Title: Effect of maternal exposure to polystyrene micro- and nanoplastics on placental and fetal development in a mouse model of pregnancy

Abstract:
Plastics are ubiquitous and when released into the environment, they break down into smaller particles termed microplastics (MPs). These microparticles can be ingested by organisms and potentially accumulate in tissues and organs. Recently, MPs were found in the placentas of healthy women, raising the concern that plastic exposure may have an impact on pregnancy and fetal development. In this project, we studied the effect of maternal exposure to micro- and nanoplastics on placental and fetal growth and on placental metabolism using experimental mice. CD-1 pregnant mice were exposed to 5 \( \mu \)m polystyrene microplastics (PS-MPs) and, 50 nm polystyrene nanoplastics (PS-NPs) in filtered drinking water at one of four environmentally-relevant concentrations (0 ng/L (controls), \( 10^2 \) ng/L, \( 10^4 \) ng/L, \( 10^6 \) ng/L) from embryonic day 0.5 to embryonic day 17.5 (full term is 18.5 days). While the placental weights were constant in all groups at embryonic day 17.5, there was a significant effect on fetal weights, with a dose-dependent decrease in weight in the MP- and NP-exposed fetuses (p<0.0001). Maternal exposure to PS-MPs and PS-NPs also impacted the structure of the placenta and resulted in shorter umbilical cord lengths in all MP- and NP-exposed groups. Placental metabolite profiles were determined using \(^1\)H high-resolution magic angle spinning magnetic resonance spectroscopy. The relative concentration of lysine (p=0.003) and glucose (p<0.0001) in the placenta were found to decrease
with increasing MP concentration. This study highlights the impact of MP and NP exposure on pregnancy outcomes and that efforts should be made to minimize exposure to plastics, particularly during pregnancy.