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Effects of cadmium on oxidative metabolism and motility of human placental cells in chemically-induced hypoxia

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Elevated cadmium concentrations are indicated as serious risk factor in the pathogenesis of various pathological forms of pregnancy related to an impaired migratory and invasive potential of trophoblasts, such as preeclampsia. The aim of this study was to investigate *in vitro* effects of increasing cadmium concentrations on human trophoblast cells under chemical hypoxia, the state that corresponds to physiological conditions in first trimester of pregnancy and evaluate theirpotential contribution to metabolic and trophoblast motility disorders under hypoxia, leading to a better understanding of role of cadminum in the pathogenesis of gestational disorders. Cell viability, migration capacity and the parameters of oxidative metabolism (such as superoxide anion radical and nitrites) were evaluated. We examined the effects of cadmium treatment in four concentrations (0.1, 1, 5, and 10 μM) at two periods of incubation (24 and 72 h) under normoxia and conditions of chemically induced hypoxia on human JEG-3 choriocarcinoma cell line. In conditions of chemical hypoxia, cadmium shows particularly intense effects on the disturbance of metabolism and mobility of human trophoblasts in relation to normoxic conditions, where its effect on the examined parameters is insignificant. In hypoxic conditions, cadmium significantly reduces the production of superoxide anion radicals, which indicates a strong decline in the mitochondrial trigger metabolism and correlates with reduced trophoblast viability. Cadmium induced a strong decrease in nitrite production in hypoxia, and also showed a promigratory effect, which in combination with severely disturbed redox balance and disturbed nitite signaling may indicate its contribution to inadequate trophoblast motility. These results indicate a high degree of sensitivity of human trophoblasts to cadmium in the early stages of embryonic development and placental formation, when proper proliferation and invasiveness of trophoblasts is crucial for establishing optimal levels of trophic exchange with the endometrium.

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