Amanda N. Buerger, Ph.D., DABT

SUPERVISING SCIENTIST

CONTACT INFORMATION

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PROFESSIONAL PROFILE

Dr. Amanda Buerger is a toxicologist in ToxStrategies' Health Sciences practice with experience in human health risk assessment, with a focus on applying weight-of-evidence (WoE) approaches and mode-of-action (MoA) analyses. She has provided support to a range of clients, including pharmaceutical companies, chemical manufacturers, universities, and consumer product producers. She studies the health effects related to exposure to a wide range of chemicals, including environmental contaminants like pesticides, phthalates, industrial chemicals, and ingredients used in consumer products like flavorants.

Dr. Buerger conducts risk assessments that apply WoE approaches incorporating clinical, nonclinical, *in vivo, in vitro*, and *in silico* data. She leverages dose-response modeling and new approach methodologies (NAMs) in her projects, including using 'omics data, to inform MoA and reference value derivation. She is experienced in conducting statistical analyses using R (RStudio) and benchmark dose modeling. She conducts systematic reviews and evidence mapping by leveraging software such as DistillerSR and SysRev to evaluate the potential for agents to act as human carcinogens or metabolism or endocrine function disruptors.

Dr. Buerger has produced and contributed to a variety of work products for clients, including: United States Environmental Protection Agency (EPA) submissions; occupational exposure limit (OEL), occupational exposure banding (OEB), permissible daily exposure (PDE), and allowable daily exposure (ADE) derivation documents; MoA analyses; and inhalation risk assessment courses. Dr. Buerger also has experience providing litigation support related to pesticides, chlorine, asbestos, talc, and food flavorings.

EDUCATION AND DEGREES EARNED

2019 Ph.D., Environmental and Global Health, University of Florida, Gainesville, FL

2015 B.S., Environmental Sciences; Sustainability minor, University of Notre Dame, Notre Dame, IN

HONORS/AWARDS

2020 Outstanding Student Research Award, University of Florida, Department of Environmental and Global Health

2019 Outstanding Student in Public Health Service Award, University of Florida, Department of Environmental and Global Health

2019 Best Paper, *Environmental Toxicology and Chemistry* journal

PROFESSIONAL ASSOCIATIONS

2016–Present Society of Toxicology

2015-2021 Society of Environmental Toxicology and Chemistry (SETAC)

2019-2020 Membership Committee (SETAC)

2017-2019 North American Student Advisory Council, Member (SETAC)

2017-2018 North America Student Advisory Council, Southeast Chapter, Representative (SETAC)

INVITED LECTURES

Buerger AN. Emerging contaminants and endocrine disrupting compounds. Environmental Concepts in Public Health, Department of Environmental and Global Health, University of Florida.

Buerger AN. Metabolic consequences of DEHP exposure in zebrafish: Convergence of host and microbial mechanisms. Environmental and Global Health Seminar, University of Florida, October 3, 2018.

Buerger AN. Probing phthalate-induced transcriptional changes related to obesity in zebrafish. Environmental and Global Health Seminar, University of Florida, September 20, 2016.

SELECTED PROFESSIONAL EXPERIENCE

Data Integration Approaches for Risk Assessment, MoA Analyses, and Systematic Review

Implemented a systematic review approach from literature searching, title and abstract (TiAb) screening, data extraction, and database management to identify relevant human cancer, animal cancer, and mechanistic data relevant to evaluating the carcinogenic hazard of a phthalate (DINP). Organized data according to the key characteristics of carcinogens (KCCs) (Smith et al., 2026) and mapped mechanistic data to key events (KEs) in a MoA for rodent tumors. Contributed to data organization according to KCCs, data analysis, and integration to evaluate the carcinogenic hazard of a fuel additive (MTBE).

Performed a MoA evaluation for rodent liver tumors, integrating mechanistic evidence from epidemiological, *in vivo*, and *in vitro* models across the key events, assessing evidence for alternative MoAs, and evaluating the human relevance of the MoA.

Assisted in applying ECHA/EFSA endocrine disruptor criteria (2018) focusing on estrogen, androgen, thyroid, and steroidogenesis (EATS) to evaluate the available evidence bases for two phthalates (DINP & DIDP); evaluated DINP evidence in the context of a hypothesized adverse outcome pathway (AOP) for Sertoli cell-based effects in the developing male testis.

