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Faculty Candidate Seminar

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"In Vivo Structural Plasticity of Cerebral Vasculature"

March 21, 2017
3:30pm – 4:30pm
Biocomplexity Institute Room 145

The cerebral vasculature provides blood flow throughout the brain, and local changes in blood flow are regulated to match the metabolic demands of the active brain regions. This neurovascular coupling is mediated by real-time changes in vessel diameter and depends on the underlying vascular network structure. Neurovascular structure is configured during development by genetic and activity-dependent factors. In adulthood, it can be altered by experiences such as prolonged hypoxia, sensory deprivation and seizure. Here, we have sought to determine whether exercise could alter cerebral vascular structure in the adult mouse. We performed repeated in vivo two-photon imaging in the motor cortex of adult transgenic mice expressing membrane-anchored green fluorescent protein in endothelial cells (tyrosine endothelial kinase 2 receptor (Tie2)-Cre:mTmG). This strategy allows for high-resolution imaging of the vessel walls throughout the lifespan. Vascular structure, as measured by capillary branch point number and position, segment diameter and length remained stable over a time scale of months as did pericyte number and position. Furthermore, we compared the vascular structure before, during, and after periods of voluntary wheel running and found no alterations in these same parameters. In both running and control mice, we observed a low rate of capillary segment subtraction. Interestingly, these rare subtraction events preferentially remove short vascular loops.

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