Pengembangan Vaksin mRNA COVID-19 Berbasis Penghantaran oleh Cell Penetrating Peptide = Development of a Cell Penetrating Peptide-Based COVID-19 mRNA Vaccine

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Abstrak

Coronavirus disease 2019 (COVID-19) yang disebabkan oleh infeksi virus SARS-CoV-2 yang menyerang saluran pernapasan, telah menjadi isu kesehatan publik. Vaksin COVID-19 platform mRNA beserta sistem penghantar LNP, menunjukkan kemampuan ekspresi protein yang baik, serta imunogenisitas yang tinggi. Meskipun demikian, biaya produksi LNP yang tinggi perlu dipertimbangkan apabila produksi skala besar dalam negeri ingin dilakukan. Oleh karena itu, pada penelitian ini dilakukan ekspresi protein cell-penetrating-peptide (CPP) ALM yang menunjukkan potensi dalam menghantarkan asam nukleat ke dalam sitosol. Pada penelitian ini dilakukan pengklonaan dan ekpresi CPP ALM dalam sistem prokariot. Adapun mRNA penyandi RBD Spike dan mRNA penyandi IRES eGFP ditranskripsi secara in vitro. Interpretasi hasil penelitian dilakukan secara deskriptif dan kualitatif. Protein ALM belum berhasil diekspresi. Analisa struktur sekunder mRNA perlu dilakukan pada penelitian-penelitian selanjutnya untuk memprediksi keberhasilan ekspresi protein. mRNA penyandi RBD Spike dan eGFP belum dapat mengekspresikan protein target. Modifikasi mRNA lebih lanjut perlu dilakukan untuk meningkatkan kemampuan translasi dan stabilitas mRNA.

..... Coronavirus disease 2019 (COVID-19) which is caused by SARS-CoV-2 virus infection, attacks the respiratory tract and has become a public health issue. The mRNA platform COVID-19 vaccine along with the LNP delivery system exhibits good protein expression capabilities, as well as high immunogenicity. Nevertheless, the high cost of LNP production needs to be considered if large-scale domestic production is to be carried out. Therefore, in this study, the expression of ALM cell-penetrating-peptide (CPP) protein was carried out which showed the potential to deliver nucleic acids into the cytosol. In this study, cloning and expression of CPP ALM were carried out in a prokaryotic system. The mRNA encoding RBD Spike and the mRNA encoding IRES eGFP were transcribed in vitro. Interpretation of research results is done descriptively and qualitatively. ALM protein has not been successfully expressed. Analysis of mRNA secondary structure needs to be carried out in future studies to predict the success of protein expression. mRNA encoding RBD Spike and eGFP cannot yet express the target protein. Further modification of the mRNA needs to be done to improve the translation ability and stability of the mRNA.