's technique may vary, fully understanding the tools available is helpful in selecting the right one for the job. How does a rigid single-use plastic inoculating loop differ from one that is flexible? To answer this question, the flexibility of inoculating loops of two different sizes was determined.

Methods

A pack each of single-sided inoculating loops of 1 µL and 10 µL sizes, both rigid and flexible, from brands A and B, were tested. Figure 1 shows a representation of the top part of each size of loop. Using an Instron™ 3366 tensile tester, a compression analysis was conducted along the top face of each loop with an applied load that did not exceed the inoculating loop's material yield strength. The Instron 3366 device's head fixture was lowered onto the loop until the visual deflection represented a real-world application of an inoculating loop deflection. This force was then applied to all loops individually, and the displacement was measured. Since the main concern was how the flexible loop compared to the rigid loop, a percent difference was used for comparison rather than the actual full displacement. The percent difference was calculated using the averages of the measured displacements for both rigid and flexible loops.

Figure 1. Representation of the top part of 10 µL and 1 µL inoculating loops.

Results

The flexible and rigid forms of the inoculating loops were compared by calculating the percent difference in displacement when an equivalent force was applied to each loop (Table 1). With brand A, both 1 µL and 10 µL sizes had a small difference (29.0% and 22.4%, respectively) between flexible and rigid versions. With brand B, the two differently sized loops had a larger difference: 32.1% for the 1 µL loop and 41.0% for the 10 µL loop. The differences for brand B are also larger than those of brand A.

To further examine the data, the displacement distributions were plotted and fitted to a Gaussian distribution (Figure 2). As expected, the flexible loops show a larger displacement. Interestingly, brand A in both sizes shows a large overlap between the flexible and rigid loops. The brand B 10 µL inoculating loop also has significant overlap between flexible and rigid versions. This means when using a flexible brand A inoculating loop of either size or a 10 µL brand B loop, there is a higher probability of it having more rigid characteristics (i.e., there is less distinction between the flexible and rigid versions). This is different for the 1 µL loop from brand B where the flexible and rigid loops have a greater difference, providing a bigger distinction between the flexible and rigid options. Brand A, on the other hand, provides greater consistency between the flexible and rigid inoculating loops. The displacement data were also compared between the different brands. As seen in Figure 3, the brand A flexible loop is more rigid than the brand B rigid loop. This is true for both sizes of inoculating loop.

Table 1. Difference in displacement between flexible and rigid inoculating loops in 1 µL and 10 µL sizes for brands A and B.

Brand	1 µL	10 µL
A	29.0%	22.4%
B	32.1%	41.0%

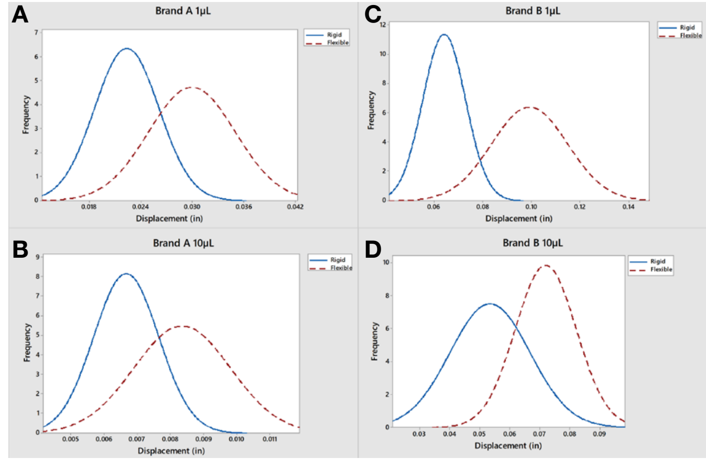


Figure 2. Displacement histograms for 1 µL and 10 µL inoculating loops from brand A (A, B) and 1 µL and 10 µL inoculating loops from brand B (C, D). In all cases, the data for the rigid inoculating loop are shown in blue and for the flexible inoculating loop in red.