Applied a dual approach to make a WoE conclusion about the metabolism disrupting potential of MTBE, incorporating an existing key characteristic of metabolism disrupting agents (MDA) framework (La Merrill et al., 2024) and a MoA approach.

Applied concepts of systematic review to develop a search strategy, artificial intelligence (AI)-based screening strategy, and full-text review of a large body of literature related to female reproductive toxicity.

Critically reviewed and evaluated numerous draft authoritative risk evaluations, drafting written and presenting oral public comments in a public forum. Developed a case study to demonstrate the importance of qualitative and quantitative uncertainty assessments in authoritative assessments to facilitate use by risk managers.

Supported clients in various sectors, including plasticizers, pharmaceuticals, foods and flavorings, fuel additives, and biosolids, and worked on projects related to various acute respiratory irritants.

Created reports regarding the effects of acute exposures on chronic health outcomes, including aspects related to odor detection, respiratory irritation, and sensory irritation.

Assisted with developing and executing inhalation risk assessment courses for a variety of clients.

Contributed to designing and conducting mixtures assessments for biosolids and cumulative risk assessments for phthalates, including applying concepts of the hazard index and relative potency factor approaches.

Application of NAMS and Computational Toxicology

Conducted transcriptomic analyses of *in vitro* and *in vivo* data using an established bioinformatic pipeline that includes quality control, differentially expressed gene identification via DeSeq, gene set enrichment analysis, Ingenuity Pathways Analysis, and benchmark dose analysis via BMDExpress. Evidence was leveraged as part of a WoE approache to inform MoA analyses and risk assessment.

Applied approaches such as read-across and chemical grouping in risk assessment and exposure limit derivation for flavorants, considering aspects of toxicokinetics and toxicodynamics from various lines of evidence.

Employed predictive toxicology approaches and tools, including QSAR modeling, to inform the toxicology of various substances in numerous inhalation risk assessments.

Applied dosimetric tools in inhalation risk assessment to inform human equivalent concentration derivation.

Created, managed, analyzed, and maintained quality control of large datasets in Distiller SR, Microsoft Excel and R software, including calculating hazard quotients and cancer risks. These datasets were used to calculate hazard quotients and cancer risks or integrate into MoA evaluations or hazard and risk assessments focused on endocrine disruption, reproductive and developmental toxicity, carcinogenicity, and metabolism disrupting potential.

Exposure Limit Derivation

Managed and contributed to a variety of occupational toxicology and risk assessment projects and critically reviewed proposed and existing regulatory exposure limits for numerous chemicals.

Contributed to developing hazard banding frameworks for biocatalytic and medicinal enzymes based on sensitization potential, informed by data from clinical, *in vivo*, *in vitro*, and *in silico* streams of evidence.

Generated standard operating procedures for deriving OELs and assignment of OEBs.

JOURNAL PEER REVIEWER

Current Research in Toxicology

Environmental Pollution

Science of the Total Environment

Chemosphere

Toxics

MANUSCRIPTS

Buerger AN, Heintz MM, Haws LC, Thompson CM. Mode-of-action and human relevance assessment for diisononyl phthalate-induced liver tumors in rodents. J Appl Toxicol 46(12):4264-4287; doi: 10.1002/jat.70223.

Buerger AN, Thompson CM, Heintz MM, Maberti S, Palermo CM, Haws LC. 2026. Application of quantitative and qualitative uncertainty assessment risk management decision-making: A case study with diisononyl phthalate. Food Chem Toxicol 214(Aug):116110; doi: 10.1016/j.fct.2026116110.

Buerger AN, Vincent MJ, Fitch S, Rivera B, Engel N, Zhang J, Rushton EK, Borghoff SJ. 2026. A mechanistic evaluation of the metabolism disrupting potential of methyl tert-butyl ether. Curr Res Toxicol 10(Apr 20):100290; doi: 10.1016/j.crtox.2026.100290.

Lea IA, **Buerger AN**, Vincent MJ,..., Choksi NY, Schaefer H, Britt J, Fitch S, Haws L, Borghoff SJ. 2026. Evaluating the potential carcinogenic hazard of diisononyl phthalate in humans via systematic integration of human, animal cancer studies, and mechanistic data. Curr Res Toxicol 10(Apr 30):100295; doi: 10.1016/j.crtox.2026.100295.

