

# How reliable are Matrix ScrewTop Tubes for sample identification?

Results from a study show that Thermo Scientific™ Matrix™ ScrewTop Tubes have robust 2D barcodes with high readability grades to enable the successful reading and identification of samples.

## Background

Ensuring that samples will be identifiable when retrieved after months or years is a critical consideration for sample storage. 2D barcodes provide an effective method to track samples and other associated information. The readability of 2D barcodes contributes to sample credibility. Barcode grading is a measure that predicts future 2D barcode readability with different types of scanners. Poor-quality barcodes may be readable under ideal conditions (e.g., excellent lighting), but there is no assurance that the codes will be readable at different stages of sample management or after samples are retrieved from storage. Barcode grading establishes a baseline for quality that greatly improves the chances of successful barcode reading and sample identification in a variety of environmental conditions.

The readability of the 2D barcodes contributes to sample credibility; unreadable samples cannot be verified and lose traceability. Matrix ScrewTop Tubes are imprinted with 2D barcodes using laser-etching technology (Figure 1). To test the robustness of barcodes, we designed a study to examine the traceability of the 2D barcode. Matrix ScrewTop Tubes and tubes from four other suppliers were tested before and after multiple cryogenic freezing and thawing cycles, which were used to induce stress on the barcodes.

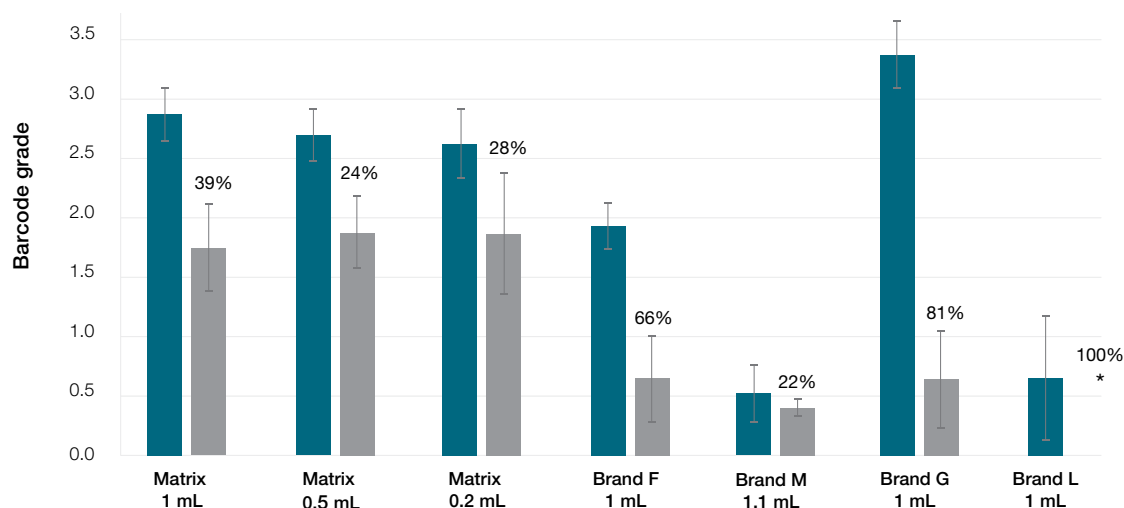


**Figure 1. Matrix ScrewTop Tube showing the bottom of the tube with a three-layer laser-etched 2D barcode.**

## Study design

To evaluate the 2D barcodes, 336 Matrix ScrewTop Tubes and 112 cryovials from four other suppliers were graded using an Omron LVS-9580 Handheld Barcode Verifier (Hoffman Estates, IL).

The barcode verifier grades 2D barcodes with overall grades of 0 to 4, based on multiple measurements, including contrast, shade consistency, and shape. For this study, the baseline readability of the 2D barcodes was graded before subjecting the tubes to cryogenic freezing conditions. The cryovials were then frozen at  $-176^{\circ}\text{C}$  for at least 24 hours and then thawed to room temperature. Freeze/thaw cycles were repeated a total of 15 times, and the 2D barcodes were graded again at the end of the cryogenic cycles for a total of 2 readability tests: one before 15 freeze/thaw cycles and one after the last cycle.



**Figure 2. Comparison of average barcode readability across different brands of storage tubes, before (teal) and after (gray) 15 cryogenic freeze/thaw cycles.** The percentages indicate depreciation in readability grades. The asterisk indicates that the barcode readability average was 0. The error bars represent standard deviation.

## Results and conclusions

The results of the study show that the Matrix ScrewTop Tubes are superior in barcode readability to equivalent tubes from other suppliers. All of the Matrix tubes start with higher readability grades than three alternative brands, and after 15 cryogenic freeze/thaw cycles they remain highly readable (Figure 2). Selecting tubes with high-quality and high barcode grades should be a key consideration when determining the suitability of storage tubes for your samples.



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