



Simultaneous Quantification of RNA and Antibodies in Lipid Nanoparticles Using Scatter-Free Absorption Spectroscopy

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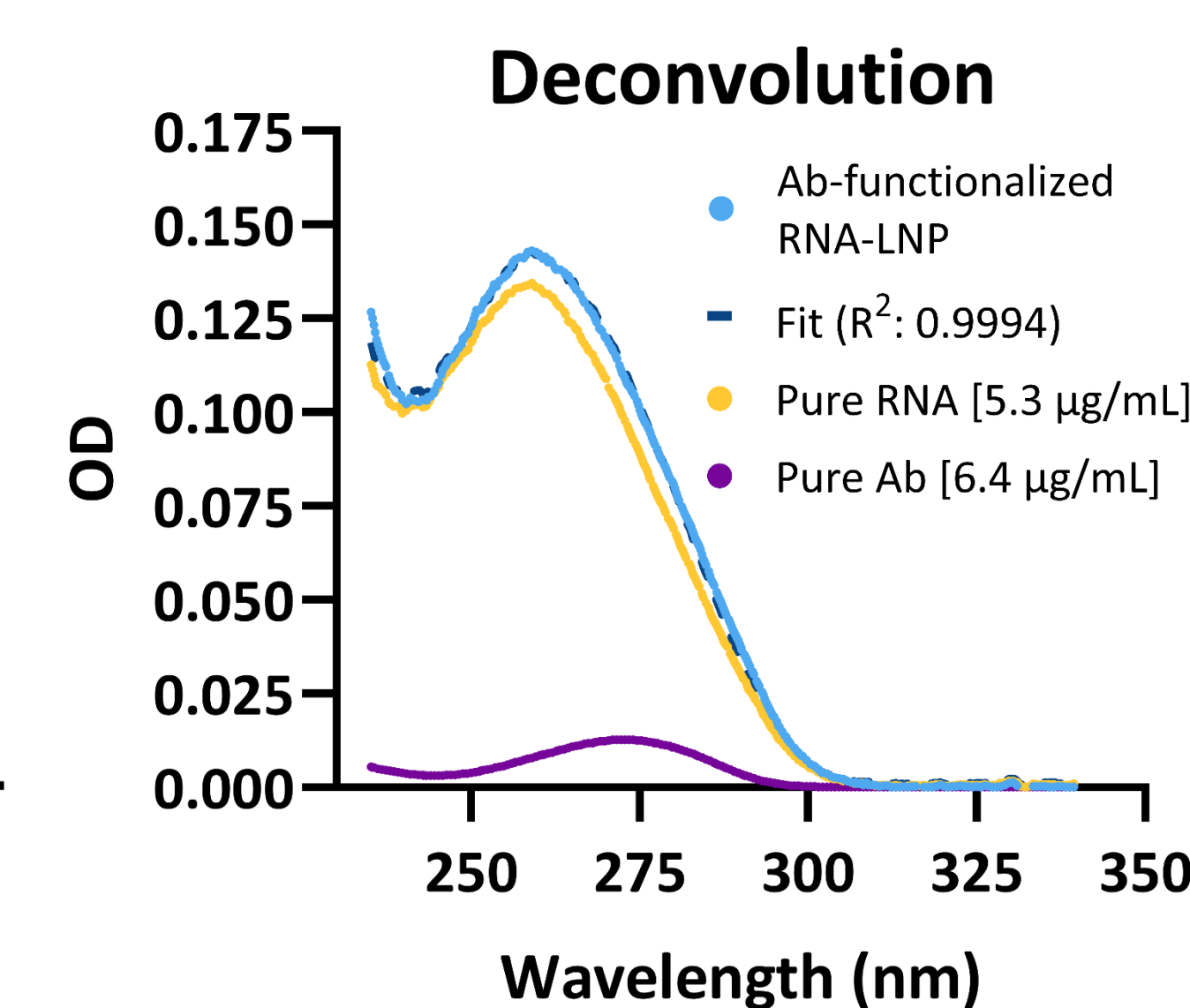
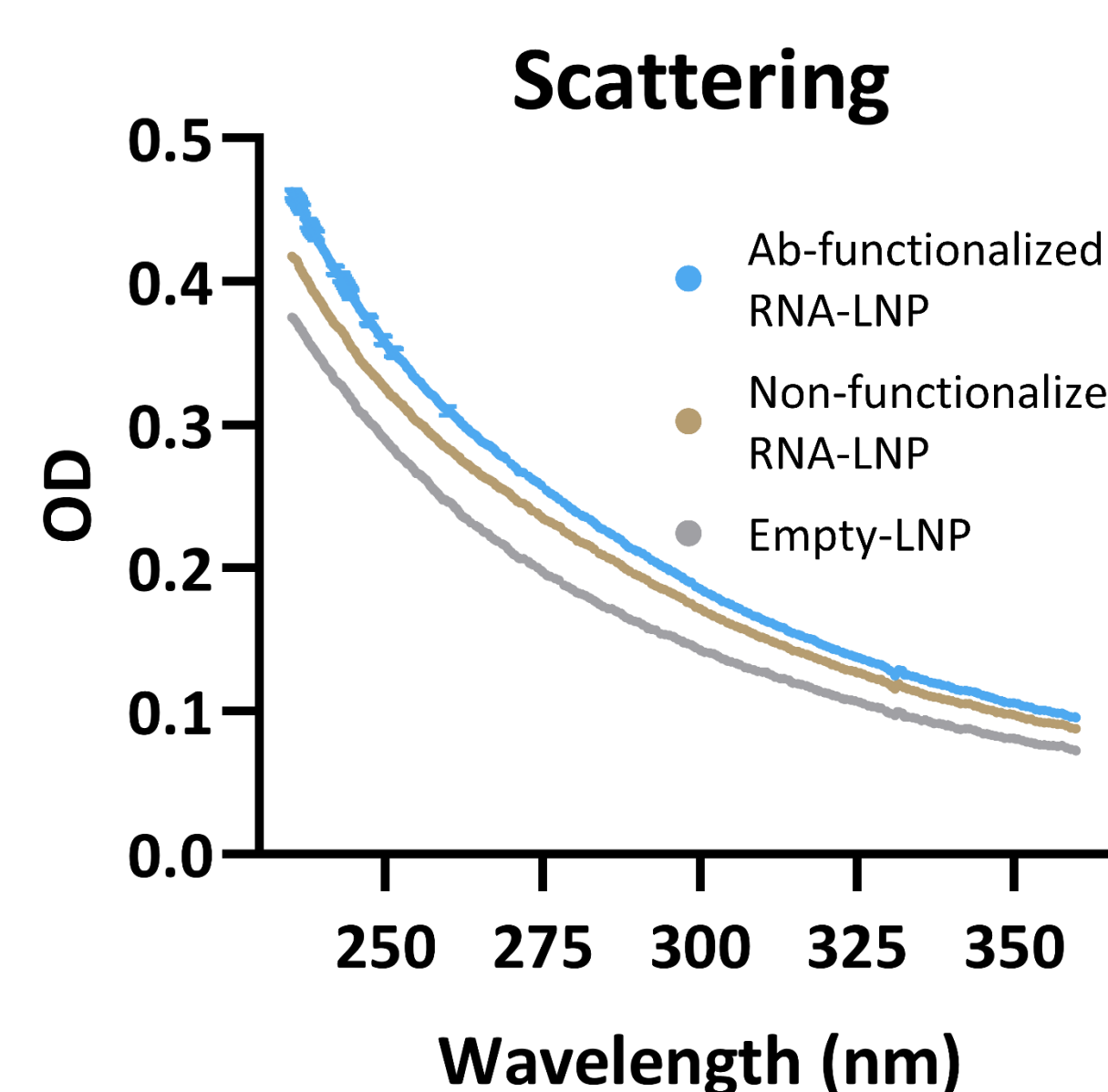
