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

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Outline

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- Objectives
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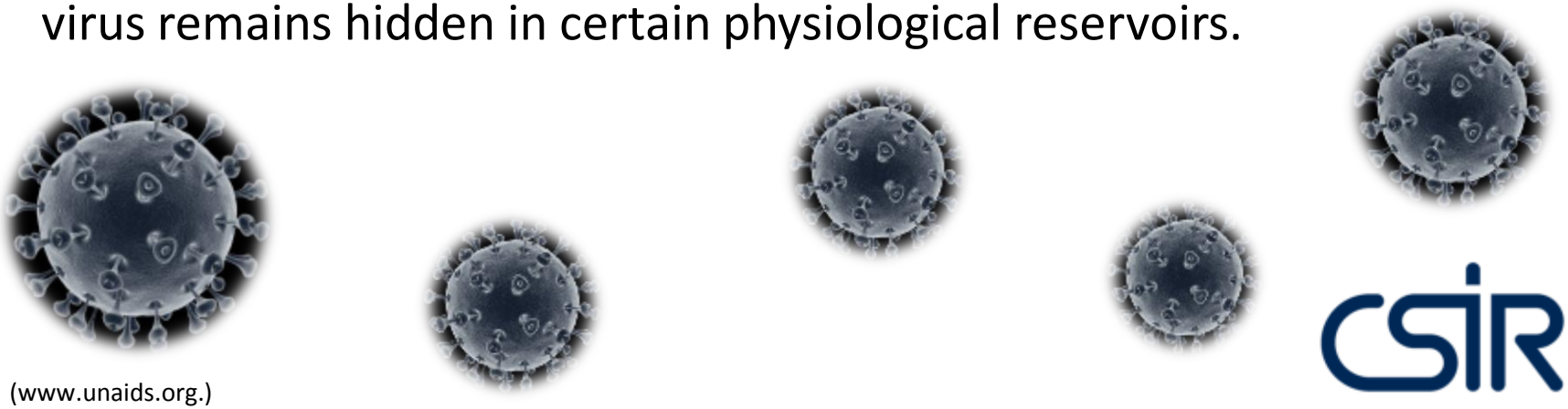
- Acknowledgements

Introduction

- Globally, it is estimated that more than 35.3 million people are living with HIV infection or AIDS, ~70% HIV infection in Sub-Saharan Africa.

- Introduction of highly active antiretroviral therapy (HAART) led to the decline in HIV-1 mortality rate and decrease in the burden of disease.

- HIV remains a chronic and life-long infection because the virus remains hidden in certain physiological reservoirs.



(www.unaids.org.)

