



Exponent®
Engineering & Scientific Consulting

Caitlin Horgan, Ph.D.

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Professional Profile

Caitlin L. Horgan, Ph.D., is a Scientist in Exponent's Biomedical Engineering & Sciences practice, focusing on biological characterization, analytical method development, biomaterials, drug-delivery systems, microbiology, and *in vitro* diagnostic technologies. She helps clients evaluate product performance, biological interactions, contamination risks, analytical data, and development challenges involving pharmaceuticals, biologics, medical devices, diagnostics, biomaterials, and advanced therapeutic platforms.

Dr. Horgan's expertise is founded on interdisciplinary training in microbiology, immunology, analytical chemistry, biomaterials, and pharmaceutical development. She applies experimental and analytical approaches to characterize complex products and biological systems, investigate sources of variability or performance limitations, and evaluate interactions among microorganisms, proteins, biomaterials, therapeutics, and medical products. Her experience spans analytical method development and validation, assay development, formulation optimization, technology transfer, contamination testing, stability assessment, and translational product development across research, clinical, and regulated environments.

Prior to joining Exponent, Dr. Horgan conducted research at AstraZeneca, the University of Notre Dame, the Wyss Institute for Biologically Inspired Engineering at Harvard Medical School, and Simmons University. Her work included development of analytical methods for pathogen-associated molecular patterns, lipid nanoparticle and drug-delivery technologies, allergy diagnostics and immunoassays, clinical-trial support, and pre-IND formulation development.

Biological Characterization & Product Development

Dr. Horgan assists clients in understanding how biological materials, biomaterials, therapeutics, and medical products interact with complex biological systems. She evaluates biological performance, identifies factors influencing product behavior, and assesses relationships among formulation, structure, function, and clinical application. Her experience includes characterization of immunological responses, biological compatibility, protein-pathogen interactions, and stability of products ranging from small molecules to novel therapeutic platforms. She helps clients interpret scientific evidence supporting product development, performance assessment, regulatory decision-making, and translational research.

Microbiology & Molecular Biology

Dr. Horgan provides consulting support involving microbiological systems, microbial materials, and biologically derived products. Her experience includes bacterial, fungal, and mammalian cell culture; pathogen-associated molecular pattern characterization; endotoxin assessment; nucleic acid and protein purification; molecular biology techniques; and biological characterization of microorganisms and

microbial products. She integrates microbiological, molecular biological, and analytical approaches to evaluate microbial testing data, contamination-related concerns, biological materials, and microbiologically influenced product performance.

In Vitro Diagnostics & Assay Development

Dr. Horgan supports clients developing and evaluating in vitro diagnostic technologies, immunoassays, biomarker assays, and biologically based analytical methods. Her experience includes assay design, optimization, validation, and performance assessment, including technologies for allergy detection, pathogen characterization, and biomarker quantification. Her expertise includes ELISA-based methods, immunoassays, flow cytometry, cellular studies, binding assays, and biomarker quantification approaches.

Biomaterials, Nanoparticles & Drug-Delivery Systems

Dr. Horgan assists clients in evaluating biomaterials, lipid nanoparticle systems, targeted drug-delivery platforms, and advanced therapeutic technologies. Her experience includes formulation development, nanoparticle characterization, biomaterial functionalization, targeted delivery strategies, stability assessment, payload encapsulation, and biological performance evaluation. She helps clients understand how formulation variables, particle characteristics, material properties, and biological interactions influence product performance, manufacturability, and translational potential.

Analytical Development & Characterization

Dr. Horgan provides consulting support involving analytical method development, product characterization, and interpretation of complex analytical datasets. Her experience includes chromatographic separations, protein characterization, materials characterization, nanoparticle analysis, and orthogonal analytical testing strategies. She assists clients in evaluating analytical methods, interpreting laboratory findings, investigating variability, comparing analytical approaches, and establishing scientifically supported conclusions regarding product identity, quality, stability, and performance.

Study Design, Data Analysis & Translational Development

Dr. Horgan assists clients in designing studies, evaluating experimental data, and supporting product-development programs spanning early research through translational development. Her experience includes Design of Experiments (DOE), statistical analysis, root-cause investigation, analytical method validation, technology transfer, clinical-trial support, cGLP/cGMP studies, pre-IND development activities, and in vivo study design. She helps clients optimize development strategies and interpret findings for product development and regulatory decision-making.

