

Metal-Related Proteins and Environmental Contaminants in Human Placentas

Shabree Anthony, Ranran Zhang, Ludwik Gorczyca, Lauren Aleksunes
University of the Virgin Islands and Rutgers, The State University of New Jersey

The placenta is a complex organ that is essential for embryonic development into the latter stages of fetal development. Critical functions of the placenta include transporting nutrients from the mother to fetus and protecting the fetus against exposure to chemicals and pathogens. One response mechanism that promotes the reduction or negation of toxic materials in the placenta is upregulation of protective sequestering proteins. Metallothioneins (MTs) are a class of nucleophilic proteins that aid in the cellular detoxification of heavy metals. These proteins are especially important during pregnancy by helping to sequester cadmium (Cd). Cadmium has been shown to cause fetal growth restriction by limiting nutrient transfer from the mother to the fetus. This may predispose the fetus to having a preterm birth or postnatal developmental issues, such as low birth weight. Therefore, the primary aim of this study was to assess relationships between mRNA and protein expression of MTs and human placental concentrations of Cd. We hypothesized that if high Cd levels were present within the placental villous tissue, the MT1A and/or MT2A would be proportionally expressed. Placental heavy metal determination and analysis were performed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Western Blotting and real-time PCR were used to quantify gene expression. Additional heavy metals and nutrients such as zinc will be examined as well. Establishing these relationships will allow us to determine whether placentas exhibit variability in their ability to respond to heavy metal toxicant exposure. Supported by the SOT Intern Program, NIH R01ES029275 and GM008422.

