

Nanoscience and Advanced Materials Specialty Section

Newsletter

Letter from the President

Dear NAMSS members,

First, I would like to thank you all for the opportunity to serve as the president of NAMSS. I would also like to take a moment to once again thank our outgoing officers for their service last year. A special thank you to Flemming Cassee as outgoing president, Jonathan Shannahan as secretary/treasurer, Salik Hussain as councilor, and Candace Wong as student representative. Thank you for your service!

In the coming months we will begin planning for the annual meeting. Whether it be held in person or virtually, we will go forward with our annual business meeting and reception. We encourage our students, postdoctoral candidates, and members to participate and to apply for the student, postdoc, and paper of the year awards outlined in the newsletter and on our website. This fall we will also be hosting the first of what we hope will be an annual trainee webinar series. There will be three student presentations on October 21st and two presentation on November 6th. Presentation details and abstracts are included in this newsletter and we will send the webinar registration links to our membership once these are available. We look forward to your participation!

Thank you,

Jenny R. Roberts

President NAMSS

Executive Committee 2020-2021

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Call for Nominees for 2021-2022: Elections for the 2021-2022 NAMSS Council are closer than you think. Elections are held in December and January. Candidates will be needed for the positions listed below. Please feel free to also self-nominate.

VP-Elect

Councillor

Postdoctoral Representative

Vice Graduate Student Representative

Contact Dr. Jared Brown:

JARED.BROWN@CUANSCHUTZ.EDU



Upcoming Webinars

NAMSS will be hosting 2 trainee webinars in October and November, details below. A registration link will be sent out to the membership and sections with related interests once it is available.

Upcoming Workshops

2020 NanoEHS COR Workshop:

Bridging insights and perspectives.

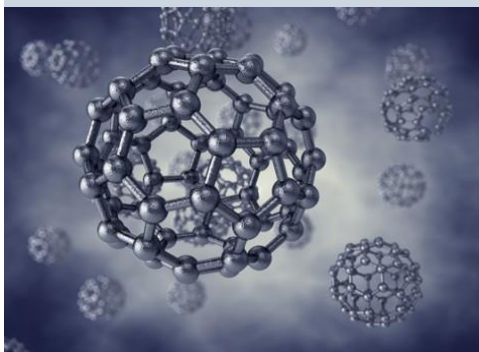
September 16-17 Virtual Meeting.

The link to the free registration is:

<https://us-eu.org/2020-nanoehs-cor-workshop/>

Other News:

ANSI-NSP conducted a workshop on Advanced Materials August 19-20, 2020 focused on identifying relationship and synergies between nanotechnologies standards activities and needs relative to advanced materials and on how can we do better at identifying the gaps and the needs relative to Advanced Materials Standards. A summary/report will be available in the near future on their website.



Future Conferences

UPDATE: The 9th Nanotechnology, Occupational, and Environmental Health meeting will be held virtually November 12-13, 2020. The abstract deadlines have been extended to September 18th of this year to accommodate those investigators that may wish to present.

<http://susnano.org/nanotech2020/nanotech-overview-2020.html>



Nanosafety 2020 Conference, October 5-7, at the Hotel Palafox in Zaragoza, Spain. <https://nanosafety2020.leibniz-nanosicherheit.de>



The Seventh International Conference nanoSAFE 2020 will be held from November 16-20, 2020, in Maison Minattec-Grenoble, France. Organized every two years since 2008, NANOSAFE Conference is intended for sharing latest research results on health and safety issues related to nanomaterials and beyond for a socially responsible approach. This special edition will be organized in partnership with the Labex SERENADE with the ambition to cover the newest findings concerning Safer- and Eco-Designed innovative nanomaterials. As a response to the spread of Covid-19 the nanoSAFE community will be meeting virtually. For the first time ever, the "nanoSAFE Digital Conference" will be held from 16th to 20th November 2020 on a virtual platform. The event is intended to enable all participants of the international conference to share the latest R&D results on environmental, health and safety issues related to nanomaterials and beyond. www.nanosafe.org



10th International Conference on Nanotoxicology: Edinburgh, UK, April 20-22, 2021. This meeting is proceeding as planned in person.

<https://nanotox2021.org>

Trainee Webinar Series

NAMSS would like to give our trainees the opportunity to present their work virtually! As many conferences and meeting have gone to a virtual format this year, this opportunity to interact with our membership is very important to us and our trainees. Please join us! We will be sending links for registration to these webinars as soon as they are available.

