Innate Errors of Quantitative Streaking Methodologies

The objective of this study was to assess the variability of quantitative streaking between and within groups of laboratory professionals, students, and an automated spiral plater. In today's clinical laboratories, advances in technology present an ever-changing landscape that mandates adaptations and the microbiology lab is no exception. Despite these advancements, one of the most quintessential manual techniques employed by laboratory professionals and taught to clinical laboratory science and technician students is quantitative streaking of bacterial cultures. Although few, there are studies detailing the accuracy of a 0.001 mL calibrated loop, perhaps the most common tool for quantitative streaking; however, there has been a lack of work addressing the variability associated with laboratory personnel's individual techniques and inherent variability. Our study analyzed the number of bacterial colony forming units (CFU)/mL that resulted from sequential plating by our control groups and automatic spiral plater from a common sample. The sample was a dilution of bacteria in saline from an initial 0.5 McFarland standard (approximation of $1.5x10^8$ CFU/mL). Preliminary data indicates that in most instances there were significant differences seen (via ANOVA and Tukey post hoc tests; $p \leq 0.05$) within the test groups and considerable variations within each individual's plating results (measured by coefficient of variation) for both the gram-positive and gram-negative organism dilutions tested, *Staphylococcus aureus* and *Escherichia coli*, respectively. While this result is not unexpected, our work also shows that there are manual streaking procedural changes that more closely mimic the results obtained by our automated plating, circumventing potential lab budgetary constraints with purchasing automated platers. Collectively, our data demonstrates that manual quantitative streaking protocols are an area of the clinical microbiology lab that should be regularly assessed for quality control to ensure accuracy and reproducibility between laboratory professionals.