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Chris B. Schaffer is an Associate Professor in the Meinig School of Biomedical Engineering and the Associate Dean of Faculty at Cornell University. Chris received his undergraduate degree from the University of Florida and his PhD from Harvard University, both in physics, before working as a post-doc in David Kleinfeld's neuroscience laboratory at the University of California, San Diego. The lab he now jointly runs with Prof. Nozomi Nishimura at Cornell develops advanced optical techniques that enable quantitative imaging and targeted manipulation of individual cells in the central nervous system of rodents and uses such tools to construct a microscopic-scale understanding of normal and disease-state physiological processes in the brain. One area of current focus is understanding the role of brain blood flow disruptions in the development of Alzheimer's disease.

KN2: '*In vivo imaging reveals that stalled capillary flow causes cortical perfusion deficits that contribute to impaired memory function in mouse models of Alzheimer's disease.*'

Blood flow to the brain is reduced by about one third in patients with Alzheimer's disease. This decreased brain blood flow contributes to the memory and cognitive problems seen in Alzheimer's and may accelerate progression of the disease. The mechanism causing this poor brain blood flow, however, has remained undiscovered. Using high-resolution in vivo imaging of blood flow in mouse models of Alzheimer's disease, we have identified the plugging of capillary segments by firmly adhered white blood cells as a mechanism that contributes to this blood flow decrease. In Alzheimer's mice, nearly 2% of capillaries have stalled blood flow due to an adhered leukocyte, while wild type mice have stalls in less than 0.5% of capillaries. Because one stalled capillary decreases blood flow in many downstream branches, the 2% of capillaries stalled leads to substantial blood flow decreases. When we blocked leukocyte adhesion, the incidence of capillary stalls was sharply reduced and cortical blood flow increased by ~30%, immediately. This increase in brain blood flow was accompanied by a rapid improvement in cognitive performance of mice on spatial and working memory tasks. These data suggest that white blood cells sticking in capillaries may be responsible for the reduced blood flow to the brain seen in Alzheimer's patients and that treating this could both improve cognitive function and slow disease progression.