Abstract for BPI East 2022

Large-batch consistency evaluation of cell counting instruments used in cell therapy applications

Carolina Franco Nitta, Jordan Bell, Yongyang Huang, and Leo Li-Ying Chan

Cell therapy has been hailed as a medical revolution, and its rise has only increased the importance of accuracy and precision in cell counting. Ensuring the identity, purity, and viability of cell therapy products is critical for increasing efficacy and avoiding potential harmful side effects. A significant portion of this burden now rests on sample analysis by automated cell counters. As cell therapies move from experimentation to production, the need is growing for higher consistency in cell counting instrumentation. Confidence in a particular cell counting method is reduced if several "identical" instruments disagree on the cell concentration and viability for a single given sample. Such comparison among several instruments is rarely done largely due to logistical challenges. Instead, measurements are usually collected on a single instrument and taken at face value, running the risk of discrepancy if a process is scaled up to a new instrument. Here we compare two distinct cell counting instruments, both capable of brightfield and fluorescence imaging and growing in adoption among the cell therapy community. The Cellometer K2 is a well-established single-sample counter utilizing disposable slides and the Cellaca MX is a relatively new high-throughput cell counter designed for integration into automated workflows . We investigated the consistency between a cell counter mostly used in an R&D setting compared to a high-throughput counter used in manufacturing. To compare a large pool of instruments, we used fluorescent beads embedded in a cured polymer using 2 or 6 different concentrations (single-sample and high-throughput counter, respectively). These fluorescent beads are stable and resistant to photobleaching, making them ideal for this longitudinal study comparing 58 Cellometer K2 instruments and 40 Cellaca MX instruments over a period of more than a year. Results showed reliable consistency among cell counters, both within groups of similar as well as distinct instrument types. Fluorescent bead counting on the Cellaca MX and Cellometer K2 gave inter-instrument CVs of less than 2%. We also found that, on average, there is a 2.5% difference between instrument types. Our work here describes a novel experimental procedure that is suitable for comparing multiple cell counting methods. This reliable consistency between instruments tested here encourages optimism for "future-proof" assays that can survive the transition from single-sample R&D testing to high-throughput manufacturing with minimal adjustment.