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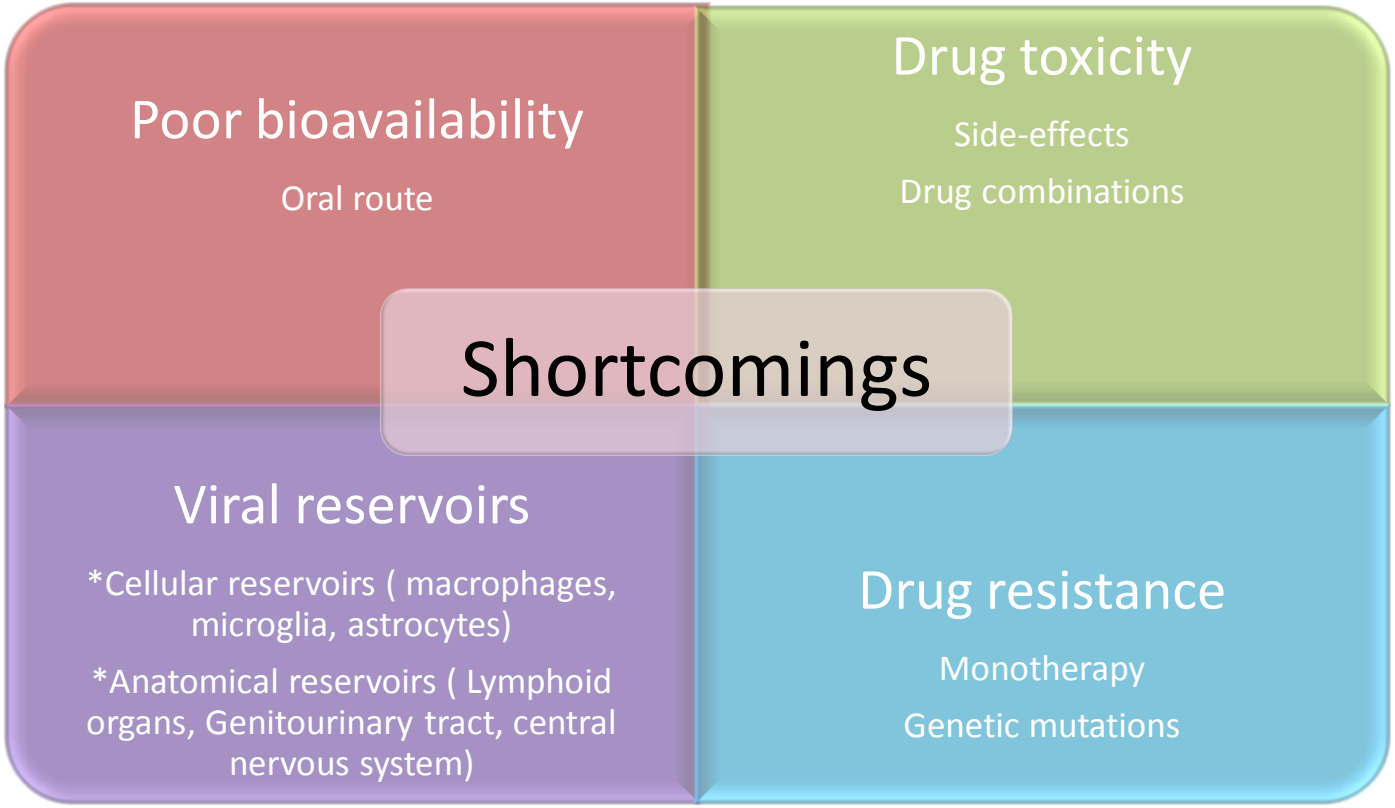
Problem statement



❖ ***Stumbling block for the complete eradication of HIV infection..***

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Drug delivery systems

HIV researches done

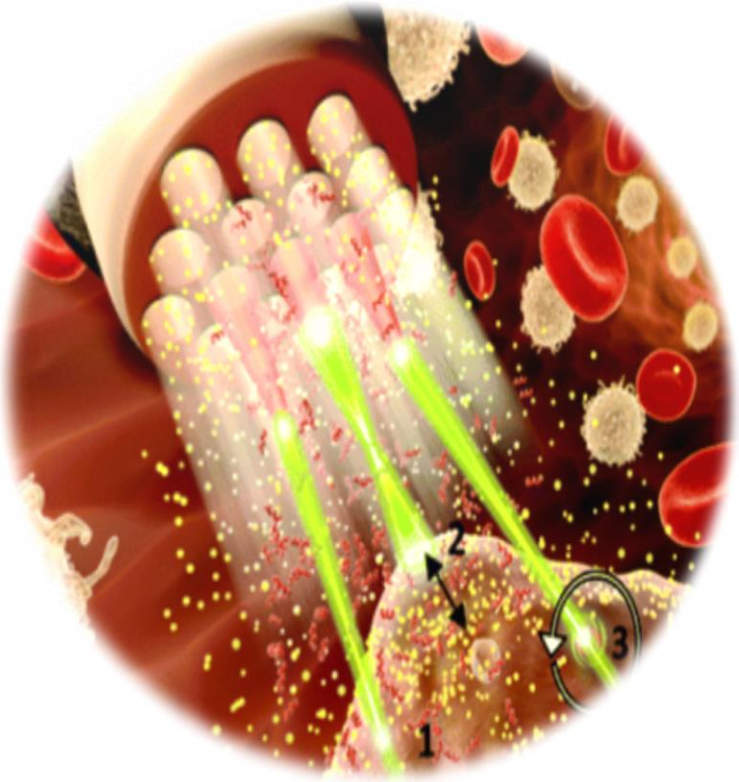
- Pre-exposure prophylaxis
- Targeting efficacious drug concentrations

Laser aided drug delivery systems

- Highly efficient
- Non-invasive
- Sterile and non-toxic treatment to cells

Femtosecond lasers

- powerful laser photo translocation technique
- using ultrafast pulses with high peak powers
- to precisely disrupt the cell membrane in order to allow exogenous matter into live mammalian cells.



