mRNA-based Vaccine for the Prevention of Yellow Fever

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This project aims to develop a novel vaccine against the yellow fever virus using an mRNA platform. Currently, the vaccine used for the prevention of Yellow Fever is based on a live, attenuated viral strain. This vaccine can cause several viral diseases in rare cases and is not recommended for infants under the age of 6 months nor the immunosuppressed. The supply of this existing vaccine is not meeting worldwide demand. Development of a less expensive and safer vaccine to combat the yellow fever virus would be of great benefit to those in endemic areas. Genes for yellow fever structural viral proteins were cloned into an mRNA expression vector. A dsDNA template was designed to encode for an optimized 5' untranslated region, 3' untranslated region and a codon-optimized protein coding sequence. RNA was synthesized in a test tube via in-vitro transcription with a T7 bacterial RNA polymerase and a 5' cap and 3' poly(A) tail were added to replicate the motifs of endogenous host mRNA. Resulting mRNA was transfected into mammalian tissue culture cells and tested for viral protein expression and non-infectious particle secretion through western blots with antibodies against the viral surface protein. Successful in-vitro mRNA synthesis resulted in robust RNA expression of the predicted size. Protein expression occurred and future work will focus on generic chimeric proteins within the transmembrane domain of the viral protein to stabilize expression and non-infectious particle secretion.

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