Curcumin, a promising anti-amyloid, anti-inflammatory natural polyphenol to label, and image amyloid beta protein and prevent Alzheimer's disease

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Abstract (300 words)

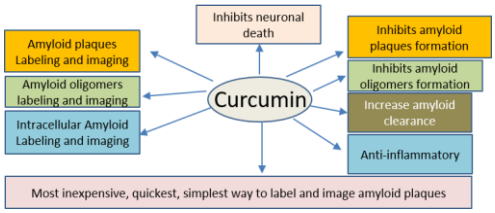
Deposition of amyloid beta protein (Aβ) in extra- and intracellular spaces is one of the hallmark pathologies of Alzheimer's disease (AD). Therefore, detection of the presence of Aβ in AD brain tissue and its degradation is an important for developing new treatments to prevent the progression of this disease. Several classical amyloid binding dyes, fluorochrome compounds, imaging probes, and Aβ-specific antibodies have been utilized to detect Aβ histochemically in AD brain tissue. Use of these compounds for Aβ detection is costly and time consuming. However, because of its intense fluorescent activity, high-affinity, and specificity for Aβ, as well as structural similarities with traditional amyloid binding dyes, curcumin (Cur) is a promising candidate for labeling and imaging of Aβ plaques in post-mortem brain tissue. It is a natural polyphenol from the herb *Curcuma longa*. In the present study, we used Cur to histochemically labeled Aβ plaques within a minute from both a genetic mouse model of familial Alzheimer's disease (5xFAD) and from human AD tissue. We compared the labeling capability of Cur along with other classical amyloid binding dyes, such as thioflavin-S, Congo red and Fluoro-jade C, and with Aβ-specific antibodies (6E10 and A11). We also treated Alzheimer's disease mouse (5xFAD) with Cur (100 mg/Kg BW) for 5 days and for 2 months. We observed that Cur is the most inexpensive and quickest way to label and image Aβ plaques among all of these classical amyloid binding dyes and Aβ-specific antibodies. In addition, Cur binds with most Aβ species, such as oligomers and fibrils. It also inhibits amyloid plaques formation, decrease neurodegeneration and neuroinflammation. Therefore, Cur can be used as the most cost effective, simple and quick fluorochrome detection agent for Aβ plaques and inhibit amyloid aggregation *in vitro* and *in vivo*.

Keywords: Alzheimer's disease, amyloid beta protein, Curcumin, neurodegeneration, classical amyloid binding dyes, 5XFAD

Recent Publications (minimum 5)

1. Maiti P, Hall TC, Paladugu L, Koli N, Learman C, Rossignol J, Dunbar, GL (2016). A comparative study of dietary curcumin, nanocurcumin, and other classical amyloid-binding dyes for labeling and imaging of amyloid plaques in brain tissue of 5×-familial Alzheimer's disease mice. Histochemistry and Cell Biology, 12; 146(5):609-625.
2. Maiti P, Dunbar DL. Comparative neuroprotective effects of dietary curcumin and solid lipid curcumin particles in cultured mouse neuroblastoma cells after exposure to Aβ42. International journal of Alzheimer's Disease 2017, 2017: 1-13
3. Maiti P, Rossignol J, Dunbar DL (2017). Curcumin modulates molecular chaperones and autophagy lysosomal pathway in rat cortical neurons after exposure to Aβ42. Journal of Alzheimer's disease and Parkinsonism, 7(1): 1-12.

4. Maiti P, Paladugu L, Dunbar GL (2018). Solid lipid curcumin particles provide greater anti-amyloid, anti-inflammatory and neuroprotective effects than dietary curcumin in the 5xFAD mouse model of Alzheimer's disease. BMC Neurosci. 19(1):7.
5. Maiti P, Scott J, Sengupta D, Al-Gharaibeh A, Dunbar G (2019). Curcumin and Solid Lipid Curcumin Particles Induce Autophagy but Inhibit Mitophagy and the PI3K-Akt/mTOR Pathway in Cultured Glioblastoma Cells. International Journal of Molecular Sciences, 2019 Int J Mol Sci. 18;20(2).





Biography (150-word limit)

Panchanan Maiti is expertise on neurodegenerative diseases. His current research interest on protein misfolding in neurodegenerative diseases. He is looking mechanistic details of role of autophagy, mitophagy, molecular chaperones, unfolded protein responses in these diseases. His second line of research interest is on anti-cancer effects of natural compounds in glioblastoma. Currently, he is the Lead research scientist of Field Neurosciences Institute, Ascension of St. Mary's hospital, and hold adjunct faculty positions at Psychology, Neuroscience program, Central Michigan University, Dept. of Biology, Saginaw Valley State University and Instructor at Brain Research Laboratory at Saginaw Valley State University, MI, USA. He has published more than 48 papers in reputed journals and 4 book chapters and many abstracts. Along with this he is also serving as an editorial board member of several reputed journals.

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