Ankur Singhal, MA
Senior Analytics Scientist

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Academic and Professional Profile

Mr. Ankur Singhal is an environmental health scientist specializing in quantitative exposure science. He uses his expertise in exposure assessment along with his unique skill set in data collection, data science and machine learning (ML) to provide end-to-end risk assessment solutions for his clients. He has experience conducting field studies, simulation studies and exposure reconstructions to generate data; developing mathematical models, including ML models, to characterize and predict exposures; and performing human health risk assessments.

Mr. Singhal is an active participant in the academic and professional community publishing in peer-reviewed journals and presenting in conferences such as American Industrial Hygiene Association (AIHA), Society for Risk Analysis (SRA), International Society for Exposure Sciences (ISES), Society of Toxicology (SOT), and Product Stewardship Society.

Education and Degrees Earned

- M.A., Endocrinology, University of California, Berkeley, 2011
- B.A., Molecular and Cell Biology, University of California, Berkeley, 2008

Membership to Professional Societies

- Society for Risk Analysis (SRA)
- American Industrial Hygiene Association (AIHA)
  - Member of Risk Assessment Committee (2018 – 2020)
- Product Stewardship Society (PSS)
  - Member of Credentialing Committee (2018 – 2020)
  - Author on chapters for the Principal Practices of Product Stewardship (2019)
- Society of Toxicology (SOT)
- Society of Environmental Toxicology and Chemistry (SETAC)
- International Society of Exposure Science (ISES)

Experience Summary (Professional Career)

Paustenbach and Associates
Senior Analytics Scientist
April 2020 – Present

- Consultant in toxicology, risk assessment, consumer product safety, statistics, and data science and quality
- Provide expertise in statistics, regression analysis, and advanced analytical tools statistics such as machine learning, deep learning, computer vision, natural language processing (NLP), recommender systems. Proficient in Mathematica, R, Python
- Address epidemiology, toxicology, occupational health, ecotoxicology, environmental toxicology and carcinogenic risk assessment
- Develop physiologically-based pharmacokinetic (PBPK) models
- Expert in various toxicants including asbestos, benzene, PFOA, PFOS, formaldehyde, lead, cadmium, chromium, radionuclides and a host of other chemicals
- Assess risks of exposure to nearly any chemical in air (direct and bystander exposure in the workplace), water, groundwater, soil, sediments, and consumer products

Empirical Solutions Consulting, LLC
President and Founder
July 2019 – April 2020

- Consultant in litigation support, consumer product safety, statistics, data science and analytics
- Created COVID-19 projection tools (code available in GitHub)
- Created an NLP to recommendation system pipeline for rock climbers

Exponent, Inc.
Managing Scientist
January 2013 – May 2019

- One of the youngest scientists to ever become a Managing Scientist
- Consulted in the areas of risk assessment, environmental and occupational toxicology, and the scientific aspects of toxic tort cases. Provided advice on industry hygiene issues as well as remedial/feasibility studies
- Created quality control programs for Fortune 500 companies in order to maintain compliance with consumer product safety regulations around the country include CPSIA and California's Proposition (Prop) 65.
- Provided expertise in consumer product safety matters, industrial and occupational toxicology, pharmacokinetics (PBPK modeling), environmental fate and transport, air pollution, odor abatement and ventilation engineering

- Routinely involved in evaluation of health hazards posed by hazardous waste sites, landfills, contaminated soil, gaseous emissions, water, the workplace, pesticides and manufacturing processes
- Managed projects involving the assessment of the health risks and significance of chemical contaminants present in water, sediment, ambient air, food, soil, the occupational environment, and in consumer products
- Frequently interacted with local, regional, state and federal regulatory agencies

Key Projects (Partial List)

- **California Proposition 65 assessment**: Mr. Singhal has over 7 years of experience performing California Prop 65 assessments for numerous chemicals including the most litigated ones – lead, cadmium, phthalates, bisphenol-A (BPA) and formaldehyde – in consumer products and food products. Mr. Singhal has also been working with the cannabis industry to assess Prop 65 compliance for their products, especially those meant to be orally ingested.
- **Quality Assessment and Quality Control (QA/QC) programs**: Mr. Singhal has helped many of his consumer product clients develop Prop 65 screening programs as part of their Quality Control programs in order to proactively manage CPSIA and Prop 65 compliance internally.
- **Risk assessment for radionuclides:** Mr. Singhal has helped clients conduct assessments to estimate risk from radionuclides potentially present in the groundwater and soil. He is familiar with RESRAD and the PRG calculators for assessing risk to radionuclides.
- **Potential adverse effects of vaping of liquids containing nicotine and various flavorings.** Evaluating whether e-cigarettes are a public health problem or a benefit to those who are trying to quit smoking (or both).
- **Evaluation of claims that airborne dust from a former Naval site posed a cancer hazard to the community.** It was claimed that hundreds of persons who lived within ¼ mile of a former Naval base had been exposed to airborne dust (soil) from the facility and that it had entered their homes and was causing adverse health effects. Evaluated air and dust data in order to conduct an assessment.
- **Air quality assessments**: Mr. Singhal has conducted numerous indoor and ambient air quality assessments using low cost sensors, active sampling, exposure chambers, etc. to determine exposure to pollutants such as benzene, formaldehyde, volatile organic compounds (VOCs) and asbestos among others.
- **Predicting air quality using low cost sensors**: Mr. Singhal is actively researching the use of advanced data science methods such as deep learning to predict air quality. For example, he is currently building a deep neural network model to predict air quality at any geolocation based on features like weather patterns or even photos taken from someone's phone.
- **Formaldehyde exposures from laminate flooring**: Mr. Singhal led a team of several Exponent and non-Exponent scientists to assess formaldehyde exposures from laminate flooring. This work emerged out of the Lumber Liquidators litigation. He and his team