(Nelson et al.,2015)

(Mohanty 2012)

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Objectives of the study

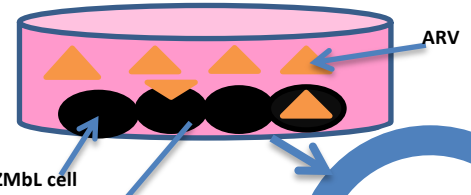
- To use femtosecond laser pulses in a photo-translocation system to deliver ARVs into HIV infected TZMbl cells.
- Investigate the influence of ARVs and laser on cellular processes using different molecular assays.

Methodology

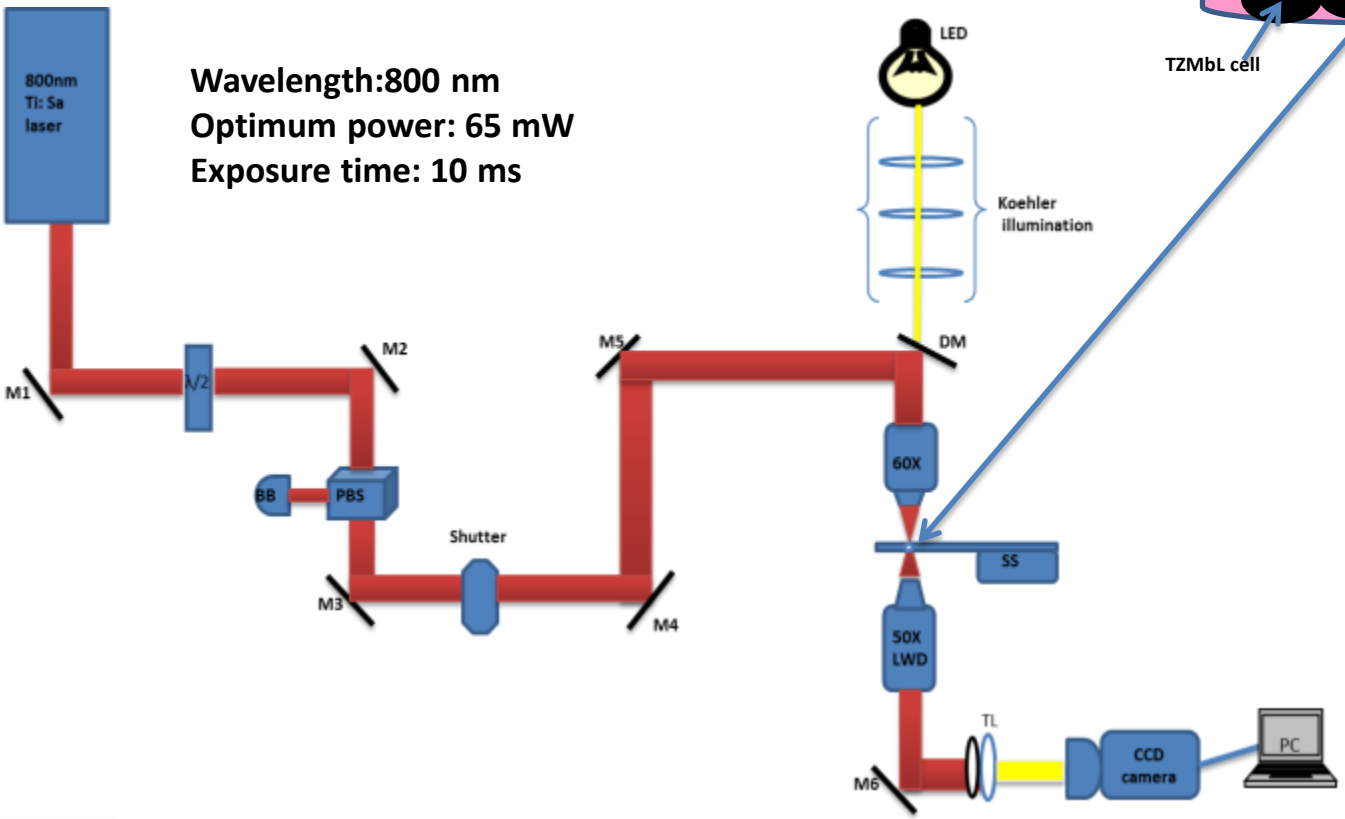
Culturing of cells and preparing pseudoviruses

