

Decoding *Dementia* through Alzheimer's Disease

Prof. Dr. Thimmaiah Govindaraju

Bioorganic Chemistry Laboratory, New Chemistry Unit, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Jakkur P.O., Bengaluru-560064, Karnataka, India.

E-mail: tgraju@jncasr.ac.in

Alzheimer's disease (AD) is a major neurodegenerative disorder (NDD) and a growing global health concern due to its increasing prevalence and the absence of effective treatments. Neurodegenerative disorders are generally characterized by abnormal protein aggregation, oxidative stress, mitochondrial damage, neuroinflammation, and neuronal loss, leading to cognitive deficits. Ferroptosis, an iron-dependent form of cell death, plays a crucial role in the pathology of AD, as several characteristics of AD align with the features of ferroptosis. Similarly, neuroinflammation is an early pathological feature observed in the majority of neurodegenerative disorders, including AD. The activation of microglia and the NLRP3 inflammasome plays a pivotal role in mediating neuroinflammation and significantly contributes to the pathogenesis of various neurodegenerative and neuroinflammatory disorders through pyroptosis, making it a promising therapeutic target. In this talk, I will present the multifactorial nature of AD and our research on the neuroinflammation-ferroptosis-AD Axis. I will also discuss innovative strategies for mitigating this nexus under neurodegenerative conditions, specifically AD.

References

Milind Kumar Anand, Elumalai Premalatha, Hariharan Moorthy, Thimmaiah Govindaraju. Recent innovative approaches for drug delivery systems targeting cancer and CNS disorders. *Journal of Materials Chemistry B*, 2026, 14(20), 6132–6155.

Kumar, Ashish, Mondal, Tanmay, Ramesh, Madhu, Samanta, Sourav, Govindaraju, Thimmaiah. Griess's Reagent-Based Azo Compounds Ameliorate Multifaceted Toxicity and Ferroptosis in Alzheimer's Disease. *ACS Chemical Neuroscience* 2026, 17(4), 833–845.

Kumar, Ashish, Ramesh, Madhu, Bhoi, Jikesh, Govindaraju, Thimmaiah. Papaverine-Derived Dual-Active Modulator Ameliorates Alzheimer's Disease Pathology in Aged APP/PSEN1 Transgenic Mice. *Journal of Medicinal Chemistry* 2026, 69(2), 1735–1751.

Kharat, Narendra Dinkar, Naharwal, Sushma, Mandal, Sabyasachi, Bajaj, Kiran, Sakhuja, Rajeev. A rhodium-catalyzed [4 + 2] annulation strategy to synthesize pyranone-mounted tyrosines with anti-neuroinflammatory activity. *Organic and Biomolecular Chemistry* 2025, 23(46), 10533–10543.

Moorthy, Hariharan, Sain, Shreyasri, Padhi, Dikshaa, Govindaraju, Thimmaiah. The Pathological Nexus and Multipronged Approaches to Mitigate Ferroptosis and Alzheimer's Disease. *Journal of Medicinal Chemistry* 2025, 68(19), 19828–19845.