Alice Han, Ph.D.

Senior Health Scientist

Summary of Experience

Dr. Alice Han has practiced in the areas of analytical chemistry, product testing, regulatory compliance support, product stewardship, human health risk assessments, toxicology, and computational modeling since 2017. She earned a bachelor's degree in chemistry, a Ph.D. in analytical chemistry, and focused her post-doctoral training in physiological based pharmacokinetic (PBPK) modeling. Dr. Han has provided consulting services encompassing analytical and toxicological characterization of consumer products, risk assessments, excess lifetime cancer risk characterization, and regulatory reporting. As the technical expert in analytical chemistry, Dr. Han has collaborated closely with testing laboratories in designing studies, overseeing testing, and interpreting data. Dr. Han's work includes investigation of potential exposures and health risks associated with various ingredients in consumer products, including personal care items, electronic nicotine delivery systems, and oral nicotine products. Additionally, she has expertise in evaluating product stability and shelf-life of consumer products. Her recent research interests have focused on using computational tools to refine internal dose predictions for exposure and hazard assessments. Dr. Han has published 30 abstracts, book chapters, and peer reviewed papers on various toxicology, biomonitoring, and exposure assessment related topics.

Education

Bachelor of Arts (B.A.), Chemistry, 2012, St. Mary's College of Maryland

Doctor of Philosophy (Ph.D.), Analytical Chemistry, 2017, West Viriginia University

Project Experience

Regulatory Support and Product Stewardship

Provided regulatory support for preparation of Pre-Market Tobacco Applications (PMTAs) and Modified Risk Tobacco Product Applications (MRTPAs) for electronic nicotine delivery systems (ENDS), oral nicotine products, and smokeless or heat-not-burn tobacco products to the U.S. Food and Drug Administration (FDA). Lead product characterization (harmful or potentially harmful constituents, leachable compounds, microbial) and stability testing efforts, coordinated nonclinical studies, including in vitro genotoxicity, mutagenicity, and cytotoxicity assays, and conducted human health risk assessments to evaluate the impact of ENDs and oral nicotine products on human health and the appropriateness for the protection of public health.

In response to EPA test orders, supported clients with planning and execution of various OECD toxicity testing, including developing study plans with testing labs, interpreting data, and assisting with communication and reporting to the EPA.

Oversaw toxicity testing of various chemicals and consumer products per OECD guidelines. Reviewed data and communicated with testing laboratories to provide clients with further testing recommendations

Exposure and Risk Assessments

Conducted human health risk assessments, consisting of hazard identification, dose-response assessment, exposure assessment, and risk characterization of potential contaminants and ingredients in consumer products to understand risks from use for an anticipated consumer.

Characterized excess lifetime cancer risks of potential carcinogenic and genotoxic constituents in consumer products.

Assessed ethanol exposures in sensitive populations from use hygiene products and potential developmental toxicity effects. Utilized PBPK modeling, benchmark dose-modeling, and review of toxicological and epidemiological literature to evaluate the margin of exposure compared to toxicity and health benchmarks.

Evaluated exposures to herbicides and pesticides in environmental and occupational settings through review and comparison of biomonitoring data and computationally predicted exposure concentrations to health benchmarks.

Investigated potential exposures and associated hazards for unintended contaminants in food cargo and downstream food products.

Computational Modeling

Collaborated with team in the development and validation of a PBPK model used to predict ethanol exposures from dermal and inhalation routes from the use of alcohol-based hand sanitizers. Developed a PBPK model to investigate chemical concentrations distributed in saliva for potential non-invasive monitoring applications.

Evaluated nicotine dosimetry of *in vitro* toxicological outcomes in relation to expected human exposures via *in vitro* to *in vivo* extrapolation (IVIVE) computational methodologies.

Professional Experience

Senior Health Scientist, Valeo Sciences LLC, May 2024 – present

Assess product stability, toxicology, chemistry, and potential health hazards of consumer products and conduct comprehensive human health risk assessments to support product stewardship. Advise on and manage regulatory compliance requirements and reporting.

Senior Health Scientist, Stantec (ChemRisk) (Formerly Cardno ChemRisk and ChemRisk), December 2019 – May 2024.

