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Lentiviral re-targeting for in vivo neuro-optogenetics applications

The application of optogenetics techniques to study neural behavior in the central nervous systems of non-human primates is of great interest for the neurobiology research field. Viral vectors are widely used for the delivery of opsin genes in vivo. Among these lentiviral vectors are particularly suitable because of their ability to transduce non-dividing cells in a safe manner producing long-term, stable transgene expression. Aiming to narrow the tropism of HIV-1 based lentiviral vectors towards nervous tissue, we show in this study the production of LV vectors pseudotyped with vesicular stomatitis virus G (VSV-G) protein and Rabies virus G protein that are capable of transducing fibroblasts and neuroblastoma cell lines as well as rat brain primary culture in vitro and marmoset brain ex vivo in organotypic cultures. We also show a LV re-targeting approach using a single chain antibody against the tyrosine kinase receptor type B (TrkB) in combination with a mutated binding defective influenza hemagglutinin to promote fusion.

Key words: Optogenetics; non-human primates; Lentivirus, pseudotyping