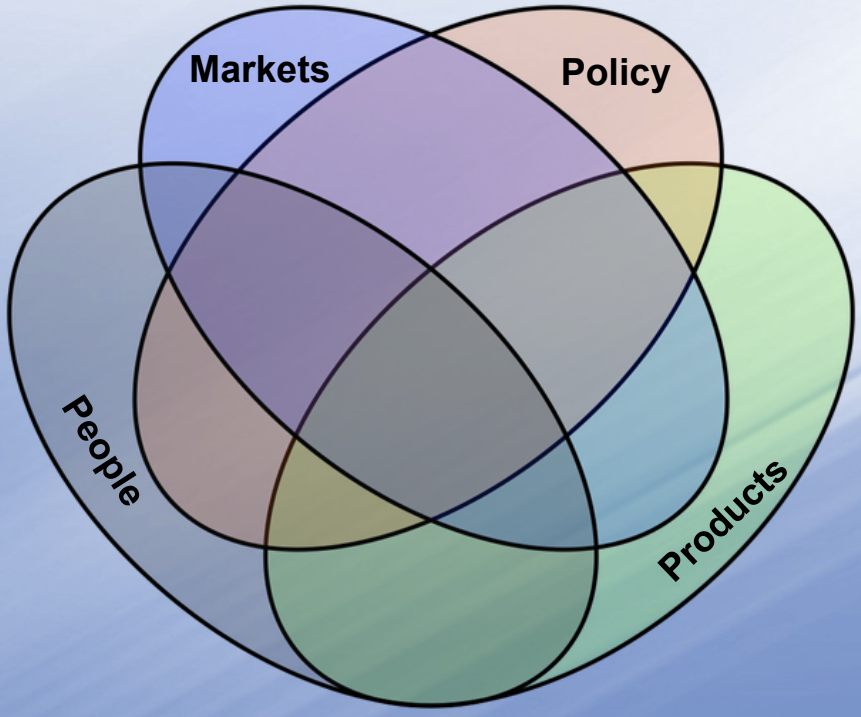
Vireo Advisors

Raising the Bar on Sustainability in Innovation

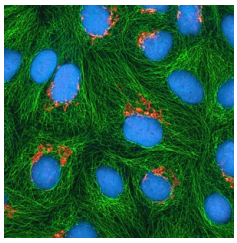
Vireo Advisors is an international expert advising firm dedicated to advancing the commercialization of safer and environmentally preferable emerging technologies. We evaluate and translate sound science into practice.

