DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE SEMINAR SERIES FALL 2021

DATE: WEDNESDAY, OCTOBER 13, 2021

LOCATION: Kupfrian Hall - 117 TIME: 1:00-2:20PM

GUEST SPEAKER

Dr. Phoebe Stapleton Assistant Professor Department of Pharmacology and Toxicology and Ernest Mario School of Pharmacy Rutgers University Piscataway, NJ

TOPIC

Can a fetus be affected by aerosolized particles?

ABSTRACT

Environmental exposures during pregnancy have implications pertaining to maternal and fetal health. Airborne particulate matter is of particular concern as inhaled nanosized particles deposit in the lower lung following exposure. Epidemiological evidence identifies exposure to particulate matter during gestation as a risk factor for intrauterine growth restriction and reduced fetal growth. Therefore, our laboratory focus is to identify mechanisms by which maternal inhalation of particulate matter may affect fetal health. One burgeoning group of nanoparticles increasingly recognized due to their chemical stability and environmental accumulation are those derived from plastics. Therefore, the purpose of these studies was to characterize maternal and fetal health, quantify ENM translocation through the placental barrier, and identify anatomical particle deposition after maternal exposure during pregnancy.

Methods: Initially, we exposed GD 19 SD rats (n = 3-6) to 300 uL of PS or saline through intratracheal instillation. This dose is equivalent to human exposure. Animals were sacrificed 24 hours later (GD 20) and tissues were collected. Particle deposition was assessed with FX Pro molecular imaging and dark-field microscopy. In a subset of studies, naïve GD 20 Sprague-Dawley (SD) rats (n = 6-9) were anesthetized, the left uterine horn was removed. A placental unit was identified, dissected, and transferred to an optimized isolated microvessel chamber. The uterine artery (proximal and distal) and umbilical vein and artery were cannulated, secured, and perfused with warmed oxygenated PSS at 80 mmHg and 50 mmHg, respectively. A 90 μ L bolus of Rhodamine labeled 20 nm polystyrene beads (PS; 8.8 x 10¹⁴ particles/mL) was introduced into the proximal side of the maternal artery, and maternal and fetal outputs were collected every 10m for 3h.

Results: The fetus and placenta of exposed dams were significantly smaller than control 24h after maternal exposure. Further, in isolated placenta, we measured polystyrene translocation from the maternal to fetal compartment within 30m of bolus infusion and continued over the 180m trial. The whole animal studies provide visualization of significant polystyrene

nanoparticle translocation in the placenta, fetal pup, fetal heart, and fetal liver as compared to saline controls. These findings were further confirmed using CytoViva darkfield microscopy.

Conclusion: Preliminary evidence demonstrates that maternal pulmonary exposure to nanosized particles can directly impact fetal health and impair fetal growth.

These and translocate from maternal exposure into fetal tissues after only 24h post-exposure.

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<u>BIO</u>

Dr. Stapleton is a tenure-track Assistant Professor in the Pharmacology and Toxicology Department of the Ernest Mario School of Pharmacy. She completed both her graduate studies and postdoctoral fellowship at West Virginia University. Dr. Stapleton's laboratory studies the cardiovascular implications of maternal exposure to nanomaterials during pregnancy, identifying the maternal, fetal, and offspring outcomes associated with these exposures. Most of her work has focused on inhalation of titanium dioxide nanoparticles, but recently Dr. Stapleton had begun to investigate toxicological outcomes associated with nanosized plastic particles.