Zika Virus Neutralization Using Laser Force Cytology™

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LumaCyte®

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Introduction

The quantification of viral infectivity, that is, the number of infectious viral particles per unit volume, is an essential step at various points in studies of the mechanism of viral infection, vaccine development, vaccine efficacy testing, virally-driven recombinant protein production, and anti-viral compound development and testing. For each of these processes, the rapid and accurate determination of viral infectivity can yield important information about virus-cell interactions, improve the product under development, and reduce costs while speeding development.

Laser Force Cytology™ (LFC) uses a combination of optical pressure and microfluidics to interrogate the biophysical properties of individual cells, while at the same time taking high resolution video of each cell. Using this type of data to quickly and cost effectively detect viral infection is incredibly valuable for process development, optimization / scale-up, and functional assays. Changes in biochemistry (compositional changes in the cytoplasm, for example), cellular morphology, cytopathic effects, or the development of viral inclusion bodies give rise to measurable differences in cells, which can be rapidly quantified. This capability gives LFC many advantages over other detection technologies for the rapid measurement of viral infectivity.

Experimental Results

Viral infectivity-based applications benefit greatly from the automation, data quality, and speed of LFC provided by LumaCyte's Radiance® Instrument. It is highly effective in several areas including: (1) Viral infectivity assays – measuring the number of infectious particles in a sample, (2) Neutralization assays – determining the ability of an antibody or serum sample to reduce or prevent infection, and (3) Anti-viral compound screening. When evaluating compounds for their anti-viral properties, a functional test is critical for understanding the mechanism and quantitating the effect of the anti-viral molecules being studied. With LFC, the time to detection is much shorter than with other methods. Additional benefits include reduced labor, fewer dilutions, and minimal reagent or antibody requirements, which is especially important for new and emerging threats as reagents might not be available.

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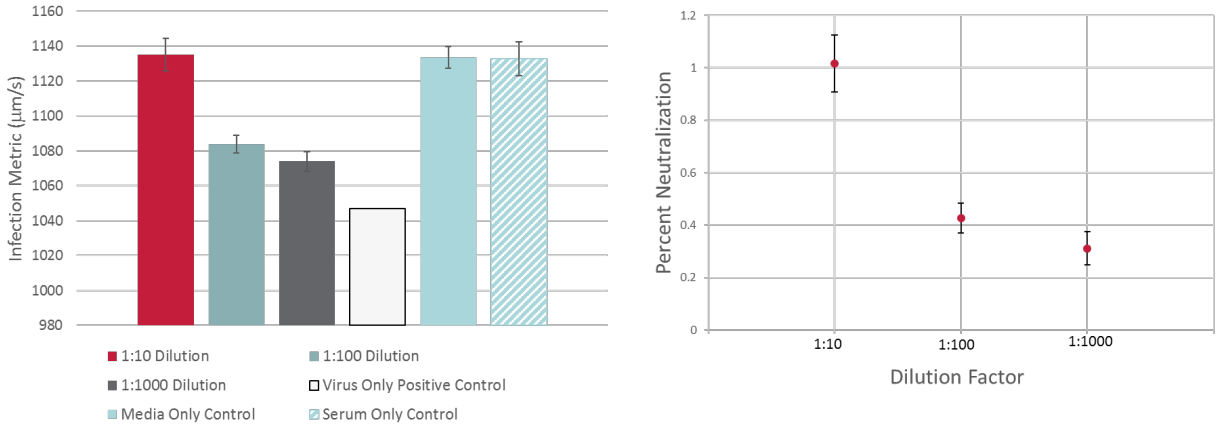

Figure 1: Zika Virus neutralization data using serum with a known neutralizing antibody. The bar graph shows the Radiance Infection Metric for 3 dilutions of serum compared to a Virus Only control (0% neutralization) as well as both Media Only and Serum Only controls (100% neutralization). The scatter plot shows a neutralization curve calculated from the data.

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