# Exploring The Structure of Lipid Nanoparticle-Based Mrna Vaccine Systems Using a Laboratory SAXS Beamline

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Lipid nanoparticle (LNP)-based mRNA vaccines have become an interesting alternative to conventional vaccine systems due to their comparatively better properties such as a higher potency and efficacy. The reasons for the advantageous behavior of LNP-based vaccines lies in various physicochemical properties, such as shape and structure, charge, and particle size and specific surface area. In particular for the latter properties, small-angle X-ray scattering (SAXS) is an excellent method to characterize the nanostructured LNP-mRNA systems.

In this contribution, we report on SAXS measurements with the SAXSpoint 5.0 laboratory beamline of mRNA vaccines employing lipid nanoparticles. We will discuss how SAXS results can quickly prove the presence of the mRNA vaccine within the LNP carrier vehicle and which influence the LNP particle size has on the efficacy of these vaccine systems.

Furthermore, we will illustrate the core-(multiple) shell structure model of the mRNA delivery system.