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In-vitro photo-translocation of antiretroviral drug delivery into TZMbl cells

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ABSTRACT:

The current human immunodeficiency virus (HIV) treatment regime possesses the ability to diminish the viral capacity to unnoticeable levels; however complete eradication of the virus cannot be achieved while latent HIV-1 reservoirs go unchallenged. Therapeutic targeting of HIV therefore requires further investigation and current therapies need modification in order to address HIV eradication. This deflects research towards investigating potential novel antiretroviral drug delivery systems. The use of femtosecond (fs) laser pulses in promoting targeted optical drug delivery of antiretroviral drugs (ARVs) into TZMbl cells revolves around using ultrafast laser pulses that have high peak powers, which precisely disrupt the cell plasma membrane in order to allow immediate transportation and expression of exogenous material into the live mammalian cells. A photo-translocation optical setup was built and validated by characterisation of the accurate parameters such as wavelength (800 nm) and pulse duration (115 fs). Optimisation of drug translocation parameters were done by performing trypan blue translocation studies. Cellular responses were determined via cell viability (Adenosine Triphosphate activity) and cell cytotoxicity (Lactate Dehydrogenase) assays which were done to study the influence of the drugs and laser exposure on the cells. After laser irradiation, high cell viability was observed and low toxicity levels were observed after exposure of the cells to both the ARVs and the laser. Our results confirmed that, with minimal damage and high therapeutic levels of ARVs, the fs laser assisted drug delivery system is efficient with benefits of non-invasive and non-toxic treatment to the cells.