Neural stem cells in the fetal brain produce neurons and glial cells for the mature brain that we rely upon to live, laugh, and love. Recent work shows that neural stem cells are associated with immune system cells and vasculature. To better understand how these components may work together during brain development we investigated their relationships in germinal zones of the developing brain. This work revealed that links between blood vessels, immune cells and neural stem cells form a tightly woven plexus in the brain’s germinal zones. These data, together with findings showing that these cell types are susceptible to infection, suggested pathogens that impact any component of the germinal plexus may impact the trajectory of brain development. To explore this concept, we tested fetal brain tissue after exposure to a viral pathogen. We found massive alterations in the distribution of neural stem cells and fetal immune cells; a significant increase in the size and volume of blood vessels in the fetal brain; and reduced thickness of cortical grey matter — changes that persisted at least three months after virus exposure. To date, these studies indicate that interplay between neural stem cells, fetal immune cells, and developing vasculature contributes to normal brain development, and that persistent changes in brain structure may result from virus exposure during early gestation.

About the Speaker

Dr. Noctor is an Associate Professor in the Department of Psychiatry and Behavioral Sciences at the UC Davis School of Medicine. He studies perinatal development of the cerebral cortex, the folded outermost layer of the brain. The cerebral cortex plays an important role in movement, vision, hearing, touch, learning, memory, and higher cognition. The Noctor lab studies how the cerebral cortex develops during early stages of life, with a central focus on factors that control the embryonic stem and progenitor cells that produce cortical neurons and glial cells. His current work is examining how interactions between the developing nervous, immune and vascular systems govern growth of the brain during prenatal development. These studies have opened new avenues for understanding the etiology of neurodevelopmental disorders that result from alterations in brain cell production.