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(54) Title: HIGH-THROUGHPUT METHODS FOR PREPARING LIPID NANOPARTICLES AND USES THEREOF

(57) Abstract: Provided herein are high throughput methods for optimizing and manufacturing various lipid nanoparticle (LNP) compositions and uses thereof. For example, in some embodiments, the present disclosure provides a high-throughput screening method for manufacturing a LNP composition comprising, obtaining at least two intermixable solutions comprising a payload and a plurality of molecules capable of self-assembly and mixing said at least two solutions under a set of controlled conditions, by which injection sequence, speed, volume, phase ratio and mixing duration are varied. In various embodiments, the present disclosure enables optimal encapsulation efficiency, particle size distribution, purification and particle recovery rate, and formulation stability to be determined. The methods disclosed herein enable efficient optimization of manufacturing conditions for preparation of LNP-based therapeutics.