collected the largest ever consumer product data set collected to date and developed novel mathematical models to estimate formaldehyde exposures from consumer products. This work was presented to US Consumer Product Safety Commission (CPSC) and has since then been published.

- **Biocompatibility assessment for consumer wearables:** Mr. Singhal has helped many of his clients in the tech industry assess dermal sensitization risk from their wearable products. Wearable products are unique in their composition and in how they are regulated and therefore, also require unique exposure assessment approaches. Mr. Singhal and his team at Exponent developed seminal methods for estimating allergic contact dermatitis (ACD) risk from wearable devices. This work has also been published.
- **PBPK model for malathion:** Mr. Singhal updated a PBPK model for malathion using *in vivo* human data
- **Identifying potential equipment failures using computer vision:** Mr. Singhal helped develop a state of the art computer vision model to screen thousands of images of electrical utility equipment to identify and tag images that may have the potential of failing in order to proactively manage equipment failures.
- **Develop a natural language processing-to-recommender system pipeline:** Mr. Singhal developed a recommender system for rock climbers. He first gathered publicly available data on websites using advanced website scraping techniques, parsed through these data using advanced NLP techniques and ultimately developed a recommender system that would aid climbers identify similar climbs and climbers based on their prior preferences.
- **Data analysis and data science:** Mr. Singhal has been helping these companies make the most out of their data by providing *ad hoc* data analysis services. His clients have included construction companies, utility companies and consumer products companies.

Publications

- Bogen KT, Lewis RC, Singhal A, Sheehan P. 2020. Development of a Novel Method for Estimating Dermal Contact with Hand-Applied Cleaning Solutions. Environmental Monitoring and Assessment. Environ Monit Assess 2020; 192:157.

- Sheehan P, Singhal A, Bogen KT, MacIntosh D, Kalmes RM, McCarthy J. 2018. Potential Exposure and Cancer Risk from Formaldehyde Emissions from Installed Chinese Manufactured Laminate Flooring. Risk Anal 2017. doi:10.1111/risa.12926

- Singhal A, Posson M, Kalmes R, Gauthier A, Lewis R, Schenk J, Goswami E and Sheehan P. 2018. Proposition (Prop) 65 Risk Assessment. In: G Hart (Eds), Professional Practices of Product Stewardship (pp. 423-427). Falls Church, VA: Product Stewardship Society.

- Singhal A, Bogen KT, Sheehan P. 2018. Wearable Devices. In: G Hart (Eds), Professional Practices of Product Stewardship (pp. 428-433). Falls Church, VA: Product Stewardship Society.

- Bogen KT, Singhal A. Malathion dermal permeability in relation to dermal load: Assessment by PBPK modeling of in vivo human data. J Env Sci Health, Part B 2016; 0:1-9.

- Marconett CN, Singhal A, Sundar SN, Firestone GL. Indole-3-carbinol disrupts estrogen receptor-alpha dependent expression of insulin-like growth factor-1 receptor and insulin receptor substrate-1 and proliferation of human breast cancer cells. Molecular and Cellular Endocrinology 2012; 363:74-84.

- Marconett CN, Morgenstern TJ, San Ramon AK, Sundar SN, Singhal A, Firestone GL. BZL101, a phytochemical extract from Scutellaria barbata plant, disrupts proliferation of human breast and prostate cancer cells through distinct mechanisms dependent on the cancer cell phenotype. Cancer Biology and Therapy 2010; 10: 397-405.

Presentations at Scientific Conferences

- Schenk J, Singhal A, Scrafford C, Kalmes R. Emerging Regulatory Issues and Exposure Assessment of Furfuryl Alcohol (FFA). Presented at the Joint Annual ISES/ISEE Meeting, August 26-30, 2018, Ottawa, Canada.

- Singhal A, Kalmes R, Posson M. 2018. Addressing Chemical Exposure from Consumer Products: Lessons Learned. Presented at 2nd Annual Product Stewardship Society Conference Annual Meeting in Washington, DC, September 27-29, 2018.

- Singhal A, Kalmes R, Sheehan P. 2018. Lessons Learned from Formaldehyde Sampling Conducted in U.S. Homes. Presented at American Industrial Hygiene Conference and Exposition (AIHce) Annual Meeting in Philadelphia, PA, May 2018.

- Singhal A. 2018. Determining Compliance for Proposition 65 in Proposition 65 Update. Webinar presentation for International Society of Primerus Law Firms.