We Collaborate with Our Clients to Bring Better Technologies to Market



Nanotechnologies

New Sustainable Materials



Alternative Testing Strategies

Sustainable Packaging

Novel Technologies

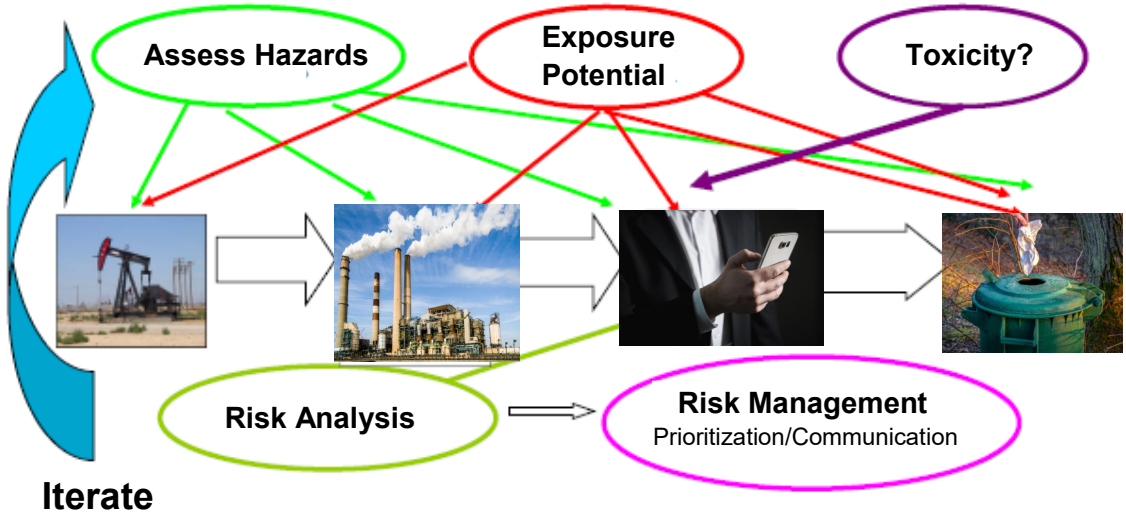
Bio-Based Chemicals & Fuels

What We Do

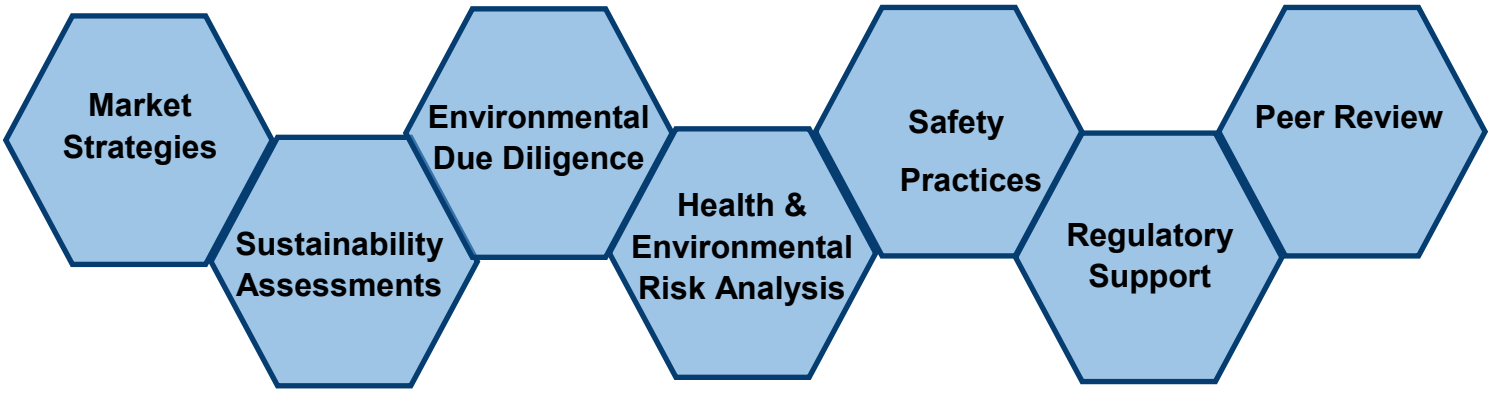
Vireo Advisors Works to Reduce The Risks of Innovation

- We apply our expertise and **navigate the regulatory landscape** to help clients get their novel materials and technologies to market.
- We help our clients **navigate the environmental health and safety landscape** by managing the safety aspects of new products and technologies
- We work with consortia to **address critical data gaps** necessary for commercialization
- We use **advanced risk assessment tools** such as LCRA to advise on customer strategies, sustainable and efficient product development and commercialization.

LCRA: Streamlined Life Cycle/ Risk Assessment Framework



Vireo provides a variety of services for manufacturers and end-users of novel technologies and advanced materials. Our experience and expertise includes:



Meet Our Team

Jo Anne Shatkin, Ph.D., President, Founder of Vireo Advisors, LLC

Dr. Jo Anne Shatkin is an environmental health scientist and internationally recognized expert in environmental science and policy, human health risk assessment, emerging contaminants policy and environmental aspects of nanotechnology. She received an Individually designed Ph.D. in Environmental Health Science and Policy and her MA in Risk Management and Technology Assessment from Clark University, Worcester, Massachusetts, and earned a Bachelor of Science degree from Worcester Polytechnic University in Molecular Biology and Biotechnology.

