Integrated extraction-preservation of bacterial RNAs using ionic liquids

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Abstract:

Ribonucleic acid (RNA) is a biopolymer of high relevance in the biopharmaceuticals field and in fundamental and applied research. In all these applications, the methods and solvents used for extracting and purifying RNA from various types of cells or other biological matrices, and respective preservation, are critical issues (Tateishi-Karimata & Sugimoto, 2018). Considering that RNA is a highly labile polymer with inherent chemical instability highly susceptible to degradation by nucleases (Tan & Yiap, 2009), a set of amino-acid based ionic liquids (AA-ILs) are investigated in this work to act both as preservation media and as phase-forming agents of aqueous biphasic systems (ABS). The ultimate goal is to develop integrated extraction-preservation platforms for RNA (Quental et al, 2019).

AA-ILs comprising the cholinium cation and anions derived from L-lysine, L-arginine, L-glutamic acid, and DL-aspartic acid were investigated. It is shown that the stability of bacterial RNA is preserved in aqueous solutions of the studied AA-ILs, even in the presence of ribonucleases. Both with pure RNA and bacterial lysate samples, RNA was successfully extracted to the AA-IL-rich phase ABS without compromising its integrity and stability.

Overall, this work discloses an integrated extraction-preservation process for RNA in which it is initially extracted from the bacterial lysate sample using ABS, after which the IL-rich phase can be used as the preservation medium of RNA up to its use.

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