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Efficient femtosecond driven SOX 17 delivery into mouse embryonic stem cells: Differentiation study

Thobakgale SL
Manoto SL
Ombinda-Lemboumba S
Maaza M
Mthunzi-Kufa P

ABSTRACT:

Embryonic stem cells have great promise in regenerative medicine because of their ability to self-renew and differentiate into various cell types. Delivery of therapeutic genes into cells has already been achieved using of chemical agents and viral vectors with high transfection efficiencies. However, these methods have also been documented as toxic and in the latter case they can cause latent cell infections. In this study we use femtosecond laser pulses to optically deliver genetic material in mouse embryonic stem cells. Femtosecond laser pulses in contrast to the conventional approach, minimises the risk of unwanted side effects because photons are used to create transient pores on the membrane which allow free entry of molecules with no need for delivery agents. Using an Olympus microscope, fluorescence imaging of the samples post irradiation was performed and decreased expression of stage specific embryonic antigen one (SSEA-1) consistent with on-going cellular differentiation was observed. Our results also show that femtosecond laser pulses were effective in delivering SOX 17 plasmid DNA (pSOX17) which resulted in the differentiation of mouse embryonic stem cells into endoderm cells. We thus concluded that laser transfection of stem cells for the purpose of differentiation, holds potential for applications in tissue engineering as a method of generating new cell lines.