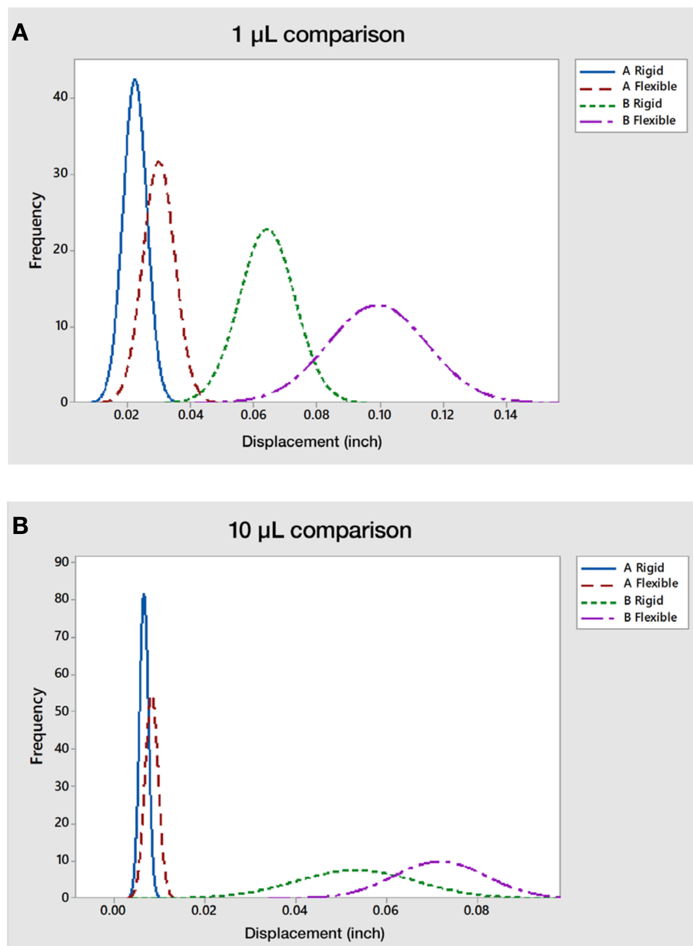
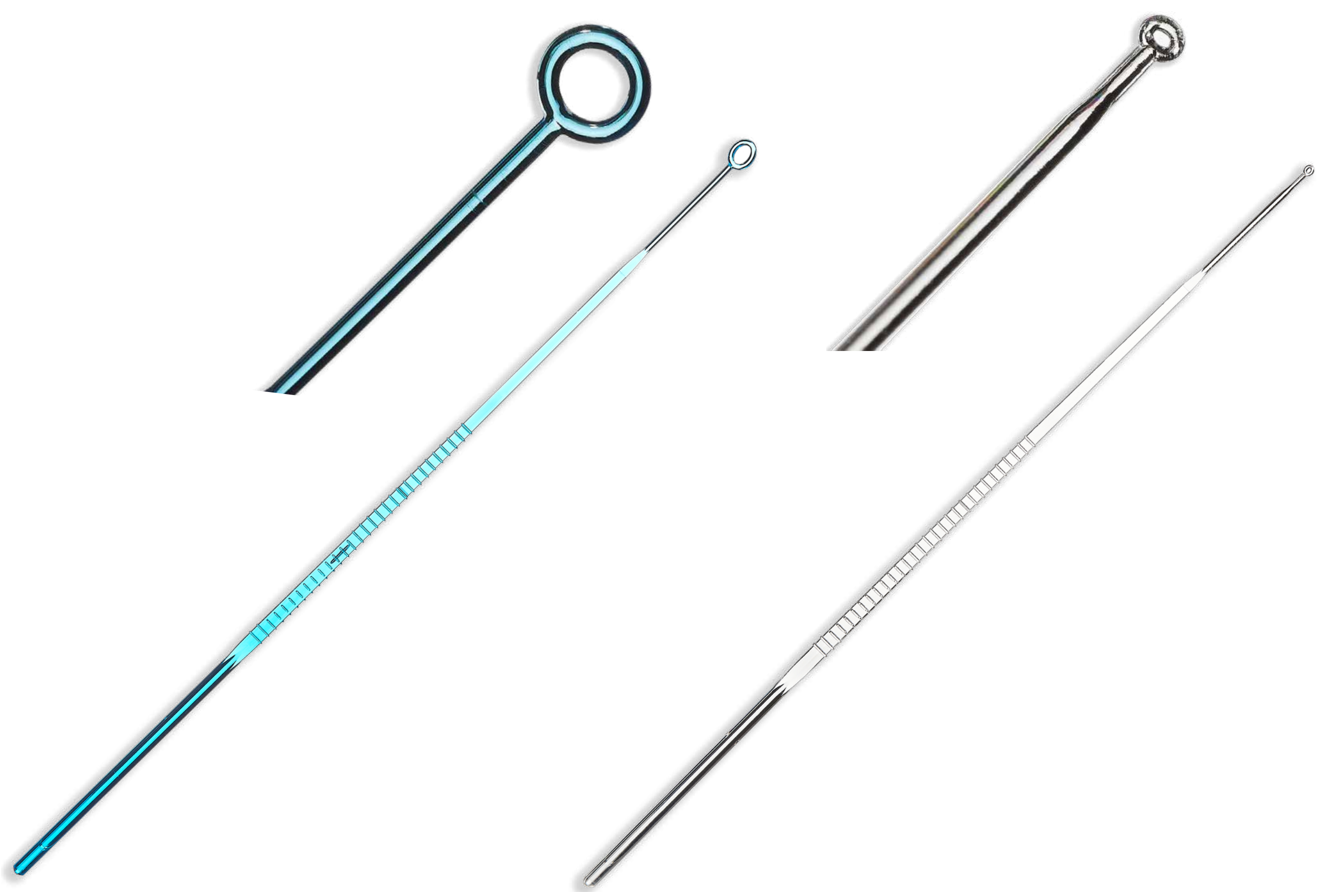


Figure 3. Displacement histograms for (A) 1 µL inoculating loops and (B) 10 µL inoculating loops. The closer to zero, the more rigid the inoculating loop.

Conclusion

To better understand the tools available for inoculation, flexibility versus rigidity was quantified for 1 and 10 µL inoculating loops from two different brands. What is meant by a "flexible inoculating loop" was quantified in two ways: 1) by measuring the average displacement and comparing the percent difference between rigid and flexible loops, and 2) by comparing the distribution of the displacement data. Whether based on the application or user preference, these collective data should be considered when attempting to find the right tool. Thermo Fisher Scientific offers a variety of choices that demonstrate the various options in the amount of flexibility one may need, as shown in this study. For more information or questions on your options, please contact your commercial representative at **thermofisher.com**.



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