Docket #: S20-183

mRNA Vaccines: Methods of Synthesis and Stability Assessment

As part of a portfolio of COVID-19 inspired innovations, Stanford researchers led by Dr. Rhiju Das have developed ***methods to rationally and rapidly design, synthesize and assess mRNA vaccines.*** These methods include in vitro and in cell experiments to measure degradation, secondary structure, biophysical characterization by SAXS, efficiency of translation in cells and in-cell stability. This work can be used to develop improved mRNA vaccines immediately for the COVID-19 pandemic. It is known that mRNA vaccines have the potential to respond to novel disease outbreaks on a timescale orders of magnitude faster than traditional, protein-based vaccines (weeks vs. months). But low-temperature storage requirements have hindered wide-scale deployment. Optimization of the mRNA structure for storage and shipment has not yet been addressed. To overcome this challenge, the new methods combine both in cell assays as well as in vitro assays to assess not only efficient translation in cells but also how mRNA vaccines are degraded or biophysically altered during storage.

Explore more RNA vaccine technologies and tools:

Stanford docket S20-224 - Algorithm for Maximizing mRNA Thermodynamic Stability
Stanford docket S20-258 - Additive Reduces Cost of Manufacturing mRNA

Applications

- Development of rapidly deployable mRNA vaccines
- mRNA therapeutics to replace proteins in patients with genetic disease
- mRNA therapeutics to deliver monoclonal antibodies for cancers and autoimmune diseases

Advantages

- Confronts critical storage and shipment challenges
- Identifies key features for optimal mRNA vaccine design

Patents

- Published Application: 20220162588
- Published Application: 20260201365

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