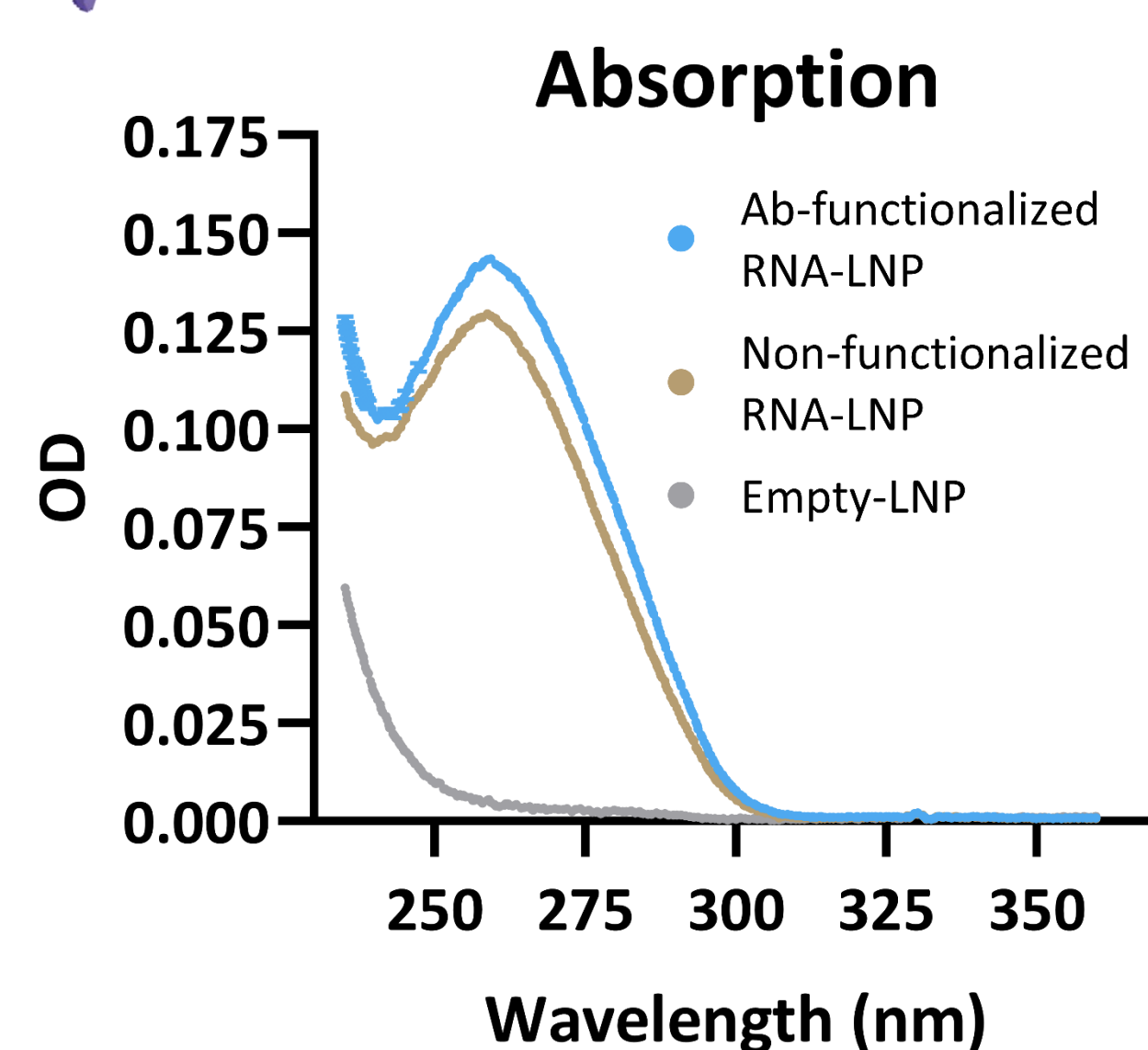
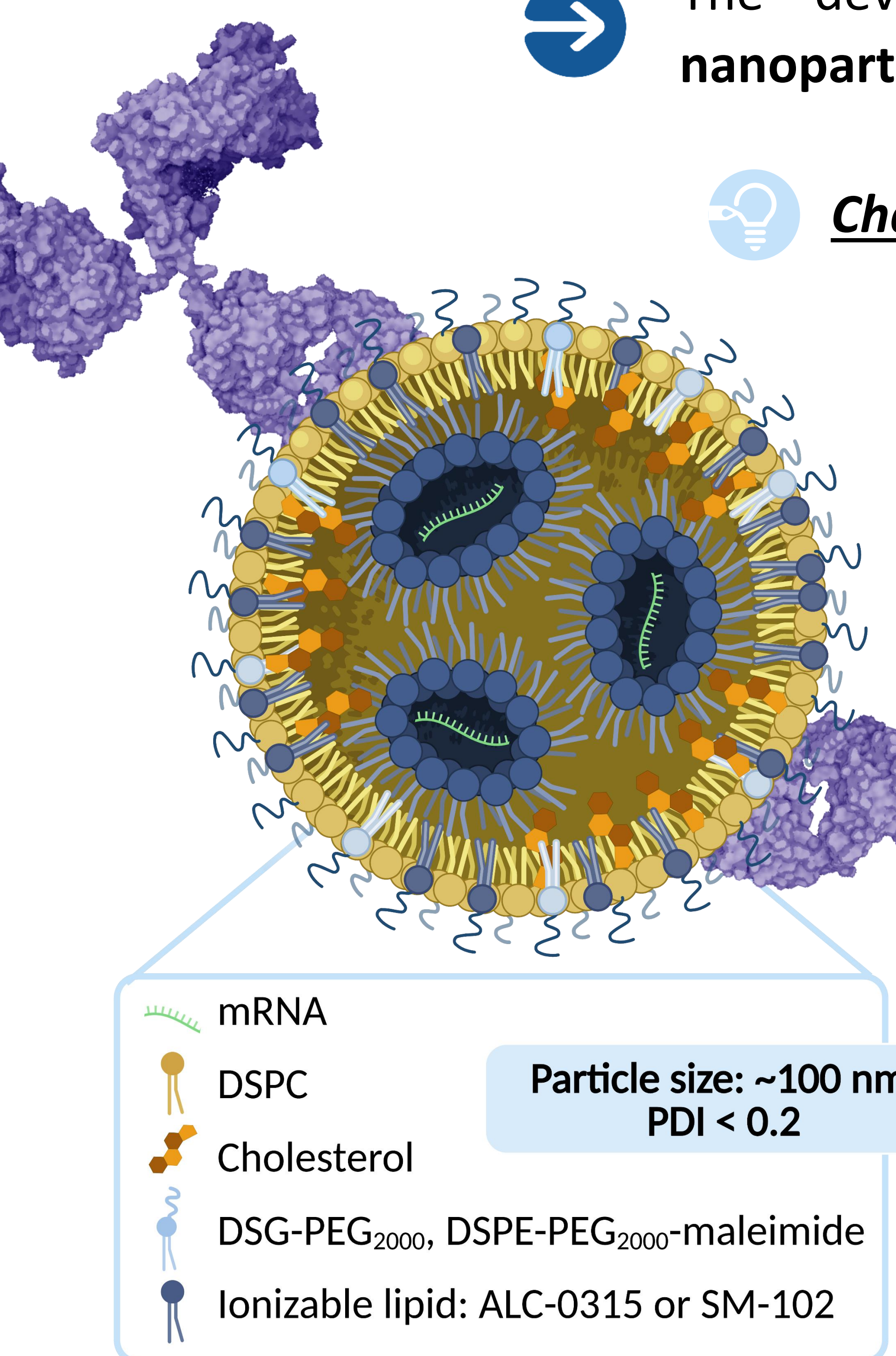
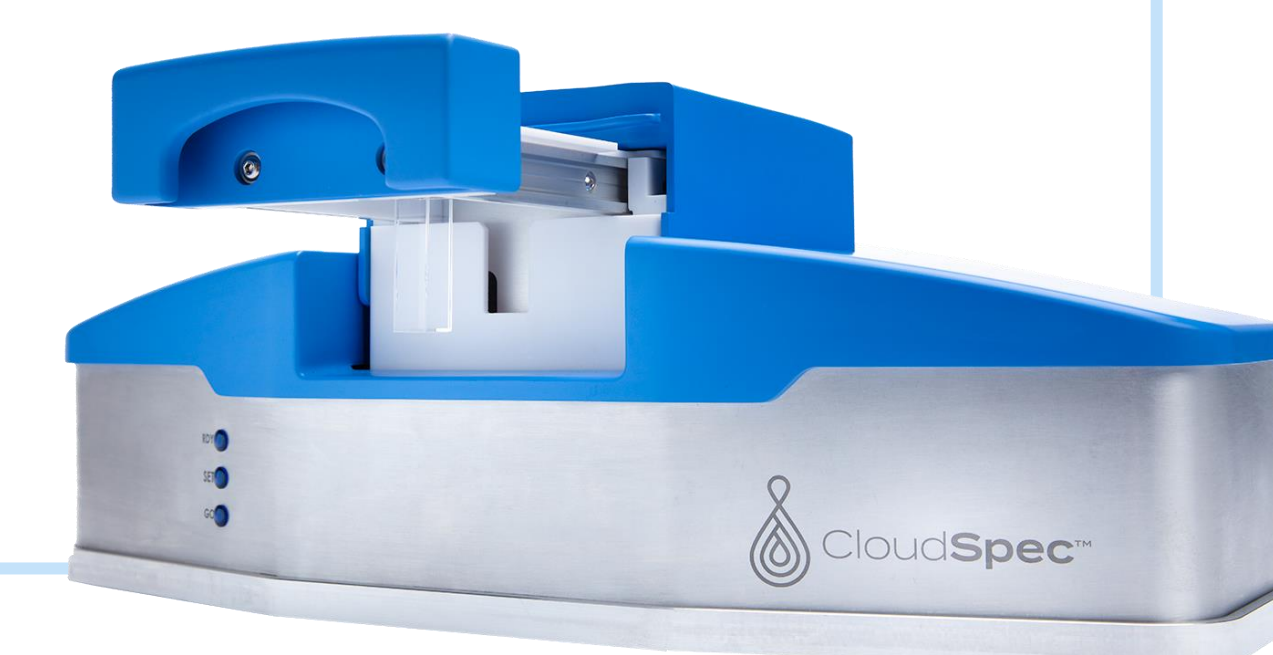
➔ The development of **antibody (Ab)-functionalized, RNA-loaded lipid nanoparticles (LNP)** for cell-specific delivery is a major focus in nanomedicine

