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Research Activities

The neural development requires both genetic (intrinsic) and environmental (extrinsic) factors at different embryonic and postnatal stages. Either lack is destined for CNS dysplasia. Our general research goal is to understand molecular pathways and genetic programs that control the CNS development. Currently it focuses on transcriptional regulation on the generation, specification and differentiation of both neuronal and glial cells, which is a pivotal intrinsic mechanism to control neural cell fate. In addition, we are also interested in how environmental factors affect this process. The study aims: (1) to identify and characterize candidate genes that are specifically expressed in neurons or glia; (2) to investigate the 'molecular switches' in CNS that are involved in hypoxia, aging, or developmental and neurological disorders such as attention-deficit hyperactivity disorder (ADHD), autism, multiple sclerosis (MS), amyotrophic lateral sclerosis (ALS) etc; (3) to develop molecular and/or cellular strategies for preventive or therapeutic purpose. The experimental approaches cover molecular cloning, RNA in situ hybridization, immunohistochemistry, Western blot, gene targeting, in ovo electroporation, and in vitro explant or stem cell culture. The electrophysiological and neurobehavioral assessments are also performed for functional analyses. Ongoing projects include:

- PAF signaling in normal CNS development.
- Oligodendroglial injury and sleep apnea-associated intermittent hypoxia.



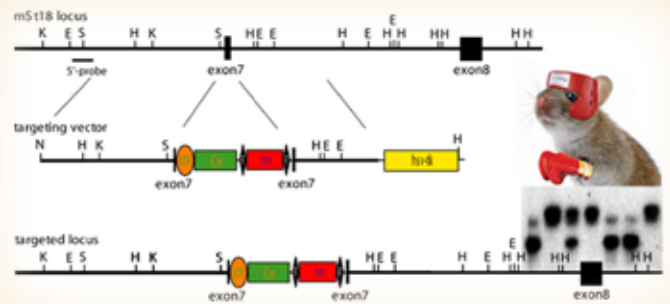
Grants Funded

Role: Principal Investigator

Title: Oligodendrocyte Generation in Prenatal Exposure to Intermittent Hypoxia

Funding Agency: University of Louisville

Direct Costs Funded: \$4,942



Role: COBRE Supported Junior Investigator

Title: Intermittent Hypoxia-mediated Oligodendrocytes Defects in a Murine Model of Gestational Sleep Apnea

Funding Agency: NIH/NCRR, COBRE

Direct Costs Funded: \$50,000

Role: Principal Investigator

Title: Phenotype on Myelination and Myelin Architecture in Intermittent Hypoxia Mouse Model

Funding Agency: University of Louisville School of Medicine

Direct Costs Funded: \$14,964.15

Peer-reviewed Publications

Liu Z, Hu X, **Cai J**, Liu B, Peng X, Wegner M, Qiu, M. Induction of oligodendrocyte differentiation by Olig2 and Sox10: evidence for reciprocal interactions and dosage-dependent mechanisms. *Developmental Biology* 302: 683-693 (2007)

Zhang YP, Shields LB, Pei J, Zhang Y, Xu XM, Hoskins R, **Cai J**, Qiu MS, Magnuson DS, Burke DA, Shields CB. Use of magnetic stimulation to elicit motor evoked potentials, somatosensory evoked potentials, and H-reflexes in non-sedated rodents. *Journal of Neuroscience Methods* 165(1): 9-17 (2007).