Sample preparation
Infected cells,
Drugs (Nevirapine, Tenofovir, efavirenz)

Translocation of ARVs into TZMbl cells



Wavelength:800 nm
Optimum power: 65 mW
Exposure time: 10 ms



Cell viability (ATP assay)

Cell cytotoxicity (LDH assay)

HIV Inhibition (Luciferase Assay)

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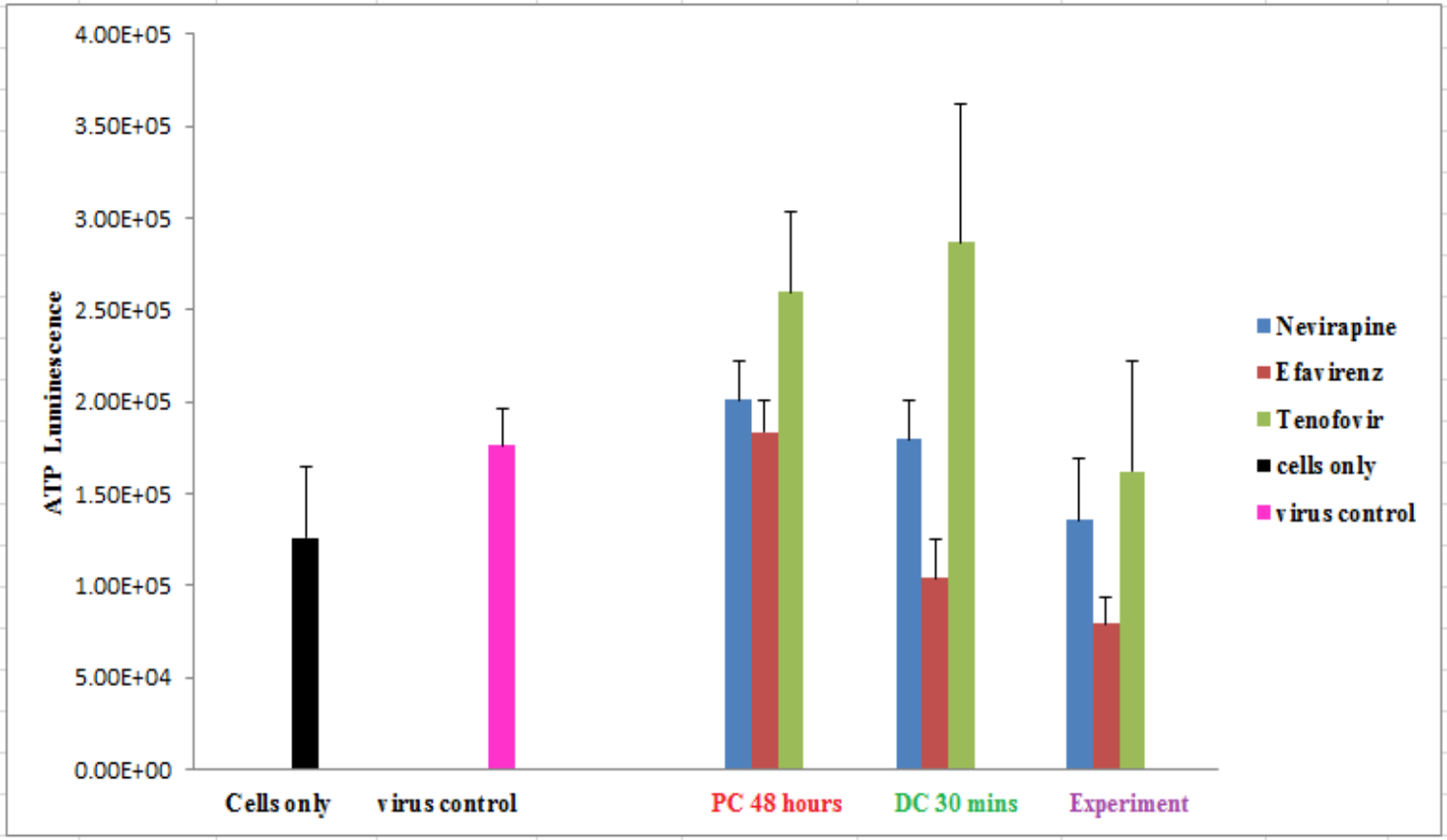
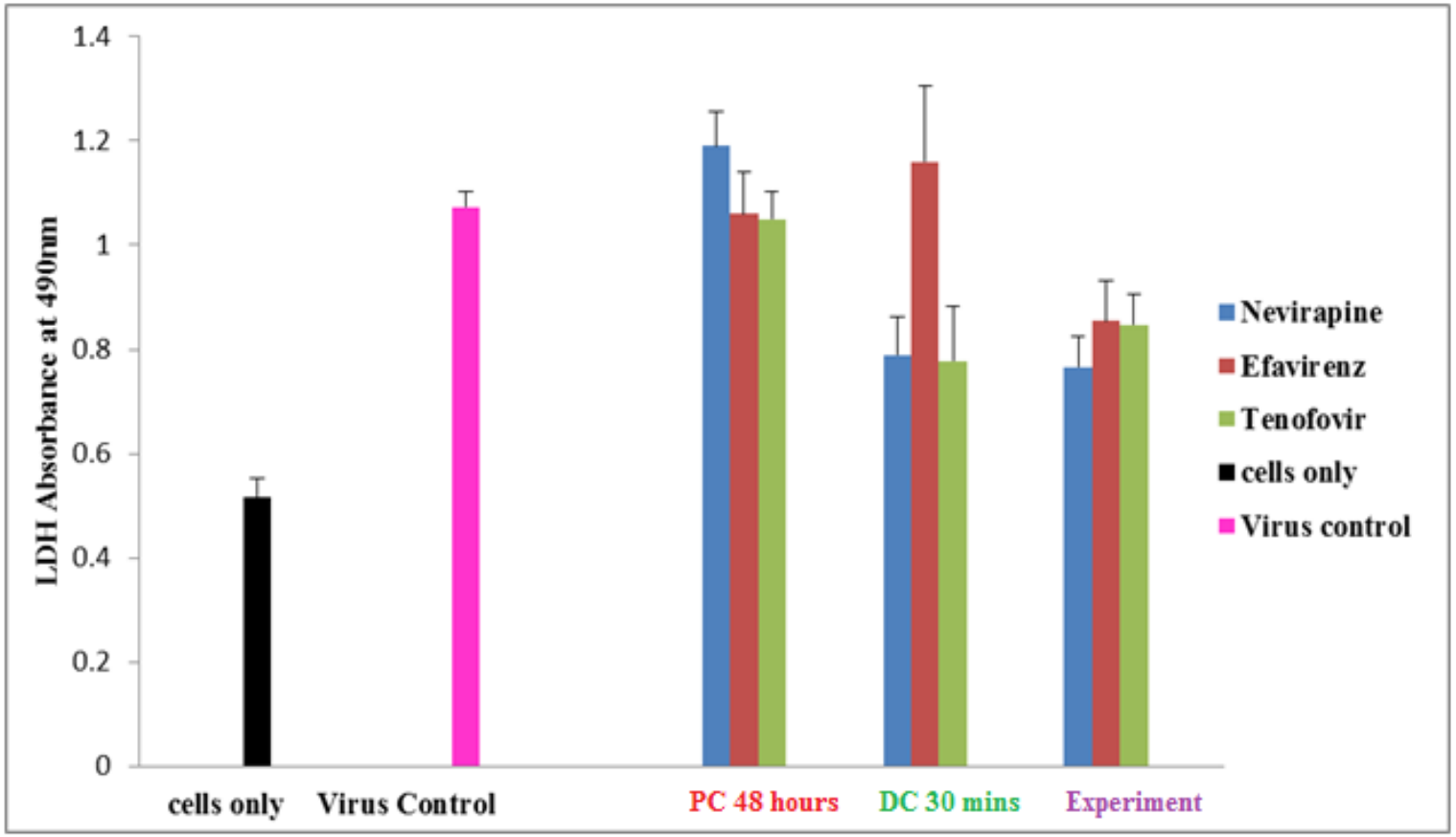
Results

