

Chronic stress may disrupt covariant fluctuations of vitamin D and cortisol plasma levels and placentome formation in pregnant sheep during the last trimester: a methodological approach and preliminary report

C. Wakefield, B. Janoschek, Y. Frank, Dennis A.B. David, F. Karp, N. Reyes, A. Desrochers, J. Schulkin, M.C. Wallingford, M.G. Frasch

Introduction: Psychosocial stress during pregnancy is a known contributor to preterm birth, but also has been increasingly appreciated as an in-utero insult acting long-term on prenatal and postnatal neurodevelopmental trajectories. These events impact many information molecules, including both vitamin D and cortisol. Both have been linked to low birth premature babies. Cortisol is frequently elevated in pregnant women and facilitates labor in part by elevating placental CRH. Vitamin D levels are decreased during pregnancy and have been shown to limit CRH in placental tissue. Both vitamin D and cortisol are linked to managing adversity. Studies in large animal models with high resemblance to human physiology that model the changes induced by such stress exposure are sparse.

Methods: Here, we model human third-trimester psychosocial stress using the ovine repetitive isolation. This model mimics stress associated with the daily challenges in the last trimester of human pregnancy. We present a digital telemetry approach to permit continuous monitoring of both maternal and fetal health in unrestricted animals. We also present intriguing findings in placentome dynamics due to chronic stress.

Results: The present pilot data suggest that chronic maternal stress during pregnancy results in endocrine and metabolic chronic habituation paralleled by sensitization to acute stress challenges.

Conclusion: Chronic stress may disrupt a physiological relationship between oscillations of vitamin D and cortisol and impacts placentome development. We present an animal model allowing for these preliminary observations to be validated in future preclinical studies in order to determine translational potential.