



Jun Cai, M.D., Ph.D.

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Department of Pediatrics
School of Medicine

Scholarly Activities:

The white matter consists mainly of myelinated axons, which is distributed into some specific areas including spinal cord, prefrontal cortex, corpus callosum, limbic system, and cerebellum etc. It plays an indispensable function not only on motor movement but advanced neuro-behaviors as well, such as self-discipline, judgment, problem solving, emotional management, long-term memory, and coordination. Both extrinsic and intrinsic cues that impact on either the developing process or the developed architecture will lead to the neurological disorders. The research activities in Dr. Cai's lab focus on understanding molecular, genetic and epigenetic regulations of white matter development in the CNS as well as pathological mechanisms in white matter impairment. The myelin-forming process and oligodendroglial-axonal interaction are targeted by use of genetic, molecular and cellular approaches on the mouse models resembling human CNS development and neurological diseases. The study aims: (1) to identify and characterize candidate genes that are specifically expressed in neurons or glia; (2) to investigate the 'molecular switch' in the CNS that are involved in white matter injury; (3) to develop molecular and/or cellular strategies for preventive or therapeutic purpose.

Grants:

Role: Co-I, COBRE supported junior faculty

Title: *Molecular determinants of developmental defects* (Robert M. Greene, PI)
Subproject - *Intermittent hypoxia-mediated oligodendrocyte defects in a murine model of gestational sleep apnea*

Funding Agency: NIH/NIGMS

Direct Costs Funded: \$100,000/year

Role: PI for pilot grant

Title: *Mechanisms of plasticity and repair after spinal cord injury* (Scott Whittemore, PI)
Pilot grant - *The role of PAF signaling in functional recovery after the SCI*

Funding Agency: NIH/NCRR

Direct Costs Funded: \$22,500

Role: PI

Title: *PAF signaling and white matter development in the CNS*

Funding Agency: Department of Pediatrics, University of Louisville School of Medicine

Direct Costs Funded: \$25,000

Publications (2013-2014):

Zhao, Y-Z., Lu, C-T.#, Li, X-K, Cai, J.# (2013) Ultrasound-mediated strategies in opening brain barriers for drug brain delivery. *Expert Opinion on Drug Delivery* 10(7): 987-1001. PMID23550691

Gao, Z., Zhu, Q.#, Zhang, Y.P., Zhao, Y., Cai, L., Shields, C.B., Cai, J.# (2013) Reciprocal modulation between microglia and astrocyte in reactive gliosis following the CNS injury. *Molecular Neurobiology* 48(3): 690-701. NIHMS471937

Cai, J.*, Zhang, Y.P.*, Shields, L.B.E., Zhang, Z.Z., Liu, N., Xu, X-M., Feng, S-Q., Shields, C.B. (2013). Correlation between electrophysiological properties, morphological maturation, and olig gene changes during postnatal motor tract development. *Developmental Neurobiology* 73(9): 713-722. NIHMS572269

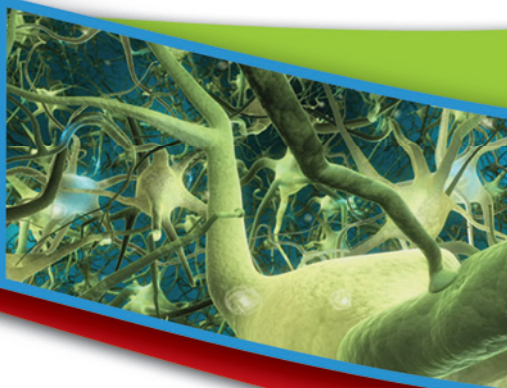
Zhao, Y-Z., Lv, H-F., Lu, C-T., Chen, L-J., Lin, M., Zhang, M., Jiang, X., Shen, X-T., Jin, R-R., Cai, J., Tian, X-Q., Wong, H-L. (2013) Evaluation of a novel thermosensitive heparin-polyoxamer hydrogel for improving vascular anastomosis quality and safety in a rabbit model. *PLoS One* 8(8):e73178. PMC3755001

Zhao, Y-Z., Li, X., Lu, C-T., Lin, M., Chen, L-J., Xiang, Q., Zhang, M., Jin, R-R., Jiang, X., Shen, X-T., Li, X-K. #, and Cai, J. #. (2014) Gelatin nanostructured lipid carriers-mediated intranasal delivery of basic fibroblast growth factor enhances recovery of dopaminergic neurons in 6-hydroxydopamine induced hemiparkinsonian rats. *Nanomedicine - Nanotechnology, Biology and Medicine* 10: 755-764.

Yin, X., Zhou, S., Zheng, Y. #, Tan, Y., Kong, M., Wang, B., Feng, W., Epstein, P.N., Cai, J.#, Cai, L. (2014) Metallothionein as a major compensative component prevents intermittent hypoxia-induced cardiomyopathy in mice. *Toxicology and Applied Pharmacology* 277(1): 58-66.

Zhou, S., Yin, X., Zheng, Y., Miao, X., Feng, W., Cai, J., Cai, L. (2014) Metallothionein prevents intermittent hypoxia-induced cardiac endoplasmic reticulum stress and cell death likely via activation of Akt signaling pathway in mice. *Toxicol Lett.* 227(2): 113-123.

Zhang, Y.P., Cai, J., Shields, L.B.E., Liu, N., Xu, X-M., Shields, C.B. (2014) Traumatic brain injury using mouse models. *Translational Stroke Research* 5(4): 454-471.



Gu, Z., Li, F-Q., Zhang, Y.P., Shields, L.B.E., Hu, X., Zheng, Y., Yu, P., Zhang, Y., Cai, J., Vitek, M.P., Shields, C.B. (2014). Apolipoprotein E mimetic promotes functional and histological recovery in lysolecithin-induced spinal cord demyelination model in mice. *J Neurol Neurophysiol.* S12: S12-010.

Lu, C-T., Zhao, Y-Z., Wang, H-L., Cai, J., Peng, L., Tian, X-Q (2014). Current approaches to enhance CNS delivery of drugs across the brain barriers. *International Journal of Nanomedicine* 10(9): 2241-2257.

Zhou, S., Wang, Y., Tan, Y., Cai, X., Cai, L., Cai, J.#, Zheng, Y.# (2014) Deletion of metallothionein exacerbates intermittent hypoxia induced oxidative and inflammatory injury in aorta. *Oxidative Medicine and Cellular Longevity* 2014: 141053.

Wu, H., Zhou, S., Kong, L., Chen, J., Feng, W., Cai, J., Miao, L., Tan, Y. (2014). Metallothionein deletion exacerbates intermittent hypoxia-induced renal injury in mice. *Toxicol Lett.* 232(2): 340-348.

co-corresponding author * contribute equally

External Professional Activities (2013-2014):

Editorial Boards, Associate editor, *International Journal of Clinical and Experimental Pathology*

Editor, *Pediatrics & Therapeutics*

Ad hoc expert panelist, *Journal Club of Sleep and Respiratory Neurobiology*, *American Thoracic Society*.

Peer manuscript reviewer for *Development*, *Neurobiology of Disease*, *Brain Research*, *Journal of Neuroscience Research*, *Stem Cells and Development*, *Molecular Biology Reports*, *Pediatrics Research*, *Pediatrics & Therapeutics*, *Neural Regeneration Research*, *Journal of Clinical Endocrinology and Metabolism*, *Sleep*, *Sleep Medicine*, *Nanomedicine-Nanotechnology*, *biology and Medicine*, *Antioxidants & Redox Signaling (ARS)*, *Journal the Royal Society Interface*.