October 21, 2020, 1:00 pm-2:00 pm ET

Kazi Tasneem, Vanderbilt University

Jeanine N. D'Errico, Rutgers University

Ho Young Lee, North Carolina State University

November 6, 2020, 11:00 am-12:00 pm ET

Alba Garcia-Rodriguez, University of Binghamton

Jessica Ray, University of Montana

Trainee Presenter Abstracts:

Bridging the Gap: Public Health Emergencies and Advanced Materials Solutions



Kazi Tasneem¹; Deji Akinwande²; Zina Jarrahi Cinker³; Jiaxing Huang⁴; Daniel Stolyarov⁵; Gregory Nichols⁶

¹Vanderbilt University; ²University of Texas at Austin; ³C6: The Advanced Material Firm; ⁴Northwestern University; ⁵G6 Materials Corp; ⁶GP Nichols & Company

During a public health crisis like COVID-19, engineered nanomaterials and other advanced material technologies appear to offer promising solutions, including for use in antimicrobial and anti-fogging coatings, diagnostic tools, personal protective equipment, filtration, sensors, and other applications. As the research community continues to implement advanced technologies, it is critical to close the scientific and regulatory gaps needed in order to expedite the application of these materials, especially nanotechnology, as the next generation of solutions in health emergencies. Advanced Material Pandemic Taskforce (AMPT) is a global task force created to use advanced materials for the prevention and management of global health crises and to address the technological and societal needs of the current and post-pandemic world. Within AMPT, the Applied Public Health and Environmental, Health, and Safety Working Group has three primary aims: 1) to address the challenges of conducting urgent toxicological testing for nanomaterials solutions during a health emergency, 2) to analyze the existing regulatory framework and associated gaps in regulatory testing and risk assessment, and 3) to ensure that the nanomaterial solutions have intended results, receive proper vetting and comply with applicable laws, regulations, and standards. Based on the fast-track roadmap of the working group, it will be possible to identify advanced materials solutions that can reasonably and safely be implemented in a short

period of time to mitigate public health challenges by providing an innovative public health solution.

Chronic Titanium Dioxide Nanoparticle Inhalation and Reduced Placental Glucose Transfer



JN D'Errico¹, PA Stapleton^{1,2}

¹ Department of Pharmacology and Toxicology, Rutgers University, Piscataway, NJ

² EOHSI, Rutgers University, New Brunswick, NJ

Epidemiological and animal data demonstrate that maternal nano/ultrafine particle inhalation during gestation leads to fetal growth restriction (FGR). The placenta is responsible for transporting nutrients (e.g., glucose, oxygen, lipids) to the fetus to support growth, with glucose being the primary energy substrate. Therefore, we hypothesized that maternal inhalation of titanium dioxide nanoparticles (nano-TiO₂) during pregnancy may impair placental glucose transport to the fetus, thus inhibiting fetal growth. Using whole-body nano-TiO₂ inhalation, we sought to understand the pathogenesis behind this FGR model. Therefore, the objective of this study was to quantify maternal-fetal blood glucose and placental glucose transporter expression after chronic maternal inhalation of nano-TiO₂ aerosols. Time-pregnant Sprague Dawley rats were exposed from gestational day (GD) 4 to GD 19 to nano-TiO₂ aerosols [9.3±0.28 mg/m³, 4 hours, primary particle size 21 nm, median particle size 306±27 nm (SMPS, TSI)] for a calculated daily maternal deposition of 32.1±1.1 µg. On GD 20 maternal, placental, and fetal weights were recorded. Maternal and fetal glucose concentrations were measured. Placental glucose transporters were quantified using qPCR and western blotting. Preliminary results demonstrate reduced maternal (375±12.5 g; control vs. 327±12.7 g; exposed), fetal (2.68±0.2 g; control vs. 2.41±0.05 g; exposed), and placental (0.54±0.04 g; control vs. 0.45±0.02 g; exposed) weight. Additionally, a 25% reduction in maternal glucose concentrations and 22% increase in fetal glucose concentrations were observed after exposure. These preliminary data indicate reduced maternal glucose concentrations likely impairing fetal and placental growth after maternal inhalation of nano-TiO₂ aerosols during pregnancy.

