

CINNAMON? SWEET!

UCSB RESEARCHERS ROSHNI GEORGE AND DONALD GRAVES TRY FIGHTING DEMENTIA WITH CINNAMON; IT LOOKS LIKE THEY'RE ON TO SOMETHING...



MAD SCIENCE **Fighting Alzheimer's with Cinnamon**

As the age of the nation's population increases, **Alzheimer's Disease** is becoming a bigger and bigger concern.

Alzheimer's, as many of us have seen, causes dementia. It starts small, with momentary memory lapses that anyone can laugh off as "senior moments." But dementia progresses, unfortunately, soon causing the loss of recent memories. Last summer's vacation with the family fades and people you recently met become ghosts. Cognitive abilities begin to wane. Reminders, lists and repetitive questions become the norm. From there, dementia continues to take memory after memory, working its way backwards. The effects are devastating, both for the person with Alzheimer's and for those close to that person.

And the economic cost of Alzheimer's is similarly devastating, estimated to be over \$200 billion in the United States this year alone.

Tangled Up

If you've heard of Alzheimer's, you've heard of "plaques and tangles." These

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are the mysterious build-ups happening in the brain that everyone blames for the slow descent into dementia. They have been the target of years of research, research that has led to several treatments. However, it has been the “plaques,” more than the “tangles,” that have been investigated. While that avenue has led to some new and effective medications, we have yet to find a long-lasting method of slowing or reversing the effects of Alzheimer’s Disease.

In the search for more effective treatments, a lab at UCSB has decided to focus on the “tangles” of Alzheimer’s. “Tangles” refer to intracellular neurofibrillary tangles composed of a protein called *tau*. The *tau* protein is involved in the construction and maintenance of microtubules, which are essential for maintaining cell structure and for the transport of proteins within the cell. Recent research has shown that breaking up *tau* tangles attenuates cognitive decline, making them a prime target.

Roshni George and Donald Graves of the Department of Molecular, Cellular and Developmental Biology at UCSB observed that the *tau* proteins are rich in binding sites for antioxidants, those miracle cancer-fighting molecules found in healthy foods. Perhaps, they thought, antioxidants could help prevent or eliminate the tangles. To test the idea, they chose everybody’s favorite Christmas time antioxidant: Cinnamon.

Don’t worry. I had no idea that cinnamon was a powerful antioxidant either.

C-C-C-Cinnamon to the Rescue

Initially, George, Graves and the entire research team had to test whether cinnamon would interact with *tau* at all. To do so, they cultured *tau* tangles outside of a neuron and bathed the tangles in cinnamon extract. Not only did the *tau* tangles cease aggregating, they also detangled themselves.

So far, so good.

Next, the research team moved on to cultured neurons taken *posthumously* from patients in the advanced stages of Alzheimer’s Disease. These neurons, cultured *in vitro*, expressed high levels of *tau* tangles. After being bathed in the cinnamon extract, the *tau* tangles within the neurons again began to break up, freeing the *tau* proteins.

More progress.

George and Graves have built on those findings. Since the discovery in 2009 that cinnamon extract can help stop and reduce *tau* tangles, the research team has been trying to determine why, precisely, that is the case. This month, they published a paper that goes a long way to answering that question.

Cinnamon, like all spices, is not



simply one molecule. Instead, it consists of many different molecules with many different properties. Breaking down the components of cinnamon extract, George and Graves focused on two particular active components: Cinnamaldehyde (the molecule that gives cinnamon its flavor and color) and epicatechin (a powerful, but flavorless, antioxidant). And, it turns out, both cinnamaldehyde and oxidized epicatechin interacted with *tau* to inhibit its aggregation.

As a protein, *tau* consists of a string of amino acids. One of the amino acids found in *tau*, cysteine, was the primary interaction site for both cinnamaldehyde and oxidized epicatechin. To cut through all that jargon, think of cinnamaldehyde and oxidized epicatechin as sunscreen and the *tau* protein as your skin.

Once you apply sunscreen, you are preventing the harmful oxidizing rays of the sun from damaging your skin. That is what these molecules from cinnamon extract are doing: they are protecting *tau* proteins from the damage caused by oxidizing molecules inside your body that would induce tangles.

This discovery gets even better. Whereas many other treatments might impair *tau*’s primary (and essential) function, cinnamaldehyde and oxidized epicatechin do not prevent *tau* from making and maintaining microtubules. Think of it as a win-win.

Research regarding cinnamon’s beneficial effects is still in its infancy. It will be years before we’ll see a usable medication come from this. But, right now, we can fully enjoy that cinnamon roll knowing that we are getting a blast of Alzheimer’s-fighting cinnamon while we satisfy our sweet tooth.

With Alzheimer’s becoming such a large social and financial concern, it is exciting to see that we have an arsenal at our disposal to fight the disease from an early stage. It’s just one more reason to eat an antioxidant-rich diet.

It is decidedly *not*, however, an excuse to try a cinnamon challenge. ☺