Massarsky A, Evans VJB, Fung ES, Yang LGL, Rogers KL, **Buerger AN**, Maier A, Reichard JF. A framework for assessing the safety of degraded pharmaceuticals for long-duration space missions—Part II: Framework application in four case studies. Crit Rev Toxicol 56(2):127-155; doi: 10.1080/10408444.2026.2633422.

Massarsky A, Evans VJB, Fung ES, Yang LGL, Rogers KL, **Buerger AN**, Maier A, Reichard JF. A framework for assessing the safety of degraded pharmaceuticals that will be required for long-duration space missions—Part I: Framework development. Crit Rev Toxicol; doi: 10.1080/10408444.2025.2533943. Online ahead of print April 9.

Borghoff SJ, Rivera B, Fitch S, **Buerger AN**, Choksi N, Franzen A, Vincent MJ, Covington T, et al. 2025. Systematic evaluation of the evidence base on methyl *tert*-butyl ether supporting a lack of concern for carcinogenic hazard in human based on animal cancer studies and mechanistic data. Curr Res Toxicol 8(Feb 16):100224; doi: 10.1016/j.crtox.2025.100224.

Heintz MM, **Buerger AN**, Haws LC, Cullen JM, East AW, Thompson CM. 2025. Comparison of phenotypic and transcriptomic profiles between HFPO-DA and prototypical PPAR*α*, PPAR*γ*, and cytotoxic agents in wild-type and *Ppara*-null mouse livers. Toxicol Sci 206(1):183-201; doi: 10.1093/toxsci/kfaf049. PMID: 40216583.

Lea IA, **Buerger AN**, Feifarek D, Mihalchik A, Heintz MM, Haws LC, Nyambego H, Goyak K, et al. 2025. Evaluation of the endocrine disrupting potential of di-isononyl phthalate. Curr Res Toxicol 8:100220; doi: 10.1016/j.crtox.2025.100220. Corrigendum 8:100233; doi: 10.1016/j.crtox.2025.100233.

Rogers JM, **Buerger AN**, Heintz MM, Palermo CM, Haws LC, Lea IA. 2025. Evaluation of a hypothesized Sertoli cell-based adverse outcome pathway for effects of diisononyl phthalate on the developing testis. Curr Res Toxicol 8:100219; doi: 10.1016/j.crtox.2025.100219.

Bates CA, Vincent MJ, **Buerger AN**, Santamaria AB, Maier A, Jack M. 2024. Investigating the relationship between β-carotene intake from diet and supplements, smoking, and lung cancer risk. Food Chem Toxicol 194:115104; doi: 10.1016/j.fct.2024.115104.

Haber LT, Bradley MA, **Buerger AN**, Behrsing H, Burla S, Clapp PW, et al. 2024. New approach methodologies (NAMs) for the *in vitro* assessment of cleaning products for respiratory irritation: Workshop report. Front Toxicol 6:1431790; doi: 10.3389/ftox.2024.1431790.

Russel AJ, Vincent M, **Buerger AN**, Dotson S, Lotter J, Maier A. 2024. Establishing short-term occupational exposure limits (STELs) for sensory irritants using predictive and in silico respiratory rate depression (RD50) models. Inhal Toxicol 36(1):13–25; doi: 10.1080/08958378.2023.2299867.

Buerger AN, Allen HL, Divis HR, Encina E, Parker J, Boles C. 2023. The worker microbiome and envirobiomes in the agricultural industry: A narrative review of current applications and understanding. J Pub Health Emerg 7:21.

Buerger AN, Massarsky A, Russell A, Zoghby N, Hirn C, Mucs D, et al. 2023. Evaluation of chemical grouping workflows for flavor inhalation risk assessment: Selected furan moiety-containing chemicals as a case study. Comp Toxicol 26:100269.

Boles C, Zisook R, **Buerger AN**, Hamaji C, Mathis C, Lauer D, et al. 2022. Semi-quantitative microbial risk assessment: a narrative review and proposed framework for health and safety practitioners. J Pub Health Emerg 6:34.

Han AA, **Buerger AN**, Allen H, Vincent M, Thornton SA, Unice K, et al. 2022. Assessment of ethanol exposure from hand sanitizer use and potential for developmental toxicity in nursing infants. J Appl Toxicol 42(9):1424–1442.