Served as technical expert on projects involving analytical chemistry and product testing, exposure assessments, and hazard identification of various consumer products. Investigated computational modeling methods to estimate internal dosimetry from external exposures.

Research Associate, Chemical Biology and Exposure Science Team, Pacific Northwest National Laboratory, September 2017 – November 2019

Utilized computational and in vitro methodologies to develop physiologically based pharmacokinetic (PBPK) models to assess the feasibility of rapid and non-invasive salivary biomonitoring of environmental and occupational exposures.

Graduate Research Associate, Department of Chemistry, West Virigina University, August 2012 – August 2017.

Researched stress responses in vitro, in vivo, and in human subjects resulting from environmental, chemical, and physical stressors. Explored network analysis of biochemical responses to predict performance outcomes.

Professional Membership and Service

- Society of Toxicology (SOT)

Peer-Reviewed Publications

Han, A.A., A.N. Buerger, H. Allen, M. Vincent, S.A. Thornton, K.M. Unice, A. Maier, and A. Quiñones-Rivera. Assessment of ethanol exposure from hand sanitizer use and potential for developmental toxicity in nursing infants. J Appl Toxicol. 2022 Sep;42(9):1424-1442. doi: 10.1002/jat.4284.

Penatzer J.A., J.V. Miller, A.A Han, N. Prince, and J.W. Boyd. Salivary cytokines as a biomarker of social stress in a mock rescue mission. Brain Behav Immun Health. 2020 Mar 28;4:100068. doi: 10.1016/j.bbih.2020.100068.

Han A.A., C. Timchalk, Z.A. Carver, T.J. Weber, K.J. Tyrrell, R.L. Sontag, T. Gibbins, W.B. Chrisler, K.K. Weitz, D. Du, Y. Lin, and J.N. Smith. Physiologically based pharmacokinetic modeling of salivary concentrations for noninvasive biomonitoring of 2,4-dichlorophenoxyacetic acid (2,4-D). Toxicol Sci. 2019 Dec 1;172(2):330-343. doi: 10.1093/toxsci/kfz206. PMID: 31550007.

Carver, Z.A., A.A. Han, C. Timchalk, T.J. Weber, K.J. Tyrrell, R.L. Sontag, T. Luders, W.B. Chrisler, K.K. Weitz, and J.N. Smith. Evaluation of non-invasive biomonitoring of 2,4-dichlorophenoxyacetic acid (2,4-D) in saliva. Toxicology, 2018, pp. 410: 171-181. doi: 10.1016/j.tox.2018.08.003.

Han, A.A., H.N. Currie, M.S. Loos, J.V. Miller, G. Scardoni, and J.W. Boyd. The impact of cytokine responses in the intra- and extracellular signaling network of a traumatic injury. Cytokine, 2018, pp. 106: 136-147. doi: 10.1016/j.cyto.2017.10.027.

Han, A.A., E.B. Fabyanic, J.V. Miller, M.S. Prediger, A.N. Prince, J.A. Mouch, and J.W. Boyd. In vitro cytotoxicity assessment of a West Virginia chemical spill mixture involving 4-methyl cyclohexane methanol and propylene glycol phenyl ether. Environmental Monitoring and Assessment, 2017, pp. 189: 190(4). doi: 10.1007/s10661-017-5895-5.

Han, A.A., H.N. Currie, M.S. Loos, J.A. Vrana, E.B. Fabyanic, M.S. Prediger, and J.W. Boyd. Spatiotemporal phosphoprotein distribution and associated cytokine response of a traumatic injury. Cytokine, 2016, pp. 79:12-22. doi: 10.1016/j.cyto.2015.12.006.

Vrana, J.A., H.N. Currie, A.A. Han, and J.W. Boyd. Forecasting cell death dose-response from early signal transduction responses in vitro. Toxicological Sciences, 2014, pp. 140(2):338–351. doi: 10.1093/toxsci/kfu089.

Currie, H.N., J.A. Vrana, A.A. Han, G. Scardoni, N. Boggs, and J.W. Boyd. An approach to investigate intracellular protein network responses. Chemical Research in Toxicology, 2014, pp. 27(1):17–26. doi: 10.1021/tx400247g.

