The Effect of Polyphenols in Spices on the Aggregation of the Amyloid-Beta Peptide 1-40, an in vitro Study

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A primary characteristic of Alzheimer’s disease is the oligomerization of amyloid-beta (aß) 1-40 random coil structures leading to the eventual formation of neurofibrillary tangles and aß plaques. Such plaques, highly resistant to degradation, accumulate within the brain. This study aimed to see the effect of the Indian spices turmeric and pepper, with active ingredients curcumin and capsaicin respectively, on the aggregation of the aß peptide, thus their effectiveness in inhibiting the oligomerization process. Curcumin has been shown to be effective in inhibiting Alzheimer's progression, yet since pure turmeric is not often ingested alone, capsaicin was studied both individually and in a mix alongside curcumin to see its effectiveness in inhibiting aggregation. A Circular Dichroism (CD) was utilized to monitor the aß oligomerization each day, using CD cells at 50mM per sample. A phosphate buffer was added as well as trifluoroacetic acid (TFA) to bring each CD cell and its contents to a pH of 7.4. Each cell was kept from light, under a constant temperature, at the same pH and concentration to maintain a control. The CD passed light through each cell creating a graph of an upside down bell curve; the position of the bottom of the curve signified how far the sample was from plaque formation. By day five, aggregation rate for curcumin, capsaicin and was 6%, 7%, and 9% respectively, while the control aggregated at a rate of 25%. Data displayed that curcumin and capsaicin effectively inhibited the aggregation process, curcumin slightly better than capsaicin and the mix. Overall, the effectiveness of curcumin, capsaicin and the mix is substantial when compared to the control, further supporting the hypothesis.

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