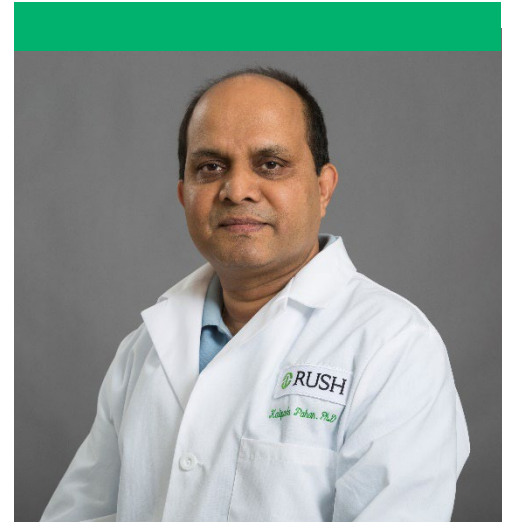


Kalipada Pahan, PhD

The Floyd A. Davis, MD, Professor of Neurology



Advancement of Medicine

In 2023, we advanced our efforts in our area of research concerning multiple sclerosis, or MS, which is the most common condition that causes damage to the protective covering that surrounds nerve fibers.

One major focus is the study of a type of cell in the central nervous system called the **oligodendrocyte** cell. Its progenitor cells, or OPCs, do not differentiate into oligodendrocytes in the central nervous system of MS patients. Understanding why this differentiation does not happen and the identification of nontoxic compounds/drugs for the stimulation of OPC differentiation are important areas of research. This is our area of investigation, which has revealed several interesting areas for further investigation, including discovery of ways that β -hydroxy β -methylbutyrate, or HMB — a non-toxic, muscle-building supplement in human — stimulates the maturation of OPCs to oligodendrocytes.

In another study, we have seen that after oral administration, HMB enters the brain, improves hippocampal plasticity, restores cognitive function and reduces plaque load in a mouse model of Alzheimer's disease. Since HMB is a non-toxic and easily available supplement, these results suggest that oral HMB may be used as a therapeutic supplement in patients with MS and Alzheimer's.

Research

Funds from the endowment have gone towards supporting my innovative research work and allowed us to support a postdoctoral student who is undertaking exciting studies on muscle-building supplements.

Grants

- Grant (1 I01 BX005613) entitled “Remyelination by intranasal TIDM peptide” from the US Department of Veterans Affairs.
- Grant (R01AT010980) entitled “Muscle building supplement HMB for remyelination” from the National Institutes of Health.

Invited Presentations

- “Is a treatment for Alzheimer’s sitting in sports and fitness supplement stores?” Neurology Grand Round, Rush University Medical Center, August 1, 2023.
- “Research at Pahan lab,” Integrated Biomedical Sciences, Graduate College, Rush University Medical Center, July 17, 2023.
- “Stop protein spreading in the brain by treadmill or a drug mimicking treadmill,” Pharmacology and Experimental Neuroscience (PEN) Seminar Series, University of Nebraska Medical Center, Omaha, NE, May 12, 2023.
- “Reduction of brain pathology by treadmill or a drug mimicking treadmill,” Research Day, Jesse Brown VA Medical Center, Chicago, IL, May 9, 2023.
- “Brain’s natural drugs for Alzheimer’s disease,” Biochemistry and Molecular Biology Graduate Program, Southern Illinois University School of Medicine, Carbondale, IL, April 28, 2023.
- “Hippocampal drugs for Alzheimer’s disease,” Neurology and Therapeutics Plenary Lecture, The 27th Scientific Conference of the Society on Neuroimmune Pharmacology (SNIP), March 18, 2023.

Publication Highlights — Abbreviated

- “Tau fibrils induce glial inflammation and neuropathology via TLR2 in Alzheimer’s disease-related mouse models,” *The Journal of Clinical Investigation* (2003)
- “Muscle-building supplement β -hydroxy β -methylbutyrate binds to PPAR α to improve hippocampal functions in mice,” *Cell reports* (2023).
- “Suppression of experimental autoimmune encephalomyelitis in mice by β -hydroxy β -methylbutyrate, a body-building supplement in humans,” *The Journal of Immunology* (2023).
- “Activation of PPAR α exhibits therapeutic efficacy in a mouse model of juvenile neuronal ceroid lipofuscinosis,” *Journal of Neuroscience* (2023).



- “Treadmill workout activates PPAR α in the hippocampus to upregulate ADAM10, decrease plaques and improve cognitive functions in 5XFAD mouse model of Alzheimer’s disease,” *Brain, behavior, and immunity* (2023).

The Year Ahead: 2024 and Beyond

Ninety-five percent of the research work in our laboratory is done by trainees. Therefore, we will continue training and mentoring medical students, graduate students and postdoctoral fellows. Many of our trainees are now either medical doctors in different clinics or faculties in academic institutions.

With Gratitude

My sincere thanks for enabling our innovative MS research at Rush. Honoring the legacy of Dr. Floyd A. Davis is a privilege I do not take lightly. Due to your generous support of our translational research, we are demonstrated leaders on a national and international level.