Biophoton and Tubulin: New Insights into the Etiology of Neurodegenerative Diseases

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Dear Editor,

Quantum physics may uncover mechanisms such as biophoton and tubulin entanglement, offering novel insights into neurological disease etiology [1]. A biophoton is an ultra-weak light emission produced by biological organisms, typically resulting from biochemical reactions such as oxidative stress or cellular metabolism [2].

Tubulin is the protein that assembles into long, cylindrical structures called microtubules, which are essential for maintaining cell shape, intracellular transport, and neuron structure [3].

The role of microtubules in neural infections such as Human cytomegalovirus and herpes simplex virus alters microtubule structures in human forebrain neurons, leading to neurite retraction and syncytia formation [4,5]. Interestingly, treatment with paclitaxel, a microtubule-stabilizing agent, restored neurite outgrowth, suggesting a neuroprotective role of microtubule stabilization, despite limited effects on viral replication [4].

Despite significant progress in conventional neuroscience, the complexity of conditions like Alzheimer's, Parkinson's, and epilepsy still presents formidable challenges [6]. A growing interest in quantum biology offers exciting possibilities, particularly concerning the roles of biophotons and tubulin in neural processes [1].

A study by Ostovari et al. [7] suggested that the entanglement between bio-photons and tubulin states in neurons could underlie cognitive processes and memory storage in microtubules that are involved in neural communication, and disruptions at the microtubule level may interfere with this process, especially in neurodegenerative conditions [7].

Furthermore, several studies suggest that biophotons could enable long-range signaling within the brain, potentially influencing synaptic activity, neuronal regulation, and possibly the development of neurodegenerative diseases. These light-based signals could introduce a novel layer of complexity to brain function, operating at the quantum level in ways we are only beginning to understand [8].

At the same time, tubulin has been proposed as a candidate for quantum computation in the brain. The Orchestrated Objective Reduction (Orch OR) theory, originally proposed by Sir Roger Penrose and Stuart Hameroff, postulates that quantum coherence might occur within microtubules, which are composed of tubulin [9]. If this theory is validated, it could imply that quantum effects within microtubules play a role in consciousness and perhaps even in the onset of neurological diseases [10]. The combination of quantum phenomena like biophoton signaling and tubulin's potential role in quantum computation presents an exciting frontier for research into neurodegenerative diseases etiology [7]. While it remains speculative, disruptions in quantum processes such as biophoton signaling or microtubule quantum computation could potentially play a role in the progression of neurodegenerative diseases. Could future therapies, aimed at modulating these quantum processes within microtubules, offer new approaches to mitigating diseases like Alzheimer's or Parkinson's? Although these questions push the boundaries of conventional neuroscience, they warrant careful investigation, given their potential to reshape our understanding of brain function and dysfunction. Nonetheless, extensive experimental validation is required to explore the feasibility of such quantum-based interventions.

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We encourage the scientific community to continue investigating these avenues, as they hold great promise for unlocking the mysteries of neurological disease at a fundamental level.

Conflict of Interest

None

References

1. Calvillo L, Redaelli V, Ludwig N, Qaswal AB, Ghidoni A, Faini A, et al. Quantum biology research meets pathophysiology and therapeutic mechanisms: a biomedical perspective. *Quantum Rep.* 2022;**4**(2):148-72. doi: 10.3390/quantum4020011.
2. Zazubovich V, Jankowiak R. Biophotonics of Photosynthesis. In: Andrews DL, editor. Photonics: Biomedical Photonics, Spectroscopy, and Microscopy. 1st ed. Wiley; 2015. p. 129–64.
3. Park JH, Roll-Mecak A. The tubulin code in neuronal polarity. *Curr Opin Neurobiol.* 2018;**51**:95-102. doi: 10.1016/j.conb.2018.03.001. PubMed PMID: 29554585. PubMed PMCID: PMC7214607.
4. Adelman JW, Sukowaty AT, Partridge KJ, Gawrys JE, Terhune SS, Ebert AD. Stabilizing microtubules aids neurite structure and disrupts syncytia formation in human cytomegalovirus-infected human forebrain neurons. *bioRxiv [Preprint]*. 2024. doi: 10.1101/2024.08.16.608340. PubMed PMID: 39229072. PubMed PMCID: PMC11370344.
5. White S, Kawano H, Harata NC, Roller RJ. Herpes Simplex Virus Organizes Cytoplasmic Membranes To Form a Viral Assembly Center in Neuronal Cells. *J Virol.* 2020;**94**(19):e00900-20. doi: 10.1128/JVI.00900-20. PubMed PMID: 32699089. PubMed PMCID: PMC7495378.
6. Bisiani J, Anugu A, Pentyala S. It's Time to Go Quantum in Medicine. *J Clin Med.* 2023;**12**(13):4506. doi: 10.3390/jcm12134506. PubMed PMID: 37445540. PubMed PMCID: PMC10342414.
7. Ostovari M, Alipour A, Mehdizadeh AR. Entanglement between bio-photons and Tubulins in brain: implications for memory storage and information processing. *NeuroQuantology.* 2014;**12**(3):350-5. doi: 10.14704/nq.2014.12.3.766.
8. Parra-Damas A, Saura CA. Synapse-to-Nucleus Signaling in Neurodegenerative and Neuropsychiatric Disorders. *Biol Psychiatry.* 2019;**86**(2):87-96. doi: 10.1016/j.biopsych.2019.01.006. PubMed PMID: 30846302.
9. Hameroff S, Penrose R. Orchestrated reduction of quantum coherence in brain microtubules: A model for consciousness. *Math Comput Simul.* 1996;**40**(3-4):453-80. doi: 10.1016/0378-4754(96)80476-9.
10. Adams B, Petruccione F. Quantum effects in the brain: A review. *AVS Quantum Sci.* 2020;**2**(2):022901. doi: 10.1116/1.5135170.

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