Challenge: ACCURATE RNA AND ANTIBODY QUANTIFICATION

- ✗ Conventional methods (RiboGreen™, BCA) → affected by LNP disruption and lipid interference
- ✗ Advanced approaches (HPLC, LC-MS) → costly and technically demanding
- ✗ UV/Vis spectroscopy → confounded by light scattering from LNP

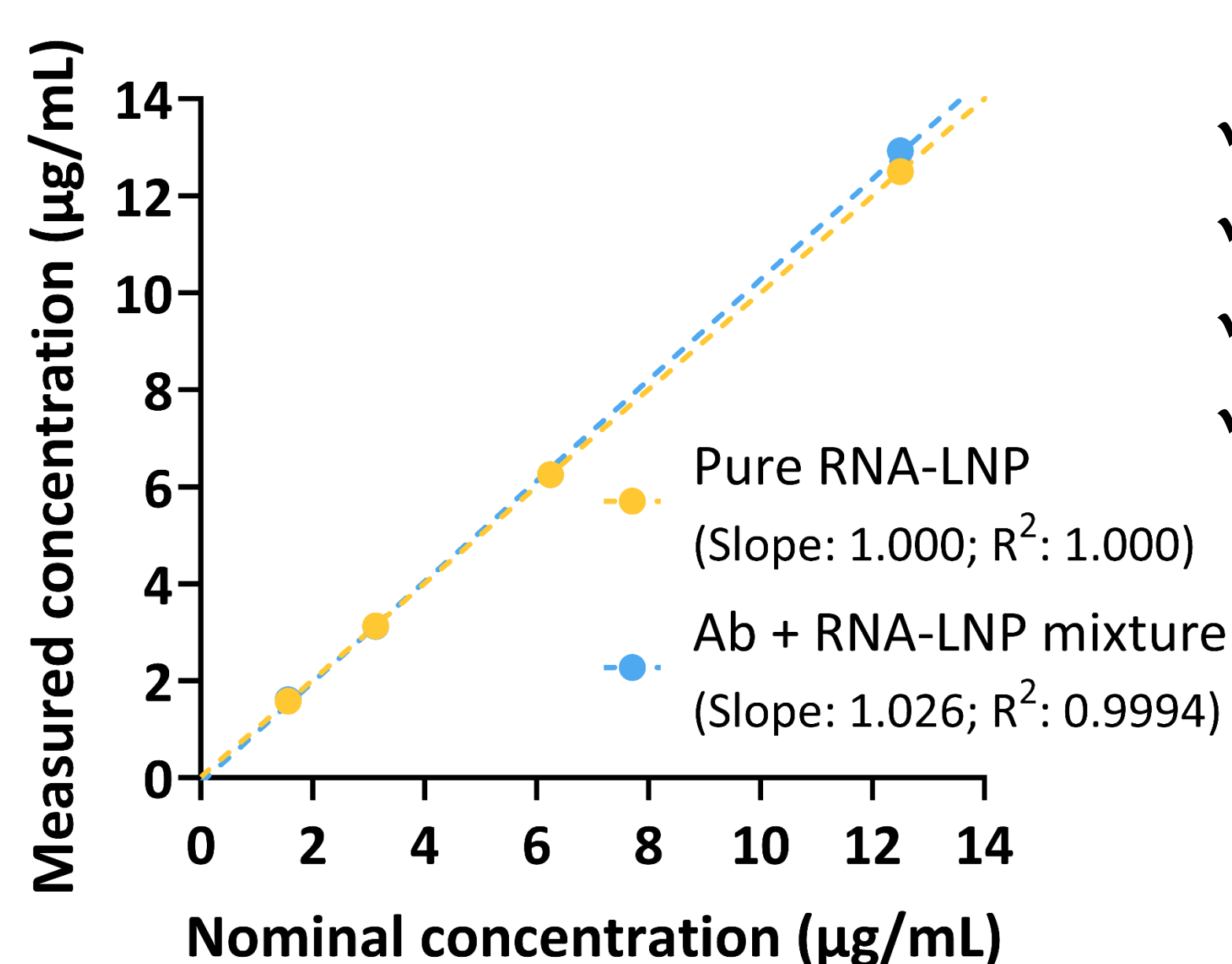
✓ Scatter-Free Absorption Spectroscopy (SFAS)

