

# Phytochemical Fighting Alzheimer's Disease

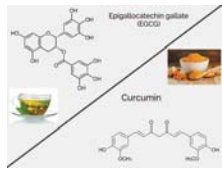
## How the Small Molecules in Plant Compounds Might Reduce the Risk of Memory Loss

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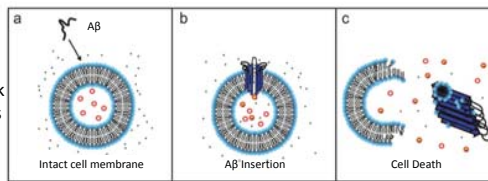
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**Problem:** Alzheimer's is the six leading cause of death in the US..

**Goal of Research:** To test the effects of the plant compounds EGCG and curcumin on A $\beta$  insertion into a lipid membrane.

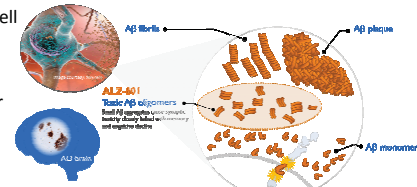


EGCG and curcumin are thought to reduce the risk of Alzheimer's Disease.



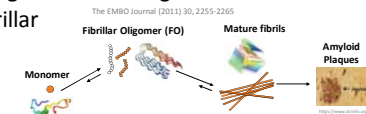
Some form of Amyloid Beta inserts into the cell membrane. This causes damage to the cell membrane and leads to cell death.

Alzheimer's begins from a peptide of APP. This monomer can form toxic oligomers. Oligomers aggregate into fibrils, which clump together and form the plaques that are seen in Alzheimer's patient's brains.



### Introduction:

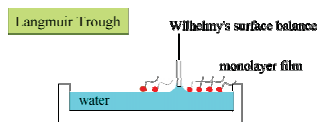
It is known that Amyloid Beta (A $\beta$ ) is the peptide from Amyloid Precursor Protein (APP) that begins the degeneration of neurons. A $\beta$  has multiple forms. Monomers are individual peptides of APP. These monomers aggregate to form oligomers. In this experiment, Fibrillar Oligomers (FOs) were tested in a Langmuir Trough. Both monomers and oligomers are forms of A $\beta$ .



Forms of A $\beta$	
Monomeric	Fibrillar Oligomer (FO)
Majority random coil	$\beta$ -sheet rich
4nm	10-20nm
1 unit	2-4 units

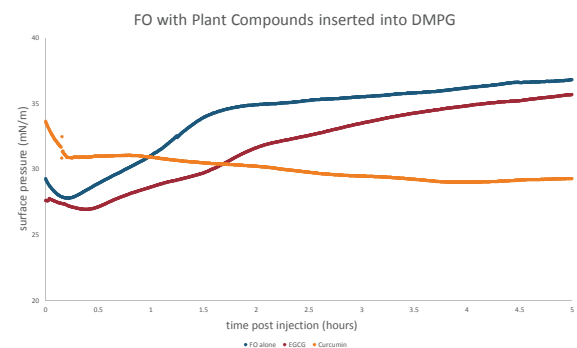
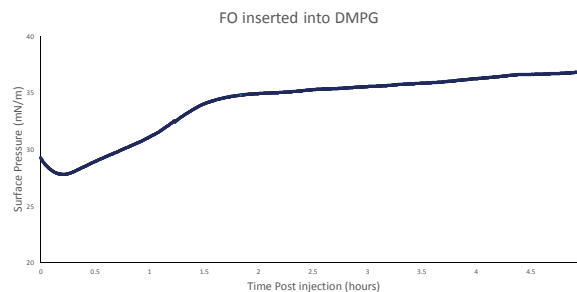
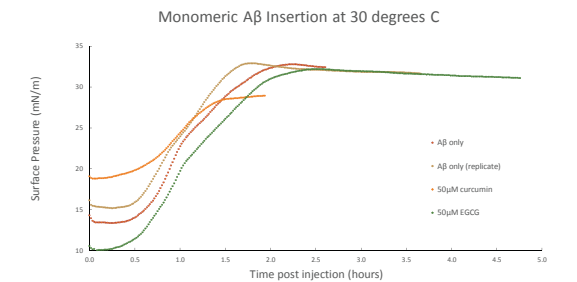
### Methods:

To test this, a Langmuir Trough was used. The Langmuir trough is filled with water and the lipid DMPG is used for the monolayer. Protein is injected under the subphase. The Wilhelmy Plate on the trough measures surface pressure. When protein injects into a lipid membrane, we see an increase of surface pressure because more molecules are coming to the surface.



Tel Aviv University, www.bing.com/images/search?view=details%2Cwilhelmy%

### Results:



Previous work in the Chi Lab had tested monomeric A $\beta$  with the plant compounds. When interpreting this graph, we look at how long the protein takes to insert, and where the surface pressure stabilizes. The plant compounds do not have a drastic effect on how long it took the protein to insert. This means that the plant compound does not inhibit the A $\beta$  from inserting into the lipids

The second graph is FO alone, used for a control. The FO takes about 1-2 hours to insert into the lipid monolayer, and stabilizes at a surface pressure of about 35mN/m.

The plant compounds were combined with the FO and sat for approximately thirty minutes. The plant compounds do effect how the FO inserts into the membrane. EGCG (red), slows the insertion and also stabilizes at a lower surface pressure. Curcumin (orange) completely inhibits the FO from inserting into the lipid monolayer.

### Future Work:

- This experiment shows that plant compounds effect how A $\beta$  inserts into DMPG. It is unknown whether the plant compounds effect insertion by protecting the cell membrane, or by detoxifying the oligomers. There could be future work done to test what the compounds are doing.
- Other plant compounds are also thought to benefit the brain in the same way as curcumin and EGCG. Specifically resveratrol and myricetin are thought to slow the progression of Alzheimer's Disease. Tests can be done in the future using the Langmuir Trough to see if these compounds effect A $\beta$  insertion the same way EGCG and curcumin did.

### Acknowledgments:

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