Obtaining Consistent and Accurate Cell Counting Results with Cellometer® Automatic Cell Counters

Bo Lin, Timothy Smith, Alnoor Pirani, Jean Qi, and Peter Li
Nexcelom Bioscience LLC 360 Merrimack Street, Building 9, Lawrence MA 01843

Abstract

Technology

Cellometer automatic cell counters include a compact instrument with advanced imaging-based cell counting software, which automatically and accurately counts cells and measures cell concentration, viability, and cell size. The imaging system, combined with a sophisticated image analysis algorithm, is designed to eliminate tedious manual cell counting processes. In comparison with traditional hemocytometers, we found that there is high correlation for measuring cell concentration and trypan blue viability between Cellometer automatic cell counters and traditional hemocytometers. Experimental results indicated that Cellometer Vision can be used to accurately count clumpy cells and irregularly shaped cells. With proprietary algorithms, the system can specifically analyze sub-populations of cells from heterogeneous biological samples and eliminate cell/tissue debris by size and shape exclusion. We also developed the Cellometer Vision system to perform a quantitative analysis of cell size. By using the plastic disposable counting chamber, all washing steps can be eliminated.

Fluorophores and fluorescing proteins have been widely applied in cell-based assays. The fluorescence signals are used as a readout to monitor cell proliferation, differentiation, toxicology, morphology, etc. To quantitatively analyze fluorescent cells, researchers have to utilize a calibrated flow cytometer. However, in addition to the complexity, cost and availability limitations, flow cytometers are often not the best solution for cell population analysis due to the potential of complex sample clogging in the flow system. Hence, we developed an imaging-based automation system, which we called Cellometer Vision. The system can be applied to various cell samples and eliminate cell/tissue debris by size and shape exclusion. Sophisticated algorithms were developed to process cell sample images. More than 300 different type of cells have been studied on Cellometer Vision. By using the plastic disposable counting chamber, all washing steps can be eliminated.

Cellometer Applications

In the experiments, we demonstrated how to use the Cellometer Vision system to automatically count cell concentration, viability, and cell size. The system can be applied to various cell samples and eliminate cell/tissue debris by size and shape exclusion. Sophisticated algorithms were developed to process cell sample images. More than 300 different type of cells have been studied on Cellometer Vision. By using the plastic disposable counting chamber, all washing steps can be eliminated.

More Applications

Summary

Experimental results shown here indicate that the non-flow, image based Cellometer automatic cell counter can be used to replace manual hemocytometers to rapidly and accurately measure cell concentration, viability, and cell size using just 20 µl of cell sample in less than 30 seconds. By using the plastic disposable counting chamber, all washing steps can be eliminated.

Sophisticated algorithms were developed to process cell sample images. More than 300 different types of cells have been counted on Cellometer systems. Utilizing the user friendly software interface, researchers can also be applied to quantitatively determine cell population cell concentration from heterogeneous biological samples, such as PBMC from plated peripheral background, primary adipocytes from lipid droplets, etc.

Cellometer Vision can be applied to various cell sample analyses and fluorescent cell-based assays. Multiple fluorescent filters are available for detecting commonly used fluorophores or fluorescent proteins.

In conclusion, Cellometer automatic cell counting systems provide a novel tool to standardize cell counting processes consequently eliminating variations inherent in manual cell counting methods used in cell-based assays today.