Pulmonary Exposure of Mice to Perfluoro-2-Propoxy Propanoic Acid (GENX) Transforms Alveolar Macrophages from a Pro-inflammatory Phenotype to a Proliferative Phenotype



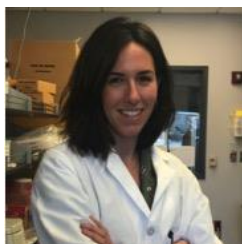
HY Lee¹, DJ You¹, AJ Taylor-Just¹, KE Linder², JC Bonner¹

¹Toxicology Program, Department of Biological Sciences, and ²Department of Population Health and Pathobiology, College of Veterinary Medicine, North Carolina State University, Raleigh NC, USA

The host response to inhaled particles may be modulated by chemicals that disrupt homeostasis of the immune system, resulting in increased susceptibility to disease. Per- and polyfluoroalkyl substances (PFAS) are persistent chemicals that cause immunosuppression in mice and humans and have been associated with susceptibility to asthma and lung infections in humans. Emerging PFAS, including perfluoro-2-propoxy propanoic acid (GenX), are a concern for human health due to contamination of air and water. While both oral and

inhalation exposures are acknowledged as routes of exposure, our understanding of PFAS-induced immune dysfunction is based on studies with mice exposed orally. Because increasing evidence indicates that GenX is released into the air from industrial sources, we hypothesized that GenX would impair the innate immune response to inhaled air pollution particles in mice. Male C57BL6 mice were exposed to saline vehicle, GenX (10 mg/kg), carbon black nanoparticles (CBNP) (4 mg/kg), or GenX and CBNP via oropharyngeal aspiration. Lung tissue was harvested at 1- and 14-days post-exposure. Numbers of neutrophils in bronchoalveolar lavage fluid (BALF) induced by CBNP were reduced by GenX which coincided with reduced CXCL1 (neutrophil chemokine). Immunohistochemistry for Ki67 indicated that GenX increased the proliferation of macrophages. Experiments with RAW264.7 macrophages *in vitro* correlated with *in vivo* data, showing that GenX suppressed CXCL1 production yet stimulated cell proliferation. Overall, our study indicates that pulmonary exposure to GenX suppresses the innate immune response of lung macrophages which may impair the host response to inhaled air pollution particles and promote lung disease susceptibility.

The Role of Microbiota and Metal Oxide Nanoparticles on Small Intestinal Enzyme Activity



Alba Garcia-Rodriguez^{1,2,3}, Fabiola Moreno-Olivas¹, Cláudia N. H. Marques^{2,3}, Gretchen Mahler^{1,3}

¹Department of Biomedical Engineering, ²Department of Biological Sciences, ³Binghamton Biofilm Research Center, Binghamton University, Binghamton, NY

Engineered nanomaterials (ENMs) have become common in the food industry, which motivates the need to evaluate ENM effects on human health. Gastrointestinal (GI) *in vitro* models (e.g. Caco-2, Caco-2/HT29-MTX) have been used in nanotoxicology research. However, the human gut environment is composed of both human cells and the gut microbiota. The goal of this study is to increase the complexity of the Caco-2/HT29-MTX *in vitro* model by co-culturing human cells with the Gram-positive, commensal *Lactobacillus rhamnosus* or the Gram-negative, opportunistic *Escherichia coli*; with the hypothesis that the presence of bacteria would ameliorate the effects of exposure to metal oxide nanoparticles (NPs) such as iron oxide (Fe₂O₃), silicone dioxide (SiO₂), titanium dioxide (TiO₂), or zinc oxide (ZnO). To understand this relationship, Caco-2/HT29-MTX monolayers were acutely co-exposed (4 hours) to bacteria and/or NPs (pristine or *in vitro* digested). The activity of the brush border membrane (BBM) enzymes intestinal alkaline phosphatase (IAP), aminopeptidase-N (APN), sucrase isomaltase (SI) and the basolateral membrane enzyme (BLM) Na⁺/K⁺ ATPase were assessed. Findings show that (i) the human digestion process alters the physicochemical properties of NPs, (ii) large agglomerates of NPs remain entrapped on the apical side of the intestinal monolayer, which (iii) affects the activity of BBM enzymes. Interestingly, some NPs effects were attenuated in the presence of both bacterial strains. Confocal microscopy detected bacteria-NPs interactions, which may impede the NP-intestinal cell contact. These results highlight the importance of improving *in vitro* models to closely mimic the complexities of the human body.