Martyniuk CJ, **Buerger AN**, Vespalcova H, Rudzanova B, Sohan SR, Hanlon AT, et al. 2022. Sex-dependent host-microbiome dynamics in zebrafish: Implications for toxicology and gastrointestinal physiology. Comp Biochem Physiol D-Genom Proteom 42(June):100993.

Buerger AN, Parente CE, Harris JP, Watts EG, Wormington AM, Bisesi JH. 2022. Impacts of diethylhexyl phthalate and overfeeding on physical fitness and lipid mobilization in Danio rerio (zebrafish). Chemosphere 295(May):133703.

Barnett LMA, Kramer NE, **Buerger AN**, Love DH, Bisesi JH, Cummings BS. 2021. Transcriptomic analysis of the differential nephrotoxicity of diverse brominated flame retardants in rat and human renal cells. Int J Mol Sci 22(18):10044.

Parker JA, Boles C, **Buerger AN**, Fung ES, Maier A. 2021. Derivation of an occupational exposure limit for β-glucans. Regul Toxicol Pharmacol 123:104959.

Adamovsky O, **Buerger AN**, Vespalcova H, Sohag S, Hanlon A, Ginn P, et al. 2020. Evaluation of microbiome-host relationships in the zebrafish gastrointestinal system reveals adaptive immunity is a target of bis (2-ethylhexyl) phthalate (DEHP) exposure. Environ Sci Technol 54(9):5719–5728.

Parker J, Boles C, Leleck O, **Buerger AN**, Egnot N, Sunderman A, et al. 2020. Advancing toward normal operations for arenas and stadiums. Toxicol Ind Health 36(9):718–727.

Buerger AN, Dillon DT, Schmidt J, Yang T, Zubcevic J, Martyniuk CJ, et al. 2020. Gastrointestinal dysbiosis following diethylhexyl phthalate exposure in zebrafish (Danio rerio): Altered microbial diversity, functionality and network connectivity. Environ Pollut 265(Pt B):114496.

Buerger AN, Schmidt J, Chase A, Paixao C, Patel TN, Brumback BA, et al. 2019. Examining the responses of the zebrafish (Danio rerio) gastrointestinal system to the suspected obesogen diethylhexyl phthalate. Environ Pollut 245:1086–1094.

Lavelle C, Smith LC, Bisesi JH, Yu F, Silva-Sanchez C, Moraga-Amador D, **Buerger AN**, et al. 2018. Tissue-based mapping of the fathead minnow (Pimephales promelas) transcriptome and proteome. Front Endocrinol 9:611.

Adamovsky O, **Buerger AN**, Wormington AM, Ector N, Griffitt RJ, Bisesi JH, et al. 2018. The gut microbiome and aquatic toxicology: An emerging concept for environmental health. Environ Toxicol Chem 37(11):2758–2775.

Buerger AN, Howe K, Jacquart E, Chandler M, Culley T, Evans C, et al. 2015. Risk assessments for invasive plants: a Midwestern US comparison. Invas Plant Sci Manage 9(1):41–54.

WHITE PAPERS

LeClaire RD, McGill A, **Buerger AN**, Boles C, Cappello T, Parker J. 2021. Promoting health equity among part-time and temporary workers of large event venues.

Boles C, Leleck O, **Buerger AN**, Parker J, Egnot N, Sunderman A. 2020. Advancing towards normal operations for arenas and stadiums.

Boles C, Leleck O, **Buerger AN**, Parker J, Egnot N, Sunderman A. 2020. Advancing towards normal operations for sporting venues.

Boles C, Leleck O, **Buerger AN**, Parker J, Egnot N, Sunderman A. 2020. Advancing towards normal operations for entertainment venues.

Lynch H, **Buerger AN**, Nembhard M, Hallett L. 2020. Summer camps and campgrounds: COVID-19 mitigation strategies.

PRESENTATIONS AND ABSTRACTS

Buerger AN, Heintz MM, Haws LC, Nyambego H, Palermo CM, Thompson CM. Mode of action and human relevance assessment for diisononyl phthalate (DINP)-induced liver tumors in rodents. Abstract 3324, Society of Toxicology 65th Annual Meeting, San Diego, CA, March 2026.

