Novel ionic-liquid-based technology for long-term vaccine preservation at ambient temperature

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Ease of storage and transportation of viruses and virus-like particles is key to the production, stockpiling and equitable distribution of vaccines. The requirement for cold-chain transportation and storage is the main hurdle in vaccine production and distribution. Current technologies make vaccine distribution expensive and inequitable, leading to lack of global availability and disease persistence. Our research aims to develop new methods to stabilize vaccines using formulations of ionic liquids. Our collaborative group is formulating prior FDA approved ionic liquid combinations that are generally regarded as safe (GRAS) to combat the need for vaccine refrigeration. New synthesis methods and molecular modeling provide insights into removing hydration shells from vaccine macromolecular structures and inhibiting enzymatic degradation without disturbing vaccine structural and chemical integrity, enabling an effective route to long-term storage and transportation at ambient temperature. To ensure global accessibility, these compounds have been formulated with inexpensive and readily accessible materials and do not require extensive laboratory equipment to synthesize or utilize. Here we report on testing an array of formulations to interrogate the thermostability of vaccine-like models via accelerated aging at elevated temperatures. Preliminary results indicate the stabilization of vaccine model viruses. We hypothesize that further research in this field may result in the elimination of the cold-chain process.