Sasmal, P.K., S. Carregal-Romero, A.A. Han, C.N. Streu, Z. Lin, K. Namikawa, S.L Elliott, R.W. Köster, W.J Parak, and E. Meggers. Catalytic azide reduction in biological environments. ChemBioChem, 2012, pp. 13: 1116–1120. doi: 10.1002/cbic.201100719.

Book Chapters

Boyd, J.W., J.A. Penatzer, N. Prince, J.V. Miller, A.A. Han, and H.N. Currie. Bioenergetic analyses of in vitro and in vivo samples to guide toxicological endpoints. In: Methods in Molecular Biology. 2020;2102:3-15. doi: 10.1007/978-1-0716-0223-2_1.

Boyd, J., R. Neubig, A. Han, and M. Prediger. Chapter 1: Introduction to cellular signal transduction: The connection between a biological system and its surroundings. In: Cellular Signal Transduction in Toxicology and Pharmacology: Data Collection, Analysis, and Interpretation, Wiley, 2019. doi: 10.1002/9781119060208.ch1

Scardoni, G., G. Tosadori, J. Morris, A. Pegoraro, S. Pratap, C. Laudanna, and A. Han. Chapter 7: Computational methods for signal transduction: A network approach. In: Cellular Signal Transduction in Toxicology and Pharmacology: Data Collection, Analysis, and Interpretation, Wiley, 2019. doi: 10.1002/9781119060208.ch7

Published Abstracts

Han, A.A., A.N. Buerger, H. Allen, M. Vincent, S.A. Thornton, K. Unice, and A. Maier. 2022. Assessment of ethanol exposure in nursing infants from maternal hand sanitizer use and potential for developmental toxicity. Poster presentation P514 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, San Diego, CA; March 27-31, 2022. *Toxicologist* 186(S1):146. Abstract 3325.

O'Neill, H.C., M.J. Vincent, A.A. Han, S.E. Brown, A.M. Hazell, M.L. Kreider, and A.K. Madl. Hazard and risk banding framework for prioritization and bridging of e-liquids for toxicity testing. Virtual Poster Presentation at the 2021 Society of Toxicology (SOT) Annual Meeting; March 12-26, 2021. *Toxicologist* 180(S1):218. Abstract 2609.

Han, A.A., Y. Wang, A.D. Du, Y. Lin, and J.N. Smith. 2020. Occupational Biomonitoring and Interpretation of 2,4-dichlorophenoxyacetic acid (2,4-D) using field deployable sensors and PBPK modeling. Poster presentation P475 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, Anaheim, CA; March 15-19, 2020. *Toxicologist* 174(S1):439. Abstract 2853.

Han, A.A., Z.A. Carver, T.J. Weber, C. Timchalk, and J.N. Smith. 2019. In Vitro to in Vivo Translation of Salivary Concentrations for Non-Invasive Biomonitoring of 2,4-Dichlorophenoxyacetic Acid (2,4-D). Poster presentation P277 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, Baltimore, MD; March 10-14, 2019. *Toxicologist* 168(S1):210. Abstract 1893.

Han, A.A., Z.A. Carver, T.J. Weber, C. Timchalk, and J.N. Smith. 2018. Coupling In Vitro and Computational Methods to Investigate the Transport of Herbicide/Insecticide Mixtures into Saliva. Poster presentation P421 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, San Antonio, TX; March 11-15, 2018. *Toxicologist* 162(S1):264. Abstract 2087.

Mouch, J.A., N. Prince, A. Han, J.V. Miller, K.A. Kelly, L.T. Michalovicz, J.P. O'Callaghan, D.B. Miller, and J.W. Boyd. 2018. A Network Approach of Phosphoprotein Signaling to Identify Mixture Interactions. Poster presentation P414 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, San Antonio, TX; March 11-15, 2018. *Toxicologist* 162(S1):262. Abstract 2080.

Prince, N., J.A. Mouch, A. Han, and J.W. Boyd. 2018. Development of pH-Targeting Fluorescent Probes to Map Inflammatory Response. Poster presentation P471 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, San Antonio, TX; March 11-15, 2018. *Toxicologist* 162(S1):275. Abstract 2134.