Sex-differences and Macrophage Phenotype in Nanoparticle-induced Lung Inflammation



Jessica Ray
University of Montana, Missoula, MT

Respiratory diseases such as asthma and COPD occur more frequently in women compared to men, yet this area of research is largely overlooked in nanotoxicology and the mechanisms responsible for sex-biases in respiratory disease remain undefined. Therefore, my research utilizes a murine model of multi-walled carbon nanotube (MWCNT)-induced lung injury to address the large gap of knowledge about potential sex-differences in nanoparticle-induced lung inflammation. Thus far, I have published data demonstrating that MWCNTs induce a greater inflammatory response in female mice compared to males, at both acute and chronic timepoints. Specifically, MWCNT-treated female mice develop greater acute type 2 inflammation including eosinophilia, cytokine expression, and airway hyper-reactivity (AHR) compared to male mice. This increased acute inflammation precedes worse chronic lung pathology in females. Alveolar macrophages (AMs) are critical mediators of nanoparticle-induced lung inflammation and it has previously been reported that female AMs are predisposed to developing a more severe M2a-type phenotype, which is associated with allergy and asthma and likely the phenotype associated with MWCNT-induced eosinophilia. Therefore, I hypothesize that a more severe M2a phenotype in female AMs is responsible for sex-differences in MWCNT-induced type 2 inflammation and eosinophilia. In order to test this hypothesis, AMs were isolated from MWCNT-treated male and female mice and functional phenotype assessed by western blot and AM-specific cytokine production. Results of these experiments showed greater M2a-like activity in AMs from MWCNT-exposed females compared to males, supporting my hypothesis that sex-differences in AM phenotype development are responsible for sex-differences in nanoparticle-induced lung inflammation and injury.

**NAMSS Awards
Deadline:**

January 15, 2021

Contact:

Dr. Salik Hussain

salik.hussain@hsc.wvu.edu

NAMSS Website:

<http://www.toxicology.org/groups/ss/nano/>

***The EU Nanosafety
Cluster has renewed its
website:***

www.nanosafetycluster.eu

NAMSS Annual Meeting Awards



Best Publication Award:

An engraved plaque will be given to the first author of the paper that is judged to make significant contributions to the field of nanoscience and advanced materials. An engraved plaque also is given to the senior author if he/she is not also the first author. Selection criteria include the statement of a clear hypothesis, thoroughness of relevant nanomaterial physicochemical characterization, quality of data interpretation, potential impact, and style. At least one author of the paper must be a member of the Specialty Section.

Application materials include: Copy of accepted or in-press paper; one letter of support (cannot be authors) that describe the quality and impact of the study to the field.

Outstanding Graduate Student Award:

An engraved plaque and cash award will be given to a graduate student whose work represents an outstanding achievement in nanoscience and advanced materials. The amount of the award (\$500) will be given to a single winner or divided amongst first, second, and third place winners at the discretion of the Nanoscience and Advanced Materials Awards Committee. Selection criteria include the statement of a clear hypothesis, thoroughness of relevant nanomaterial physicochemical characterization, quality of data interpretation, potential impact, and style. Although preference will be given to Specialty Section and SOT members at large, the primary criterion for this award is the importance of the investigator's work to the field. Thus, students in other Specialty Sections are encouraged to apply. Undergraduate students are also eligible for this award.

Materials to be submitted for the award include: Accepted SOT abstract, extended abstract (2 pages maximum, tables/figures included), student CV, and one letter of recommendation (one from primary advisor).

Outstanding Postdoctoral Award:

An engraved plaque and cash award will be given to a postdoctoral student whose work represents an outstanding achievement in nanoscience and advanced materials. The amount of the award (\$500) will be given to a single winner or divided amongst first, second, and third place winners at the discretion of the Nanoscience and Advanced Materials Awards Committee. Selection criteria include the statement of a clear hypothesis, thoroughness of relevant nanomaterial physicochemical characterization, quality of data interpretation, potential impact, and style. Although preference will be given to Specialty Section and SOT members at large, the primary criterion for this award is the importance of the investigator's work to the field. Thus, postdoctoral candidates in other Specialty Sections are encouraged to apply.

Application materials include: Accepted SOT abstract, extended abstract (two pages maximum, tables/figures included), student CV, and one letter of recommendation (one from primary advisor).

Financial Report for Fall NAMSS Newsletter

Our most recent financial report posted for February 2020 states we have \$7,326.00 in available funds. Cost of awards this year were approximately \$1,440. Our membership currently consists of 158 members.

Sponsors Needed

In order for the Nanotox SS to remain a strong specialty section and to provide opportunities for students and postdocs to receive recognition for their great work, we need financial support. Individuals or organizations are encouraged to consider sponsorship for our specialty section. Sponsors are recognized at the annual meeting during the reception presentation and they will receive grateful acknowledgements in our newsletter and annual report.