Proceedings of SPIE 10501, Optical Diagnostics and Sensing XVIII: Toward Point-of-Care Diagnostics, 105011G, February 2018, San Francisco, California, United States

DOI: 10.1117/12.2290168

Label-free detection of HIV-1 infected cells via integration of optical tweezers and photoluminescence spectroscopy

Lugongolo, Masixole Y
Ombinda-Lemboumba, Saturnin
Noto LN
Maaza M
Mthunzi-Kufa, Patience

ABSTRACT:

The human immunodeficiency virus-1 (HIV-1) is currently detected using conventional qualitative and quantitative tests to determine the presence or absence of HIV in blood samples. However, the approach of these tests detects the presence of either viral antibodies or viral RNA that require labelling which may be costly, sophisticated and time consuming. A label-free approach of detecting the presence of HIV is therefore desirable. Of note optical tweezers can be coupled with other technologies including spectroscopy, which also investigates light-matter interactions. For example, coupling of optical tweezers with luminescence spectroscopy techniques has emerged as a powerful tool in biology for micro-manipulation, detection and analysis of individual cells. Integration of optical techniques has enabled studying biological particles in a label-free manner, whilst detecting functional groups and other essential molecules within mixed populations of cells. In the current study, an optical trapping system coupled to luminescence spectroscopy was utilised to detect the presence of HIV infection in TZM-bl cells in vitro. This was performed by infecting TZM-bl cells with the ZM53 HIV-1 pseudovirus, and incubating them for 48 hours prior analysis. The differences between infected and uninfected cells were thereafter displayed as shown by the spectrographs obtained. Combination of these two techniques has a potential in the field of infectious disease diagnostics.