Clin Pharmacol Biopharm 2017, 6:4(Suppl)
DOI: 10.4172/2167-065X-C1-026

Increasing the VP1-VP2/GFP complex yield with single amino acid substitutions of the VP2 interaction site for biopharmaceuticals drug delivery

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Virus-Like Particles (VLPs) are complex proteins resembling viruses, but deprived of virus DNA and therefore non-infectious. For that reason, they have an excellent potential to be great drug delivery systems. Polyomavirus VLPs are constructed of VP1-VP2 proteins complexes. VP2 is often truncated to the middle of VP1 interacting sequence in solution. During my internship at the University of Queensland in Australia I tried to increase the yield of the VP1-VP2/GFP complex by making single amino acid substitutions in the VP2 truncation site and therefore avoid the truncation. I planned single aa substitutions in the VP2 truncation site and performed site-directed mutagenesis of the template plasmid and expressed the proteins in the autoinduction media after bacterial transformation. A modified ELISA test, named FLISA - a fluorescence-linked immunosorbent assay, verified the integrity of the complex by revealing GFP fluorescence in complexes bound by an anticomplex antibody. The results confirmed the presence of a large amount of complex in 5 out of 20 prepared mutations; 3 of them were located in the 294 locus, suggesting that the original glycine is not necessary for the complex integrity and can potentially be replaced also with different candidate amino acids. Overall the results need to be investigated further, but the work can be pronounced hopeful, as the GFP protein in the complex can be substituted for a cytotoxic or therapeutic protein or compound and used with the VLP method to target particular cells in the body, giving a powerful and promising tool for biopharmaceutical treatment.

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