

Photobiomodulation Influences Alzheimer's Disease-Relevant Neurophysiology Beyond Amyloid

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Why beyond amyloid?



Neurometabolic dysfunction



Neuroinflammation



Vascular dysregulation



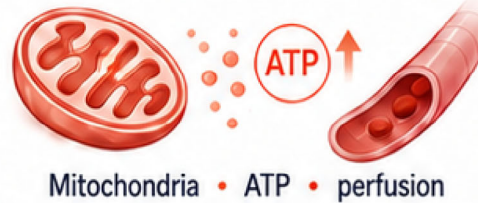
Network disintegration / impaired waste clearance

AD progression is NOT explained by amyloid alone.



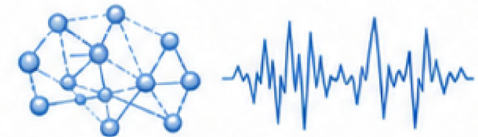
Intranasal + Transcranial Photobiomodulation (PBM).

1 Neurometabolic support



Mitochondria • ATP • perfusion

2 Network-level modulation



EEG oscillations • connectivity

3 Glymphatic / CSF-ISF exchange



Waste clearance-related physiology

Observed clinical signals



Global cognition



Executive function



Neuropsychiatric symptoms

Observed physiology



Cortical oscillations



Functional connectivity



CSF dynamics (glymphatic-related)



Human studies across the AD spectrum



MCI + early dementia



Repeated near-infrared itPBM sessions



Selected references

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2. Chao LL. Effects of Home Photobiomodulation Treatments on Cognitive and Behavioral Function, Cerebral Perfusion, and Resting-State Functional Connectivity in Patients with Dementia: A Pilot Trial. *Photobiomodul Photomed Laser Surg.* 2019;37(3):133-141.
3. Blinzt C, Relano-Gines A, Wachtel M, Touchon J. A Randomized, Double-Blind, and Sham-Controlled Trial of an Innovative Brain-Gut Photobiomodulation Therapy: Safety and Patient Compliance. *J Alzheimers Dis.* 2022;90(2):811-822.
4. Lim L. Modifying Alzheimer's disease pathophysiology with photobiomodulation: model, evidence, and future with EEG-guided intervention. *Front Neurol.* 2024;15:1407785.
5. Guo R, Li D, Li F, et al. Effects of whole-head 810 nm near-infrared therapy on cognitive and neuropsychiatric symptoms in Alzheimer's disease: A pilot study.



Take-home message

Across collaborative human studies, near-infrared intranasal + transcranial PBM was associated with improvements or stabilization in cognition and symptoms, alongside modulation of brain networks and glymphatic-related physiology. These findings support further controlled multimodal studies.

