Impairment of Placental Efficiency in Rats Exposed to Micro- and Nanoplastics Throughout Pregnancy

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Micro- and nanoplastics (MNPs) are ubiquitous environmental contaminants. The increased use and physical degradation of bulk for plastic material leads to the production of micro- and nanoplastics particles, defined as less than 5 mm or 100 nm in diameter, respectively. Human exposure to MNPs often occurs through inhalation, which is supported by the detection of MNPs in human lungs. We investigate the microvascular effects of xenobiotic exposure from a reproductive standpoint and have demonstrated vasomotor functional impairment in uterine radial arteriole exposed to MNPs. Previous studies have demonstrated that particulate inhalation can alter the placental structure, potentially leading to abnormal fetal development. The purpose of these studies were to determine any structural changes to the placental tissue. Herein, we assessed placental development after MNP exposure from gestational day (GD) 6 through GD 20 through the morphometric analysis of H&E-stained placental sections and immunohistochemistry (IHC). Using Image-Pro Premier, the area of the different placental zones (i.e., labyrinth, junctional, and decidua) was acquired. Furthermore, vascular development in the labyrinth zone was quantified by measurement of the maternal and fetal blood spaces. Using IHC we targeted smooth muscle actin to measure trophoblast invasion of vessels in the metrial gland and pericyte density in the labyrinth zone. No significant differences were detected in the area of placental zones, however, exposed males demonstrated a 42% increase in pericyte density ($p<0.05$) in comparison to the naive males. Future studies will assess how markers of vascular development are affected after MNP inhalation during pregnancy. Supported by NIH-R01-ES031285 and NIH R25ES020721, Rutgers-RISE program, and Society of Toxicology Intern Program.