Buerger AN, Lea IA, Vincent MJ, Rivera BN, Choksi NY, Britt J, Fitch S, Rogers S, et al. Systematic evaluation of the carcinogenic potential of di-isononyl phthalate in humans. Abstract 3314, Society of Toxicology 65th Annual Meeting, San Diego, CA, March 2026.

Buerger AN, Vincent MJ, Fitch S, Rivera B, Engel N, Zhang J, Rushton EK, Borghoff SJ. A pathway-based mechanistic evaluation of non-EATS modalities: A case study. Toxicology Forum Meeting, Online, October 1, 2025.

Borghoff SJ, Rivera BN, Fitch S, **Buerger AN**, Choksi N, Franzen A, Bus J, Rushton EK, Lea I. Systematic evaluation of the evidence base on methyl tert-butyl ether for carcinogenic potential in humans; Low concern based on animal cancer studies and mechanistic data. Abstract 4702, Society of Toxicology 64th Annual Meeting, Orlando, FL, March 2025.

Buerger AN, Vincent MJ, Fitch S, Rushton EK, Borghoff SJ. Evaluation of potential obesogenicity through a mode of action approach: A case study with MTBE. Abstract 3928, Society of Toxicology 64th Annual Meeting, Orlando, FL, March 2025.

Fitch S, Wikoff D, Foreman J, **Buerger A**, Haws L, Palmero C. Assessment of relative potency factors for six phthalates. Abstract 4235, Society of Toxicology 64th Annual Meeting, Orlando, FL, March 2025.

Heintz MM, **Buerger AN**, Haws LC, East AW, Cullen JM, Thompson CM. Comparison of phenotypic and transcriptomic profiles between HFPO-DA and prototypical PPARα, PPARγ, and cytotoxic agents in wild-type and PPARα knockout mice. Abstract 3972, Society of Toxicology 64th Annual Meeting, Orlando, FL, March 2025.

Massarsky A, **Buerger AN**, O'Neill HC, Gaffner J, Mucs D, Baskerville-Abraham I, Maier A. Derivation of Maximum Acceptable Group Levels (MAGLs) for ionones and related compounds. Abstract 4764, Society of Toxicology 64th Annual Meeting, Orlando, FL, March 2025.

Cooper LM, Callis CM, Fung ES, Parker JA, **Buerger AN**, Bandara S, Maier AS, Jolly RA. Framework for setting health-based exposure limits for amino acids in a pharmaceutical setting. Society of Toxicology 63rd Annual Meeting, Salt Lake City, UT, 2024.

Fung ES, Jolly R, Cooper L, Parker JA, **Buerger AN**, Maier A, Callis CM. Framework for determining ADE values for substituted saturated fatty acids observed as extractables. Society of Toxicology 63rd Annual Meeting, Salt Lake City, UT, 2024.

Hirn C, Mucs D, **Buerger AN**, Massarksy A, Russell A, Zoghby N, Maier A, Baskerville-Abraham I. Chemoinformatics and data processing challenges in chemical grouping workflows for toxicological risk assessments. Society of Toxicology 63rd Annual Meeting, 2024.

Massarsky A, **Buerger AN**, O'Neill H, Gafner J, Babcock A, Neilson L, Baskerville-Abraham I, Maier, A. Derivation of maximum acceptable group levels (MAGLs) for carvones in tobacco and nicotine products. Society of Toxicology 63rd Annual Meeting, Salt Lake City, UT, 2024.

Reichard JF, Massarsky A, Evans VJB, Fung ES, Yang LGL, Rogers KL, **Buerger AN**, Maier A. A framework approach for evaluation of potential degradation of active pharmaceutical ingredients in long-duration spaceflights. Society of Toxicology 63rd Annual Meeting, Salt Lake City UT, 2024.

Sabo-Attwood T, Lavelle C, Robinson S, Bisesi JH, **Buerger AN**, Denslow ND. Modulation of immune-relevant transcriptional profiles in fish tissues after largemouth bass virus infection. Society of Environmental Toxicology and Chemistry, 2023.

Lynch H, O'Neill H, **Buerger AN**, Rogers K. Mode-of-action analysis of thyroid hormone effects of perfluorobutane sulfonic acid. Society of Toxicology 62nd Annual Meeting, Nashville, TN, 2023.