- Singhal A. 2017. Oral (non-food-mediated) exposure to plastic product additives. Presented at the European Chemicals Agency (ECHA) additives in plastics workshop, Brussels, Belgium, November 7-8, 2017.

- Singhal A and Sheehan PJ. 2017. Consumer Wearables: A New Product Stewardship challenge. Presented at the 1st Annual Meeting of Product Stewardship Society, Tampa, FL, November 2-4, 2017.

- Gauthier AM, Lewis RC, Bogen KT, Singhal A, Sheehan PJ. 2017. Wearable Technology Biocompatibility: A Unique Opportunity in Green Chemistry and Engineering. Presented at the 21st Annual Meeting of Green Chemistry and Engineering Conference, Reston, VA, June 13-15, 2017.

- Lewis RC, Winegar E, Posson M, Gauthier AM, Singhal A, Sheehan PJ. 2017. Exposure to an Ethanol-based Cleaning Product. Presented at American Industrial Hygiene Conference and Exposition Annual Meeting, Seattle, WA, June 4-7, 2017.

- Singhal A, Bogen KT, Lewis RC, Gauthier AM, Winegar E, Sheehan PJ. 2017. A Novel Approach to Estimating Dermal Contact with Hand-Applied Cleaning Solutions: A Simulation Study Involving Denatured Alcohol. Presented at the 56th Annual Meeting of the Society of Toxicology, Baltimore, MD, March 2017.

- Winegar E, Bogen KT, Lewis RC, Gauthier AM, Singhal A, Sheehan PJ. 2017. A Use-Simulation Study of a Denatured Alcohol Cleaning Product to Assess Potential Worker Exposure. Presented at the 56th Annual Meeting of Society of Toxicology, Baltimore, MD, March 10-16, 2017.

- Singhal A, Posson M, Jones A, Lewis RC, Gauthier A, Schenk J, Kalmes R, Sheehan PJ. Assessing Risk for Consumer Products Under California's Proposition 65 Regulations. 2016. Presented at the 37th Annual Meeting of Society of Environmental Toxicology And Chemistry, Orlando, FL, November 6-10, 2016.

- Sheehan P, Singhal A, Bogen KT, Kalmes R. Evaluating the Proposition 65 Health Significance of Formaldehyde Exposures from Chinese Manufactured Laminate Flooring. Presented at the 55th Annual Meeting of the Society of Toxicology, New Orleans, LA, March 13 - 17, 2016.

- Singhal A and Bogen KT. How Malathion Dermal Absorption Varies with Dermal Load, Based on Physiologically Based Pharmacokinetic Modeling of In Vivo Human Data. Presented at the 55th Annual Meeting of the Society of Toxicology, New Orleans, LA, March 13 - 17, 2016.

- Sheehan P, Lowney Y, Kalmes R, Bogen KT, Posson M, Glomski M, Singhal A, Volberg V, Beckerman B, Goswami E. Assessing User Exposure to Consumer Products: Methods Specific to Product Use and Exposure Route to Assess Consumer Health Risk. Presented at the 36th Annaul Meeting of SETAC North America, Salt Lake City, UT, November 1 - 5, 2015.

- Kalmes R, Lowney Y, Sheehan P, Singhal A. Assessing Incidental Hand-to-Mouth Exposure to Lead from Consumer Products. Presented at the 36th Annaul Meeting of SETAC North America, Salt Lake City, UT, November 1 - 5, 2015.

- Sheehan P, Bogen KT, Singhal A, Kalmes R, Volberg V. Wearable technology products and allergic contact dermatitis: Chemical exposure and risk assessment challenges & developments. SETAC North America 36th Annual Meeting, Salt Lake City, UT, November 1-5, 2015.

- Sheehan P, Bogen KT, Singhal A, Kalmes R, Roberts M, Fedoruk MJ. Wearable products and allergic contact dermatitis: a new risk assessment challenge. Presented at the 54th Annual Meeting of the Society of Toxicology, San Diego, CA, March 22-26, 2015.

- Singhal A, Sheehan P, Turnham P, Bogen KT, Anderson E. Experimental comparison of dust concentrations from simulations in glove box and room chamber test environments.

Presented at the American Industrial Hygiene Association Annual Meeting, San Antonio, TX, May 31-June 5, 2014.

- Singhal A, Sheehan P, Turnham P, Bogen KT, Anderson E. Experimental comparison of dust concentrations from simulations in glove box and room chamber test environments. Presented at the American Industrial Hygiene Association Annual Meeting, San Antonio, TX, May 31-June 5, 2014.

- Sheehan P, Posson M, Singhal A, Bogen KT, Hellerstein J. Assessing anthraquinone (AQ) exposure from food packaging: A product stewardship challenge in Europe. Presented at the American Industrial Hygiene Association Annual Meeting, San Antonio, TX, May 31-June 5, 2014.

- Singhal A, Bogen KT. Benchmark dose analysis of NTP data on tumors induced in rodents chronically exposed to dietary anthraquinone. Presented at the 53rd Annual Meeting of the Society of Toxicology, Phoenix, AZ, March 23-March 27, 2014.