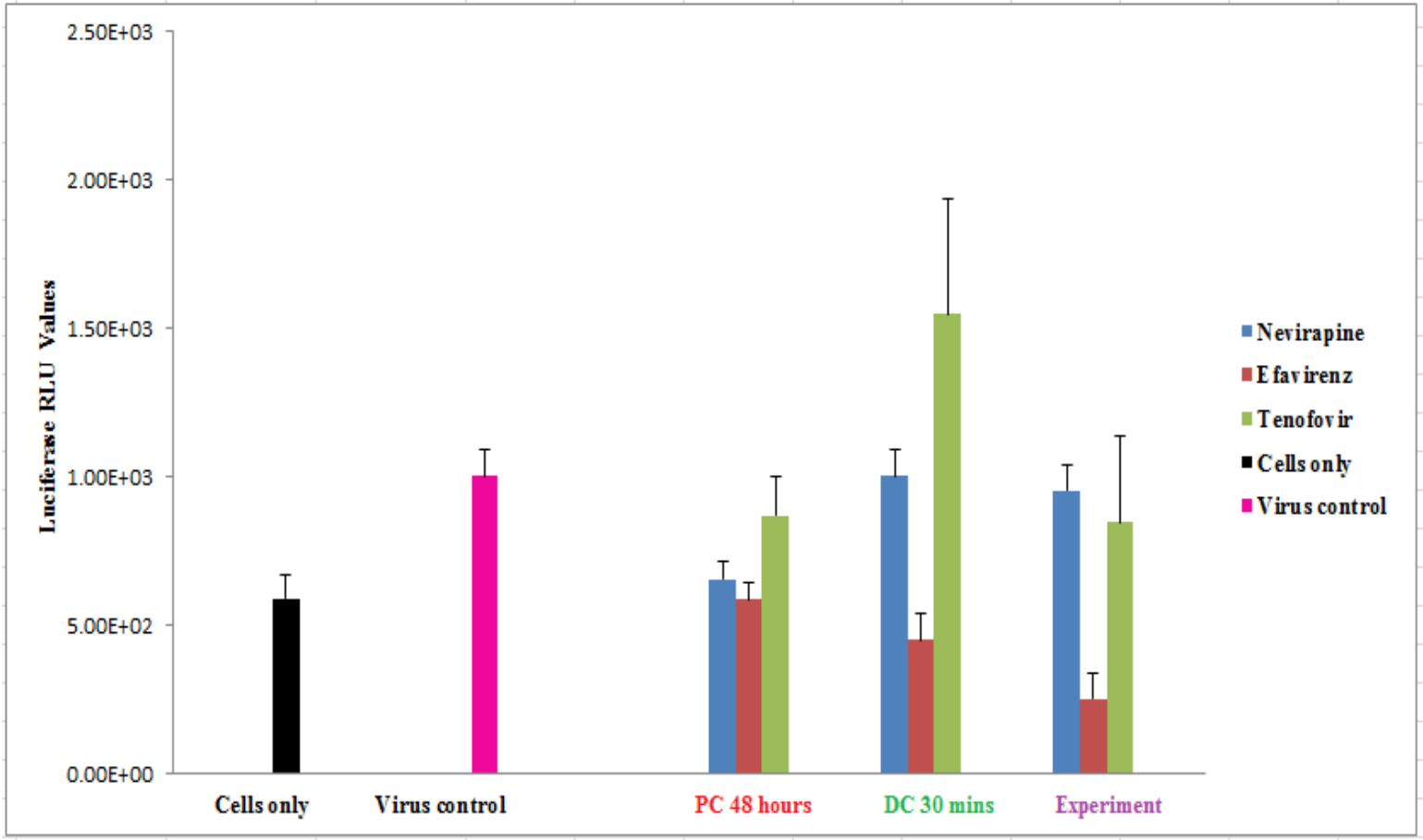
Cell viability (ATP) assay



Cytotoxicity (LDH) assay



HIV Inhibition (Luciferase) assay



Conclusion

- This study successfully demonstrated the use of femtosecond (fs) laser pulses in promoting targeted optical drug delivery of ARVs into TZMbl cells.
- Laser assisted drug delivery system was effective in reducing HIV viral infectivity
- Efavirenz showed more efficacy as compared to the other drugs.
- Future work will involve the use of coupling optical drug delivery systems with endoscope-like optical fibre for in-vivo applications.

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Acknowledgements

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Thank you