Bisesi JH, **Buerger AN**, Parente C, Martyniuk CJ. Effects of endocrine disrupting compounds on host microbiome dynamics: Implications for gastrointestinal physiology and health. American Geophysical Union Fall Meeting, 2022.

Vincent M, O'Neill HC, Maier A, **Buerger AN**, Madl AK. Analysis of toxicity assay options for data poor chemical inhalation limit setting: Flavors as a case study. Tobacco Science Research Conference, 2022.

Buerger AN, Bates C, Boles C, Vincent M, Dotson GS. Ochratoxin A and pesticides in craft beers: A pilot study. Society of Toxicology 61st Annual Meeting, San Diego, CA, 2022.

Han AA, **Buerger AN**, Allen H, Vincent M, Thornton AA, Unice K, Maier A. Assessment of ethanol exposure in nursing infants from maternal hand sanitizer use and potential for developmental toxicity. Poster presentation P514 at Society of Toxicology 61st Annual Meeting, San Diego, CA, 2022.

Buerger AN, Boles C, Reichard J, Fung E, Dahm C, Schmid K, et al. A framework for establishing occupational exposure limits for medicinal enzymes. Poster presented at Society of Toxicology 60th Annual Meeting, Virtual, 2021.

Fung ES, **Buerger AN**, Parker JA, Boles C, Masuada-Herrera M, Trejo-Martin A, et al. Determining occupational hazard control categories for biocatalytic enzymes. Poster presented at American College of Toxicology Annual Meeting, virtual event, 2021.

Parker JA, Boles C, **Buerger AN**, Fung ES, Maier A. Derivation of an occupational exposure limit for β-glucans. Poster presented at Society of Toxicology 60th Annual Meeting, Virtual, 2021.

Buerger AN, Dillon DT, Martyniuk CJ, Bisesi, JH. Gastrointestinal mediated impacts on lipid metabolism following chronic exposure to a phthalate plasticizer in zebrafish. Society of Environmental Toxicology and Chemistry North America Meeting, 2019.

Buerger AN, Dillon DT, Martyniuk CJ, Bisesi JH. Molecular and microbial responses in the zebrafish gastrointestinal system following exposure to the suspected obesogen diethylhexyl phthalate. Society for Risk Analysis/Society for Environmental Toxicology and Chemistry Africa, 2019.

Buerger AN, Dillon DT, Martyniuk CJ, Bisesi JH. Coupled host and microbial responses to phthalate exposure: Implications for obesity. Society of Toxicology 58th Annual Meeting, Baltimore, MD, 2019.

Buerger AN, Dillon DT, Martyniuk CJ, Bisesi JH. Host-microbiome alterations in fatty acid metabolism in Danio rerio following dietary phthalate exposure. Society of Environmental Toxicology and Chemistry North America Meeting, 2018.

Buerger AN, Martyniuk CJ, Bisesi JH. Phthalate disruption of the gastrointestinal microbiome as a potential obesogenic mechanism: A multigenerational study using Danio rerio. Society of Toxicology 57th Annual Meeting, San Antonio, TX, 2018.

Buerger AN, Schmidt J, Martyniuk CJ, Bisesi JH. Host-microbiome responses to DEHP exposure: A multigenerational obesity study in Danio rerio. Society of Environmental Toxicology and Chemistry North America Meeting, 2017.

Buerger AN, Schmidt J, Paixao C, Tiblier A, Martyniuk CJ, Bisesi JH. Does oral exposure to phthalates alter obesity related transcriptional networks in the gastrointestinal system through PPARα? Society of Toxicology 56th Annual Meeting, Baltimore, MD, 2017.

TEACHING EXPERIENCE

SETAC North America, Professional Training Course, Introduction to Microbiome Sample Collection, Sequencing, and Analysis Methods for Microbial Community Research: 16S Microbial Sequencing. 2020, 2021.

The University of Florida, Center for Pre-collegiate Education and Training, Summer Health Professional Education Program: Water Quality and Ecosystem Health.

The University of Florida, Center for Pre-collegiate Education and Training, Research Explorations: Environmental Health: Dose-Response and Daphnia Magna Toxicity Testing.

The University of Florida, Center for Pre-collegiate Education and Training, Student Science Training Program: Environmental Health and Toxicology Course.

Southeastern Society of Environmental Toxicology and Chemistry: RNA Extraction and Quantitative PCR Short Course.