Photo-translocation of anti-HIV-1 drugs into TZM-bl Cells

Thulile Khanyile[1] Maria Papathanasopoulos[2] Andrew Forbes[1] and Patience Mthunzi[1*]
1. National Laser Centre, Council for Scientific and Industrial Research, PO Box 395 Pretoria, 0001 South Africa.
2. HIV Pathogenesis Research Laboratory, Department of Molecular Medicine and Haematology, University of the Witwatersrand Medical School, Parktown, Johannesburg, South Africa.

[*]Email correspondence: pmthunzi@csir.co.za

Abstract: Targeted drug delivery into HIV-1 infected cells offers a reduction in toxicity and side effect. Using a femtosecond (fs) laser of different beam shapes anti-HIV-1 drugs are efficiently delivered into TZM-bl cells.

OCIS codes: (140.3538) Laser, pulsed; (160.4236) Cell analysis.

1. Introduction

While highly active retroviral therapy (HAART) has been successful in decreasing HIV-1 related deaths, side effects, drug toxicity and drug resistant strains continue to persist in HIV-1 infected patients on HAART [1]. Existing drug delivery methods have failed to effectively penetrate viral reservoir sites [1]. As a result novel and more site-directed drug delivery methods are being explored to mitigate these challenges.

Cell targeted delivery of biological agents using fs laser pulses has previously been demonstrated [2]. Some examples include the delivery of mRNA to specific sites of neuronal brain cells [3] and the delivery of red fluorescent proteins into various cell lines including embryonic stem cells (E14g2a) via a process called photo-transfection [4, 5].

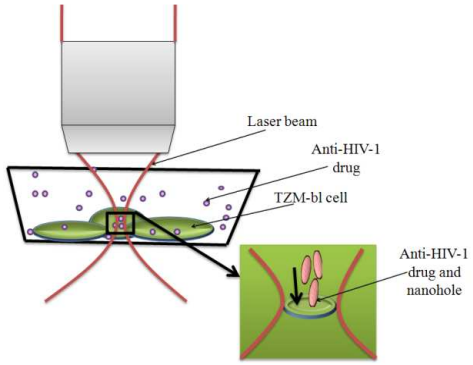

Fig. 1. Sample chamber showing translocation of anti-HIV-1 drug through laser generated transient pore.

In this study we show for the first time the delivery of an anti-HIV-1 drug tenofovir which is a nucleoside reverse transcriptase inhibitor into CD4 receptor bearing TZM-bl cells. This was achieved through a technique termed photo-translocation (Fig. 1). By using fs laser pulses of a tightly focussed Gaussian beam, Bessel beam and Laguerre Gaussian Beam, transient pores are generated onto the cell plasma membrane allowing translocation of tenofovir contained in serum free cell culture medium through the cell membrane.

2. References

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