→ Rapid characterization of intact LNP

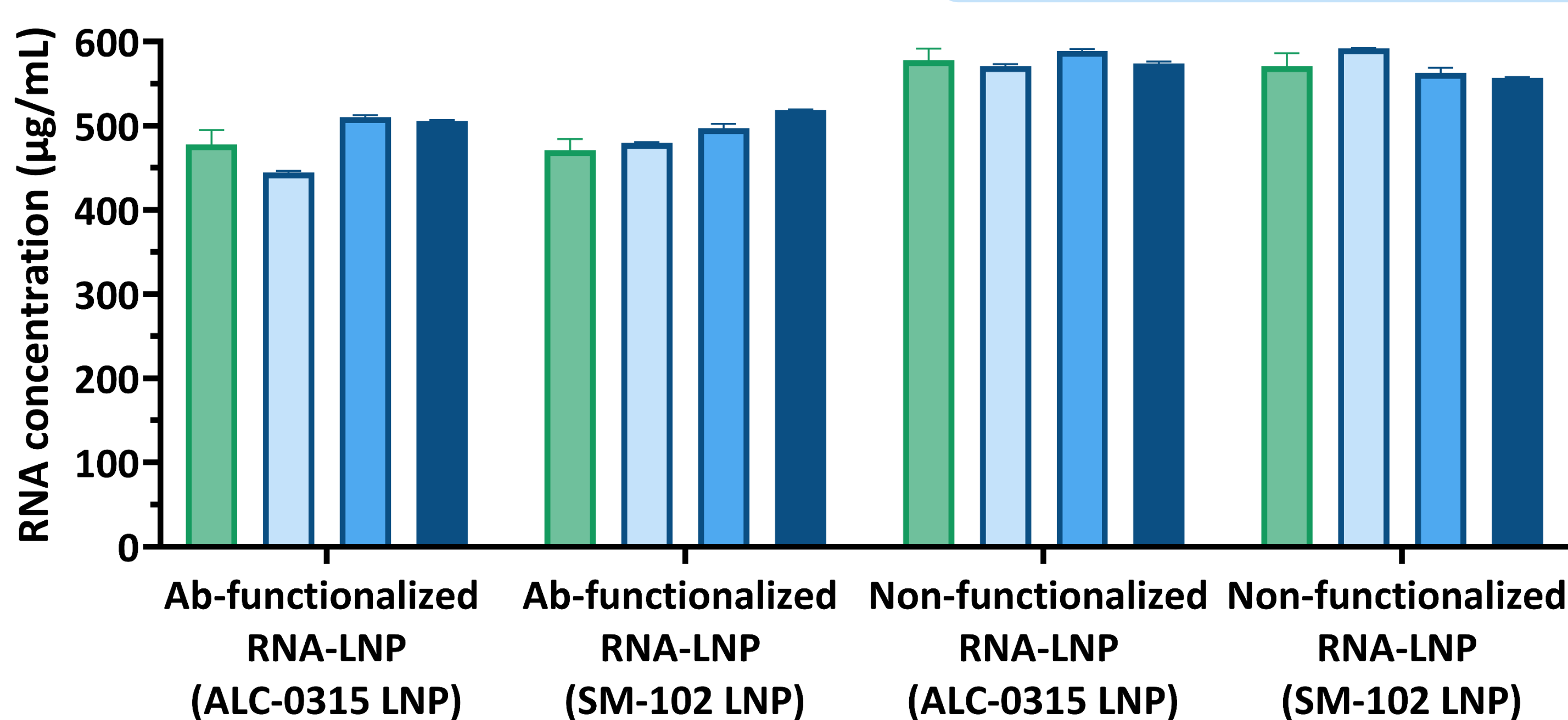


ALC-0315 LNP was used here as a representative example

