

Mitigating the Looming Vaccine crisis: production and delivery of Plasmid-Based Vaccines

Abstract

The exponentially growing human population and the emergence of new diseases are clear indications that the world can no longer depend solely on conventional vaccine technologies and production schemes. The race to find a new vaccine technology is crucial to help speed up and complement the World Health Organization (WHO) disease elimination program. The ultimate goal is to uncover fast and efficient production schemes in the event of a pandemic, and also to effectively fight deadly diseases such as malaria, bird flu, hepatitis, and human immunodeficiency virus (HIV). Plasmid DNA vaccines, if properly formulated, offer specific priming of the immune system and similar or even better prophylactic effects than conventional vaccines. This article discusses many of the critical issues that need to be considered when developing fast, effective, and reliable plasmid DNA vaccine manufacturing processes. Different modes of plasmid production via bacterial fermentation are compared. Plasmid purification by chromatography is specifically discussed as it is the most commercially viable bioprocess engineering technique for continuous purification of supercoiled plasmid DNA. Current techniques and progress covering the area of plasmid DNA vaccine design, formulation, and delivery are also put forward.