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TITLE: Development of integrated strategies for the manufacturing of mRNA resorting to aqueous biphasic systems and ionic liquids

Keywords:

mRNA; ionic liquid; integrated manufacturing processes; thermoreversible aqueous biphasic system; *in vitro* transcription; T7 RNA polymerase.

Abstract

During the COVID-19 pandemic, messenger RNA (mRNA) vaccines appeared as effective approaches to tackle infectious diseases dissemination. However, the manufacturing of mRNA vaccines is complex, costly and resorts to improved technologies to produce high quality and more accessible products. If properly designed, ionic liquids (ILs) can act as RNA stabilizing agents (Pedro et al, ACS Sustain Chem Eng, 6, 2018) and enhance the selectivity of purification processes when used to form aqueous biphasic systems (ABS) (Ventura et al, Chem Rev, 117, 2017). Therefore, and to expedite mRNA production, 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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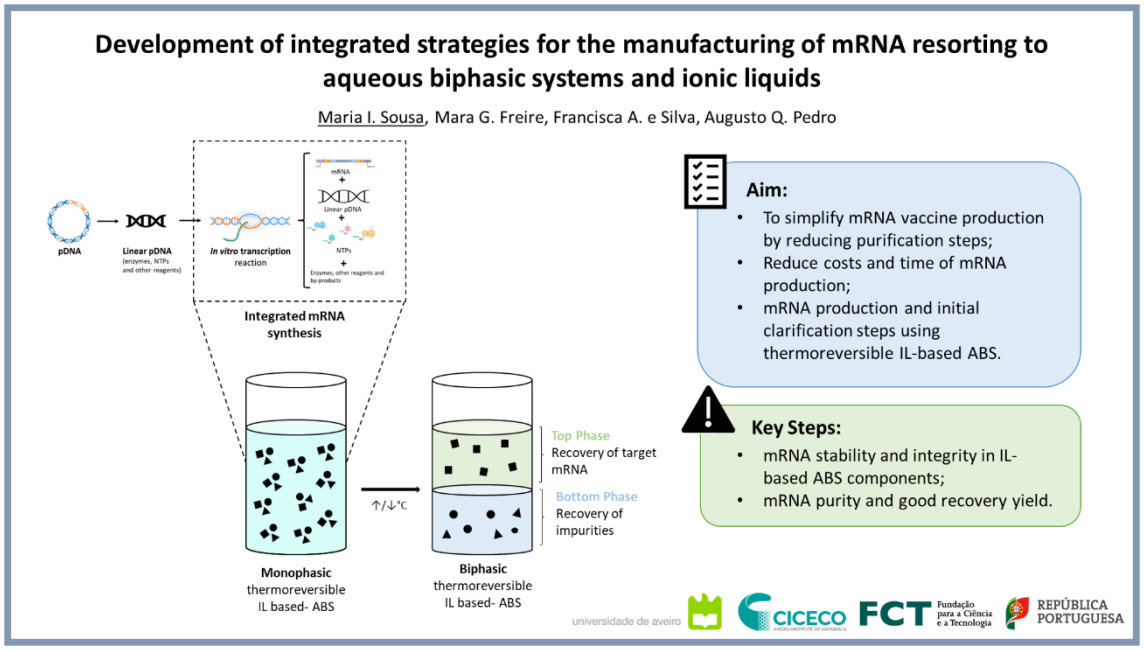

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