Dr. Shatkin founded Vireo Advisors in 2013 to provide guidance and leadership on safety and environmental aspects of new product development and commercialization of technologies for environmental applications. She brings more than 20 years of expertise in environmental leadership, stakeholder engagement, health and environmental risk analysis, sustainability science, nanotechnology and life cycle impacts of materials in the environment. Dr. Shatkin is author of Nanotechnology Health and Environmental Risks Second Edition (CRC Press 2012).

James D. Ede, Ph.D., Toxicologist and Risk Assessor at Vireo Advisors, LLC

Dr. James Ede brings expertise in risk assessment frameworks and international regulatory requirements for new and emerging substances. As a Vanier Scholar, Dr. Ede completed his Ph.D. thesis developing testing strategies for nanomaterials at the University of Alberta. He received his Bachelor of Science in physiology, cell and developmental biology.

Nearly seven years experience allowed him to foster collaborations at The National Institute for Nanotechnology, a world-class facility producing state-of-the-art materials and was a member of the RC-NSERC-BDC Nanotechnology Initiative (NNBNI). His research utilized molecular, biochemical and cellular techniques to help evaluate the hazard of several high-aspect ratio nanomaterials such as carbon nanotubes and cellulose nanocrystals.

Kimberly J. Ong, Ph.D., Ecotoxicologist and Sustainability Expert at Vireo Advisors, LLC

Dr. Kimberly Ong is an expert in advanced research and toxicology, particularly in protocol development, in vivo and in vitro testing of nanomaterials. Dr. Ong develops safety and sustainability testing plans for risk and exposure assessment of emerging materials for internal implementation and regulatory compliance. Dr. Ong has experience in evaluating sustainability assessments for bio-based materials.

Dr. Ong received a Ph.D. in Physiology, Cell, and Developmental Biology from the University of Alberta (Canada), a M.Sc. in Environmental Management and Policy at Lund University (Sweden), and a B.Sc. in Marine and Freshwater Biology from the University of Guelph (Canada).

Shaun Clancy Ph.D., Chemist at Vireo Advisors, LLC

Dr. Shaun Clancy is a chemist who has been involved in chemical regulatory and product stewardship activities for almost 25 years. He is a recognized expert in chemical control and nanotechnologies and is knowledgeable in pertinent laws and regulations covered by TSCA, FIFRA, FFDCA, DOT, CPSC and many international equivalents. Shaun joins Vireo after sixteen years as the Director for Product Stewardship, Advocacy and Compliance at Evonik Corporation, where he led company and industry activities on nanotechnology and chemical control issues and worked closely with regulatory agencies and non-governmental organizations. He previously chaired the American Chemistry Council's Health, Product and Science Policy Committee and has also worked extensively with the standards community. He served as the U.S. lead for the ISO Technical Committee on Nanotechnologies Working Group on Environmental Health and Safety and has represented the U.S. chemical industry on ISO, American National Standards Institute (ANSI) and Organization for Economic Co-Operation and Development nanotechnology groups.