Han, A.A., J.V. Miller, N. Prince, J.A. Mouch, M.S. Prediger, and J.W. Boyd. 2017. An in vitro investigation of the impact of toxic exposure duration on cellular recovery and fate. Poster presentation P240 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, Baltimore, MD; March 12-16, 2017. *Toxicologist* 156(S1):254. Abstract 2076.

Boyd, J.W, A.A. Han, H.N. Currie, J.V. Miller, G. Scardoni, N. Prince, J.A. Mouch, and M.S. Prediger. 2017. Disentangling the Spatiotemporal Tissue Response to Inflammation Caused by a Physical Stressor. Poster presentation P548 at the Society of Toxicology (SOT) Annual

Meeting & ToxExpo, Baltimore, MD; March 12-16, 2017. *Toxicologist* 156(S1):470. Abstract 2995.

Fabyanic, E., A. Han, M. Prediger, and J. Boyd. 2016. In Vitro Toxicological Assessment of 4-Methylcyclohexane Methanol and Propylene Glycol Phenyl Ether Mixtures. Poster presentation P170 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, New Orleans, LA; March 13-17, 2016. *Toxicologist* 150(S1):104. Abstract 1441.

Boyd, J., A. Han, E. Fabyanic, M. Prediger, and H. Currie. 2016. Understanding Spatiotemporal Signaling Associated with Inflammation Caused by a Physical Stressor. Poster presentation P229 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, New Orleans, LA; March 13-17, 2016. *Toxicologist* 150(S1):216. Abstract 1922.

Han, A., E. Fabyanic, M. Prediger, and J. Boyd. 2016. In vitro assessment of the mixture toxicity of a West Virginia chemical spill, 4-methyl cyclohexane methanol and propylene glycol phenyl ether. Poster presentation P365 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, New Orleans, LA; March 13-17, 2016. *Toxicologist: Late-Breaking Supplement* 150(S1):61. Abstract 3673.

Vrana, J.A., A.A. Han, and J.W. Boyd. 2015. An In Vitro Approach to Predict Chemical Mixtures Cytotoxicity Using Post-Translational Phosphorylation Responses of Individual Chemicals. Poster presentation P321 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, San Diego, CA; March 22-26, 2015. *Toxicologist* 144(S1):297. Abstract 1388.

Boyd, J.W., J. A. Vrana, and A.A. Han. 2015. Using Signal Transduction to Forecast Cell Death in Response to Chemical Mixtures. Poster presentation P322 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, San Diego, CA; March 22-26, 2015. *Toxicologist* 144(S1):297. Abstract 1389.

Han, A.A., J.A. Vrana, and J.W. Boyd. 2015. In Vitro Toxicological Assessment of Industrial Chemicals Spilled into the Elk River in Charleston, West Virginia. Poster presentation P421 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, San Diego, CA; March 22-26, 2015. *Toxicologist* 144(S1):402. Abstract 1876.

Vrana, J.A., A.A. Han, H.N. Williams, and J.W. Boyd. 2014. A Graph Theoretical Approach to Determine In Vitro Mode of Action. Poster presentation P516 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, Phoenix, AZ; March 23-27, 2014. *Toxicologist* 138(S1):454. Abstract 1729.

Han, A.A., H.N. Williams, J.A. Vrana, N. Boggs, and J.W. Boyd. 2014. An Approach to Investigate Intracellular Protein Network Responses. Poster presentation P518 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, Phoenix, AZ; March 23-27, 2014. *Toxicologist* 138(S1):454. Abstract 1731.

Boyd, J.W., J.A. Vrana, H.N. Williams, and A.A. Han. 2014. Forecasting Cell Death Dose-Response from Early Signal Transduction Responses In Vitro. Poster presentation P522 at the Society of Toxicology (SOT) Annual Meeting & ToxExpo, Phoenix, AZ; March 23-27, 2014. *Toxicologist* 138(S1):455. Abstract 1735.

Presentations

Han, A.A. 2017. Investigating the Stress Response in Integrated Biological Systems. Research Presentation at Pacific Northwest National Laboratory.

Han, A.A. 2017. Using Network Centrality Analysis to Investigate Signaling Responses of an Injury (A.A. Han). Platform Speaker, Allegheny-Erie Society of Toxicology Regional Meeting, Morgantown, West Virigina.