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Ludwig-Maximilians-Universität München

ZBP Colloquium, Thursday, November 27, 2025

pH-Dependent Mesophases Determine Lipid Nanoparticle Function: Toward Controlled Gene Expression and Cellular Reprogramming

Lipid nanoparticles (LNPs) are the leading platform for nucleic acid delivery. We show that pH-driven structural transitions of cationic ionizable lipids (CILs)—from inverse cubic (Fd3m) to inverse hexagonal (HII) phases—exist in model systems and appear to be correlated with gene delivery efficiency. Using high-resolution small-angle X-ray scattering, live-cell imaging on single-cell arrays (LISCA) and mathematical modeling we establish self-regulated and noise-buffered gene expression. We apply LNP delivery to transiently reprogram migratory phenotypes as a powerful tool for synthetic biology.

J.A. Müller, ..., J.O. Rädler. Eur. J. Pharm. Biopharm. 197:114222 (2024).
J. Philipp, ..., L. Lindfors, and J.O. Rädler, PNAS 120:e2310491120 (2023).

<https://tinyurl.com/zbp-raedler20251127>

Talk: 14:15

Tea/Coffee at 14:00

Campus Saarbrücken

Building C6.4

Room 0.09 (Lecture Hall II)

Schedule with
full abstract



Teams link

