Novel method for quantifying cells on carriers and its demonstration during SARS-2 vaccine development

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Abstract

The most effective way to prevent and control infectious disease outbreak is through vaccines. The increasing use of vaccines has elevated the need to establish new manufacturing strategies. One of the major approaches is cell-based production, which creates a need for high cell density to enable higher cell production levels. This has led to development of the technology of cell carriers, including micro and macro cell carriers. To follow the production process, quantifying the number of cells on these carriers is required, as well as the tracking of their viability and proliferation. However, owing to various carriers' unique structures, tracking the cell's is challenging using current traditional assays that were originally developed for monolayers of adherent cells. The current "gold standard" method is counting cell nuclei, separating cells from the carrier, staining with crystal violet and visually counting under a microscope. This method is tedious and counts both live and dead cells. A few other techniques were developed but were specific to the carrier type and involved specialized equipment. In this study, we describe a broadly ranging method for counting cells on carriers that was developed and employed as part of the production of a vaccine for use in the SARS-CoV-2 pandemic. The method is based on the Alamar blue dye, a well-known, common marker for cell activity, and was found to be successful in tracking cell adsorption, cell growth and viability on carriers. No separation of the cells from the carriers is needed, nor is any specialized equipment; the method is simple and rapid, and provides comprehensive details necessary for process control of viral vaccine production in cells. This method can be easily implemented in any of a number of cell-based processes and other unique platforms for measuring growth of encapsulated cells.

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