Aqueous biphasic systems composed by biocompatible amino acid-based ionic liquids as integrated preservation-purification platforms for RNA

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The emergence of RNA as a promising biopharmaceutical paved the way for the development of innovative medicines with broad therapeutic and prophylactic efficiencies in infectious diseases and cancer. Notwithstanding their relevance on this field, the labile nature and intrinsic low stability of RNA coupled with the laborious and costly methods of extraction and purification of this biopolymer constitute the main challenge for its widespread application[1].

To surpass the described bottlenecks, more competitive and sustainable strategies for purifying RNA are of crucial relevance, where amino-acid-based ILs (AA-ILs) may play a prominent role on this field. In fact, the high affinity between amino-acids and RNA as well as the favourable nucleic acids-stabilization properties exhibited by AA-ILs justifies the investigation of AA-ILs as RNA

purification platforms[2]. From the exposed, this work aims to develop alternative cost-effective and sustainable purification-preservation platforms for RNA, taking advantage of the tunable character of ILs, with the ultimate goal of purifying RNA from a complex recombinant lysate.

AA-ILs comprising cholinium, L-arginine, L-lysine and L-histidine as cations combined with chloride, DL-aspartate, L-tyrosine or L-phenylalanine were synthesized, characterized, and their ability to form two phases with distinct salts and polymers investigated. All AA-ILs in study formed ABS with polypropylene glycol with a molecular weight of 400 $g.mol^{-1}$ (PPG 400) and were further investigated as potential extraction and preservation platforms for RNA. It was demonstrated that RNA was majorly extracted to the IL-rich phase while simultaneously preserving its integrity and stability. Ongoing work is focusing on the application of the most promising IL-based ABS for the separation of RNA from complex recombinant lysates.

Overall, the approach herein developed represents a promising strategy to surpass the critical demand of RNA with high integrity, purity and biological activity, envisaging its potential use as biotherapeutics.

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