High Throughput Screening & Process Development – How Small can we get?

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Development of an integrated messenger RNA manufacturing process using thermoreversible aqueous biphasic systems

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Abstract:

The promising potential of messenger RNA (mRNA) vaccines as effective approaches to contain the dissemination of infectious diseases was fully disclosed during the combat to the COVID-19 pandemic. Over conventional vaccines, mRNA-based vaccines exhibit improved safety and efficacy profiles, and the possibility of repeatedly administration [1]. However, the manufacturing of mRNA vaccines is complex, costly and requires multi-step purification strategies to produce high quality products. If properly designed, ionic liquids (ILs) can act as RNA stabilizing agents [2] and enhance the selectivity of purification processes when used to form aqueous biphasic systems (ABS) [3]. Aiming to improve mRNA manufacturing, this work proposes the use of thermoreversible ABS based on ILs to integrate the production and clarification steps, further simplifying subsequent purification steps.

Up to date, we have achieved the production of mRNA by *in vitro* transcription and its purification using conventional methods and gathered insights on mRNA stability and integrity in several structurally distinct ILs. According to these previous results, current attention is being placed on the identification of the best thermoreversible IL-based ABS to integrate production and clarification steps.

Overall, the proposed integrated production-clarification platform is expected to tackle current challenges of mRNA manufacturing, especially by improving the cost-efficiency and technological simplicity of existing manufacturing processes and enhancing the stability and yield of the final product.

References:

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