



**Exponent<sup>®</sup>**  
Engineering & Scientific Consulting

## Rishad Dalal, Ph.D.

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### Professional Profile

Dr. Dalal specializes in polymer synthesis and characterization, with an emphasis on applications for biomaterial delivery. He has diverse experience in the fields of orthogonal polymerization, air-free chemistry, non-viral gene delivery, physiochemical polymer characterization, and in vitro and in vivo testing of biopolymers.

A chemist by training, Dr. Dalal is skilled in organic polymer and monomer synthesis, as well as molecular characterization using NMR, FTIR, UV-Vis spectroscopy, GC-MS, HPLC, and LC-MS. He also has practical knowledge of macromolecular structure characterization using size-exclusion chromatography (SEC), multi-angle laser light scattering, and static light scattering. Dr. Dalal also has expertise in analysis of polymer-DNA nanoparticle interactions through dynamic light scattering, zeta potential measurements, gel electrophoresis, and cell culture in vitro testing.

Prior to joining Exponent, Dr. Dalal obtained his Ph.D. from the University of Minnesota, Twin Cities, where he developed cationic polymeric vectors to enhance the efficacy of non-viral gene delivery. Specifically, his research included development of a family of cationic bottlebrush polymers as well as a library of linear polymers through controlled radical polymerization and combinatorial click chemistry, which were used to deliver pDNA and CRISPR-Cas9 proteins in biological systems. His highly interdisciplinary research included monomer synthesis, polymer synthesis, polymer physical characterization, biological delivery, and machine learning to study structure property relationships.

### Academic Credentials & Professional Honors

Ph.D., Chemistry, University of Minnesota, Twin Cities, 2022

M.S., University of Minnesota, Twin Cities, 2019

B.S., Chemistry, University of California, Irvine, 2016

### Professional Affiliations

American Chemical Society (member)

### Patents

U.S. Patent App No. 63/356,847: Bottlebrush Delivery Systems and Uses Thereof, July 2022 (Dalal R.J., Reineke T.M.)

## Publications

R.J. Dalal, M.L. Ohnsorg, S. Panda, T.M. Reineke; Hydrophilic Surface Modification of Cationic Unimolecular Bottlebrush Vectors Moderate pDNA and RNP Bottleplex Stability and Delivery Efficacy, *Biomacromolecules* 2022, 23, 12, 5179–5192 <https://doi.org/10.1021/acs.biomac.2c00999>

C.F. Santa Chalarca, R.J. Dalal, A. Chapa, M.G. Hansen, T.M. Reineke; Cation Bulk and pKa Modulate Diblock Polymer Micelle Binding to pDNA, *ACS Macroletters* 2022, 11, 4, 588–594 <https://doi.org/10.1021/acsmacrolett.2c00015>

R.J. Dalal, R. Kumar, M.L. Ohnsorg, M. Brown, and T.M. Reineke; Cationic Bottlebrush Polymers Outperform Linear Polymer Analogs for pDNA Expression, *ACS Macroletters* 2021, 10, 886–893 <https://doi.org/10.1021/acsmacrolett.1c00335>

M.R. Bockman, R.J. Dalal, R. Kumar, and T.M. Reineke; Facile Synthesis of GalNAc Monomers and Block Polycations for Hepatocyte Gene Delivery, *Polymer Chemistry* 2021, 12, 4063–4071 <https://doi.org/10.1039/D1PY00250C>

R. Kumar,|| C.F. Santa Chalarca,|| M.R. Bockman,|| C. Van Bruggen,‡ C.J. Grimme,‡ R.J. Dalal,‡ M.G. Hanson,‡ J.K. Hexum,‡ and T.M. Reineke; Polymeric Delivery of Therapeutic Nucleic Acids, *Chemical Reviews* 2021, (online) (||, ‡ = authors contributed equally) <https://doi.org/10.1021/ac.chemrev.0c00997>

C. Van Bruggen, J.K. Hexum,‡ Z. Tan,‡ R.J. Dalal,‡ T.M. Reineke; Nonviral Gene Delivery with Cationic Glycopolymers, *Accounts of Chemical Research* 2019, 52, 1347–1358. [ACS Editors' Choice] (‡ = authors contributed equally) <https://doi.org/10.1021/acs.accounts.8b00665>

## Presentations

Dalal, R.J., Reineke, T.M., High Throughput Design and Characterization of a Combinatorial Thiol-ene Tunable Polymer Scaffold for Efficient Gene Delivery via machine Learning, iPrime - Microstructured Polymers, University of Minnesota Twin Cities, June 1, 2022, Minneapolis, MN.

Dalal, R.J., Reineke, T.M., Comparison of Cationic Bottlebrush Polymers for Nucleic Acid Delivery, Excellence in Polymer Graduate Research Symposium, ACS 2022 National Meeting, Mar 20–24, 2022, San Diego, CA.

Dalal, R.J., Reineke, T.M., Comparison of Cationic Bottlebrush Polymers for Nucleic Acid Delivery, ACS 2021 National Meeting, Aug 21–26, 2021, Atlanta, GA.

Dalal, R.J., Shea, K.J., Abiotic Affinity Ligands: NiPAm Based Polymer NPs for IgG Affinity, ACS 2016 National Meeting, March 13–17, 2016, San Diego, CA.

## Additional Education & Training

Excellence in Polymer Graduate Research, American Chemical Society, 2022

Graduated with Honors, University of California, Irvine, 2016