RNA QUANTIFICATION

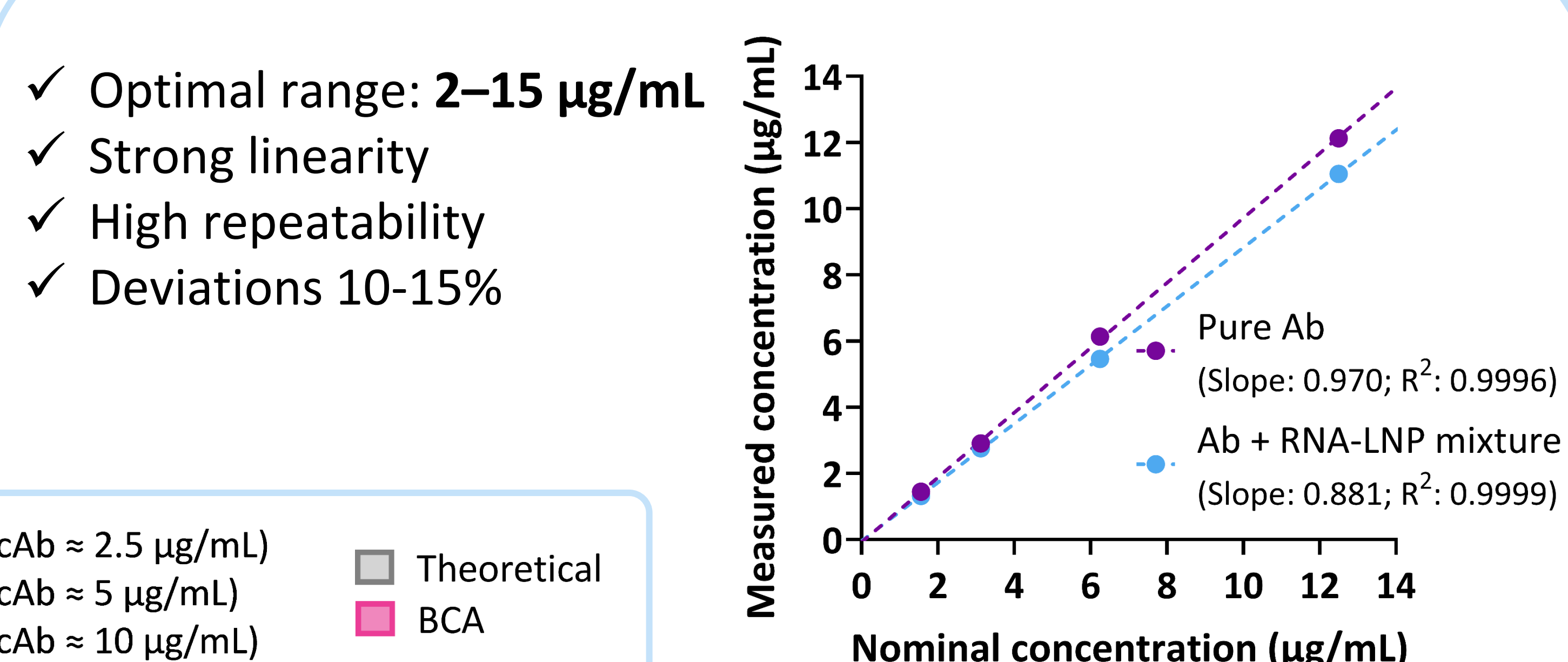


- ✓ Optimal range: 2–12 µg/mL
- ✓ Strong linearity
- ✓ High repeatability
- ✓ Deviations ≤5%