Academic Credentials & Professional Honors

Ph.D., Chemistry, University of Notre Dame, 2025

B.S., Chemistry, Simmons University, 2016

Biochemistry and Integrated Biomedical Sciences Annual Retreat Oral Presentation Award, University of Notre Dame, 2025

Harper Cancer Research Center Oral Presentation Award, University of Notre Dame, 2025

Biochemistry and Integrated Biomedical Sciences Annual Retreat Poster Presentation Award: University

of Notre Dame, 2024

Leonard J. Soltzberg Departmental Service Award, Simmons University, 2016

Francis F. Zion Endowed Scholarship, Simmons University, 2016

Outstanding Chapter Award, Americal Chemical Society, 2015

Green Chemistry Student Chapter Award, Americal Chemical Society, 2015

Prior Experience

Senior Scientist – Small Molecule Pre-formulations, AstraZeneca, 2025-2026

Research Assistant III – Protein Analysis and Characterization, The Wyss Institute at Harvard Medical School, 2016-2019

Professional Affiliations

American Chemical Society (ACS)

Sigma Xi – Scientific Research Honors Society

Harper Cancer Research Center, University of Notre Dame

Warren Drug Discovery Center, University of Notre Dame

Patents

US Patent Application 19/333,170: Covalent Dual-Function Inhibitors of Peanut Allergies, March 2026, (Bilgicer, B., et. Al.)

Publications

Bromley E, Sjoerdsma JN, Horgan CL, Smith SA, Khan DA, Phillips EJ, Blumenthal KG, Stone CA, Bilgicer B. [Engineering nanoallergens to investigate origins of immunogenicity and cross-reactivity in cephalosporin allergy](#). Journal of Allergy and Clinical Immunology 2025; 155(6):1957–1967.

Sjoerdsma J, Bromley EK, Shin J, Hilliard T, Liu Y, Horgan C, Hwang G, Bektas Michael, Omstead D, Kiziltepe T, Stack MS, Bilgicer Basar. [Combination non-targeted and sGRP78-targeted nanoparticle drug delivery outperforms either component to treat metastatic ovarian cancer](#). Journal of Controlled Release 2024.

Super M, Doherty EJ, Cartwright MJ, Seiler BT, Langellotto F, Dimitrakakis N, White DA, Stafford AG, Karkada M, Graveline AR, Horgan CL, Lightbown KR, Urena FR, Yeager CD, Rifai SA, Dellacherie MO, Li AW, Leese-Thompson C, Ijaz H, Jiang AR, Chandrasekhar V, Scott JM, Lightbown SL, Ingber DE, Mooney DJ. [Biomaterial vaccines capturing pathogen-associated molecular patterns protect against bacterial infections and septic shock](#). Nature Biomedical Engineering 2021; 6:8–18.

Presentations

Horgan C, Littlepage L, Bilgicer B. A breakthrough in breast cancer research: novel dual-loaded targeted lipid nanoparticles achieves synergy across all luminal subtypes. Oral presentation, Biochemistry and Integrated Biomedical Sciences Retreat, Notre Dame, IN, 2025.

Horgan C, Littlepage L, Bilgicer B. A breakthrough in breast cancer research: novel dual-loaded targeted lipid nanoparticles achieves synergy across all luminal subtypes. Oral presentation and Poster Presentation, Harper Cancer Research Center Annual Symposium, Notre Dame, IN, 2025.

Horgan C, Littlepage L, Bilgicer B. A breakthrough in breast cancer research: novel dual-loaded targeted lipid nanoparticles achieves synergy across all luminal subtypes. Poster presentation, Catherine Peachey Foundation Breast Cancer Research Symposium, Kokomo, IN, 2025.

Horgan C, Al Wuhaili S, Littlepage L, Bilgicer B. Targeted liposomal delivery of PI3K inhibiting prodrugs to treat breast cancer. Poster presentation, Warren Drug Discovery Center Research Symposium, Notre Dame, IN, 2024.

Horgan C, Al Wuhaili S, Littlepage L, Bilgicer B. Targeted liposomal delivery of PI3K inhibiting prodrugs to treat breast cancer. Poster presentation, Biochemistry and Integrated Biomedical Sciences Retreat, Plymouth, IN, 2024.

Horgan C, Al Wuhaili S, Littlepage L, Bilgicer B. Targeted liposomal delivery of PI3K inhibiting prodrugs to treat breast cancer. Poster presentation, Indiana University School of Medicine Cancer Research Symposium, Indianapolis, IN, 2024.

Horgan C, Al Wuhaili S, Littlepage L, Bilgicer B. Targeted liposomal delivery of PI3K inhibiting prodrugs to treat breast cancer. Poster presentation, Harper Cancer Research Center Annual Symposium, Notre Dame, IN, 2024.