Selected Publications

1. *Ede, J.D., Ong, K.J., Goergen, M., Rudie, A., Pomeroy-Carter, C.A., Shatkin, J.A. (2019). "Risk Analysis of Cellulose Nanomaterials by Inhalation: Current State of Science." Nanomaterials. Volume 9(3), 337. DOI:10.3390/nano9030337*
2. *Halappanavar, S., Ede, J. D., Shatkin, J.A., Krug, H.F. (2019). "A systematic process for identifying key events for advancing the development of nanomaterial relevant adverse outcome pathways." NanoImpact. 2019 March. DOI: 10.1016/j.impact.2019.100178*
3. *Lin, YJ, JA Shatkin and F. Kong. (2019). Evaluating mucoadhesion properties of three types of nanocellulose in the gastrointestinal tract in vitro and ex vivo. Carbohydrate Polymers Volume 210: 157-166. DOI: 10.1016/j.carbpol.2019.01.029*
4. *Rose Roberts, Kevin Gettz, Larissa V Stebounova, Thomas Peters, Jo Anne Shatkin and E. Johan Foster (2018). "Collection of airborne ultrafine cellulose nanocrystals by impinger with an efficiency mimicking deposition in the human respiratory system." Journal of Occupational and Environmental Hygiene. DOI: 10.1080/15459624.2018.1540876*
5. *Foster EJ, Moon RJ, Agarwal UP, Bortner MJ, Bras J, Camarero-Espinosa S, Chan KJ, Clift MJD, Cranston ED, Eichhorn SJ, Fox DM, Hamad WY, Heux L, Jean B, Korey M, Nieh W, Ong KJ, Reid MS, Renneckar S, Roberts R, Shatkin JA, Simonsen J, Stinson-Bagby K, Wanasekara N, Youngblood J. Review: Current characterization methods for cellulose nanomaterials. Chem Soc Rev. 2018 Apr; 47 (8):2609-2679. DOI: 10.1039/C6CS00895J*
6. *Ong, K.J, Shatkin, J.A., Nelson, K., Ede, J.D., Retsina, T. (2017). "*Establishing the safety of novel bio-based cellulose nanomaterials for commercialization*". NanoImpact. April 2017. (6): 19-29. https://doi.org/10.1016/j.impact.2017.03.002*
7. Shatkin, J.A., Ong, K.J., Ede, J.D. (2017). "Minimizing Risk: an overview of risk assessment and risk management of nanomaterials." *Metrology and Standardization of Nanomaterials: Protocols and Industrial Innovations*. Mansfield, E., Kaiser, D.L., Fujita, D., Van de Voorde, M. DOI:10.1002/9783527800308.ch24
8. OECD. 2017. Alternative testing strategies in risk assessment of manufactured nanomaterials: current state of knowledge and research needs to advance their use. Series on the Safety of Manufactured Nanomaterials No. 80. ENV/JM/MONO(2016)63.
9. Shatkin, J.A., Ong, K.J., Beaudrie, C., Clippinger, A.J., Hendren, C.O., Haber, L.T., Hill, M., Holden, P., Kennedy, A.J., Kim, B., MacDonell, M. (2016). "Advancing risk analysis for nanoscale materials: Report from an international workshop on the role of alternative testing strategies for advancement". *Risk Analysis*, 36(8), 1520-1537. DOI: 10.1111/risa.12683
10. Shatkin, J.A. and Ong, K.J. (2016). Alternative Testing Strategies for Nanomaterials: State of the Science and Considerations for Risk Analysis. *Risk Analysis*: An International Journal. 36(8), 1564-1580. DOI: 10.1111/risa.12642
11. Shatkin, J.A., Ong, K.J., Ede, J.D., Wegner, T.H., Goergen, M. 2016. Toward Cellulose Nanomaterial Commercialization: Knowledge Gap Analysis for Safety Data Sheets According to the Globally Harmonized System. *TAPPI Journal*. 15(9):425.
12. Shatkin JA. And G. Oberdörster. 2016. Comment on Shvedova et al. (2016), "Gender differences in murine pulmonary responses elicited by cellulose nanocrystals". *Particle and Fibre Toxicology*.
13. Shatkin, J.A. and B. Kim. 2015. Cellulose Nanomaterials: Life Cycle Risk Assessment, and Environmental Health and Safety Roadmap *Environmental Science: Nano*, 2015, 2: 477-499. DOI: 10.1039/C5EN00059A
14. Shatkin JA. Environmental Health and Safety Roadmap for the Commercialization of Nanocellulose. Prepared for the U.S. Forest Service Forest Products Laboratory. 2013.
15. Nelson K., Retsina T., Iakovlev M., A van Heiningen, Deng Y., Shatkin, J.A, and Mulyadi A. (2016). "Production of Low Cost Nanocellulose for Renewable, Advanced Materials Applications" *in* Madsen, Lynnette D. and Svedberg, Erik B. eds. *Materials Research for Manufacturing: An Industrial Perspective of Turning Materials into New Products, American Process Inc.: (Springer).*
16. Shatkin, JA. 2012. *Nanotechnology Health and Environmental Risks Second Edition.* CRC Press. Boca Raton, Florida.

Selected Collaborators

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