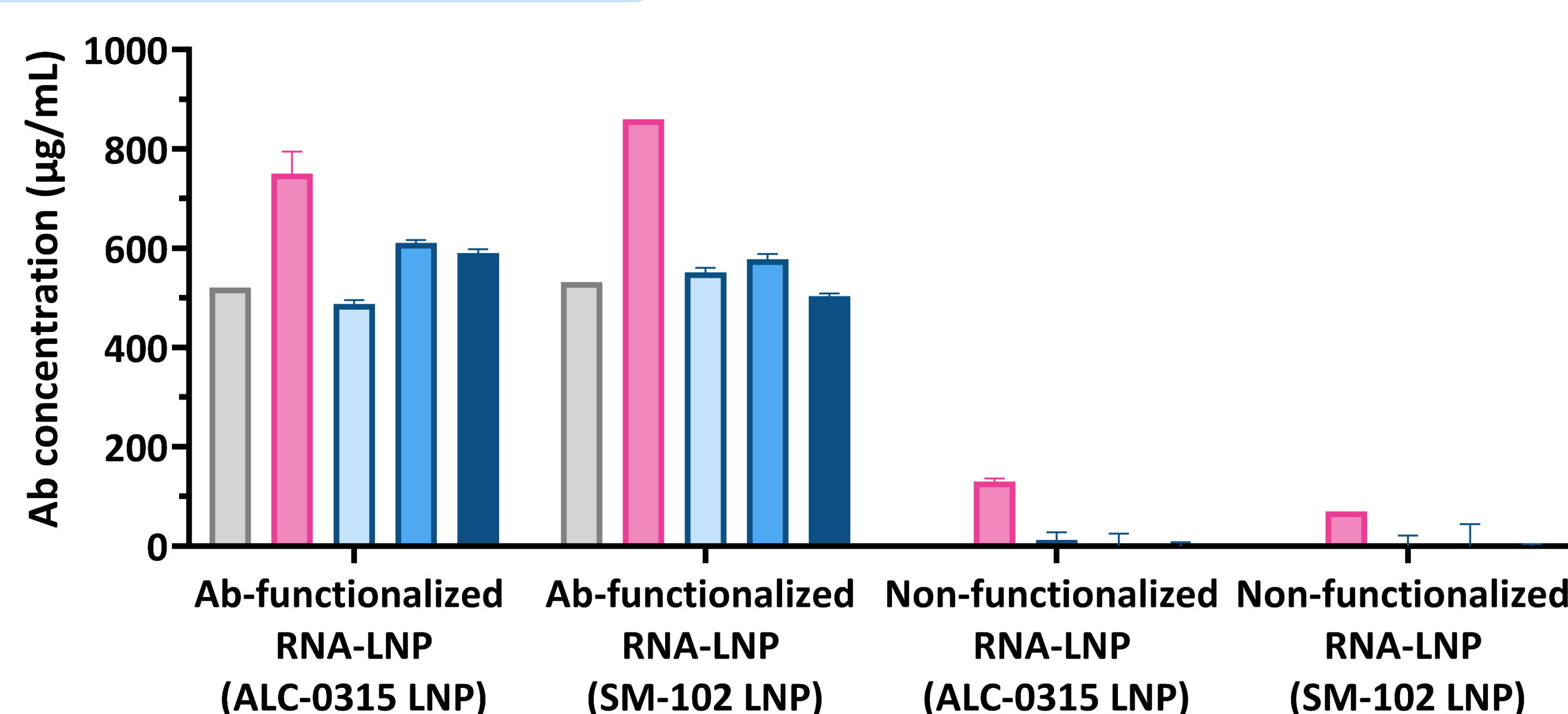


- ✓ Replicates: ≤1% deviation
- ✓ Dilutions: ≤8% deviation
- ✓ **Ribogreen: non-functionalized LNP ≤5% deviation**
- ✓ **Ab-functionalized LNP ≤10% deviation**

ANTIBODY QUANTIFICATION



- ✓ Optimal range: 2–15 µg/mL
- ✓ Strong linearity
- ✓ High repeatability
- ✓ Deviations 10-15%



- ✓ Replicates: ≤2% deviation
- ✓ Dilutions: ≤12% deviation
- ✓ Non-functionalized LNP: no antibody detected
- ✓ **Theoretical: Ab-functionalized LNP ≤15% deviation**