Fruitful Research

Summer Scholar uses fruit flies to study aging.

by Kelli Caplan | August 15, 2024

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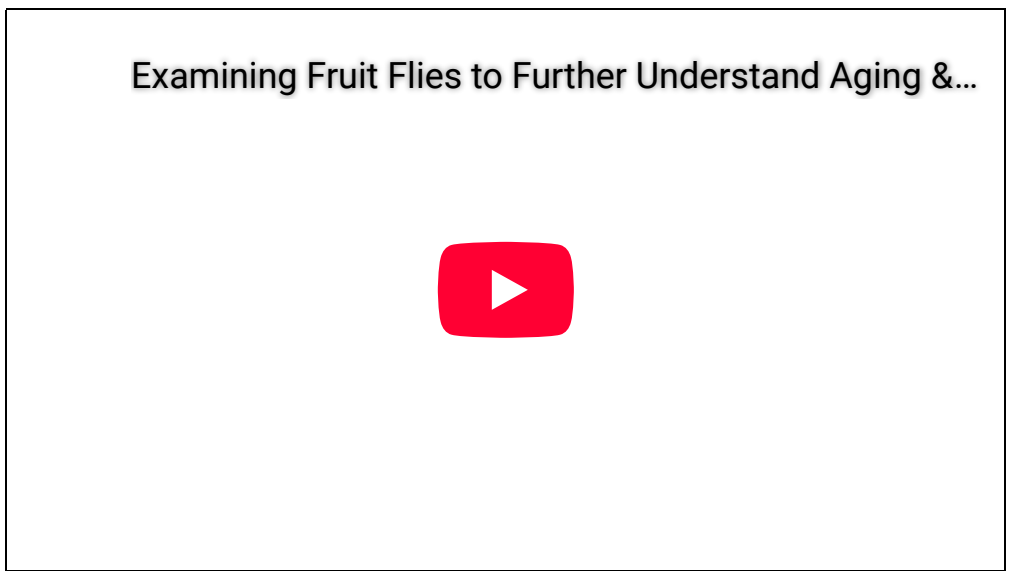
Curtis Patton spent his summer in the company of fruit flies. Lots of them.

But instead of swatting at them, he embraced them.

The tiny, yet pesky, insects have, in fact, propelled Patton to discover biological pathways that could affect the rate at which people show signs of aging.



Patton, '25 Neuroscience, conducted cutting-edge research at Christopher Newport focused on whether fruit flies hold the answer to a question that has stumped society for centuries: how does one push back against the health problems that accompany aging?

As part of his work as a Summer Scholar, Patton explored the link between leaky gut syndrome and diseases that plague the elderly. As people get older, the cells in their guts loosen, allowing nutrients and toxic substances to leak out into other parts of the body. A leaky gut has been linked to numerous health issues, including chronic inflammation, heart disease and neurodegenerative diseases, such as Alzheimer's.

The leaky gut research is one of many topics students analyzed this year as part of Summer Scholars, a competitive program at CNU that provides students the chance to do paid undergraduate research with a faculty member over the summer. It offers an opportunity to delve deeply into a subject of interest, and often results in a published work or advancing an idea to the next level.

Using fruit flies as his subject, Patton focused on finding out what can be done to reverse a leaky gut and, in turn, slow the aging process. The study, which is based out of a lab in Forbes Hall, is funded by a $484,314 three-year grant awarded to Dr. Anna Salazar, assistant professor of neuroscience, by the National Science Foundation. .

> "This lab is in such a new field that it's an honor to be working here," Patton said. "This experience at CNU is really one of a kind. It's been really enlightening."

The research revolves around eliminating a protein, called Snakeskin, in a fruit fly that helps maintain a tight barrier in the gut. Without it, the flies, like people, tend to develop a leaky gut. Fruit flies, which have a lifespan of about 80 days, possess the perfect genetic makeup for the study, Salazar said.

The flies were administered a drug that knocks down the Snakeskin protein and triggers the aging process. Once the leaky gut was initiated in the flies, they were fed blue dye. From there, Patton was able to see firsthand how a leaky gut became a systematic problem, as the flies' bodies turned blue, in what is called the Smurf effect.

Patton's focus was to determine whether that Snakeskin protein could then be restored and a healthy gut revived, thus helping the flies revert to the healthiness of their youthful years. The hope was that the flies' guts would tighten up again, and the blue hue would disappear.

As part of his research, Patton did brain surgery on the flies, removing their brains during dissections to observe how they reacted to the protein changes.

"Another thing I can add to my CV is I can do surgery on fruit flies," Patton said with a smile.

Salazar added that the surgical piece of the research is key to students, like Patton, who are working toward attending medical school.

"I like to think that my students, after they learn to do this, are going to be able to do any kind of surgery because of the development of fine motor skills," she said.

Patton used staining techniques and fluorescent antibodies to visualize changes in the flies' brains under a high-tech confocal microscope.

"When we do that, we can actually see all these beautiful details of where these protein aggregates may be found in either the brains or the muscles, or the gut," said Salazar. "What happens in the gut is going to be reflected in the brain because it turns out that changes in the gut can impact areas outside the gut and our research is attempting to understand how this occurs."

The research also looked at muscles and the ramifications of inflammation on the body as a result of a leaky gut.

To see how diet factors into the equation and influences levels of inflammation, Patton changed the fruit flies' food to mimic a high protein diet. A high protein diet has been linked to the development of a leaky gut and early death in flies and is being used to understand how diet may impact the brain and muscles.

The fruit fly research, which is ongoing, has the potential to make key findings about the impact of a leaky gut and how it can be reversed.

“It’s an interesting field because we don’t know a lot about these diseases and they cause so much damage to humanity,” Patton said.

The work Patton has done as part of the study will hopefully, one day, contribute to discovering a medical way to arrest the syndrome.

“The ultimate goal is to come up with therapeutics,” Salazar said. “So ideally, we might find the molecular mechanism and then maybe target a drug to help make our guts a little healthier, maybe strengthen the presence of some of these gut barrier proteins so that our guts don’t become leaky as we age. I think people would appreciate that rather than having to change their whole lifestyle. Because we are all going to age, even if we maintain healthy diets, we would like to discover molecular targets that can at least slow this process for everyone.”

Patton, who is inquisitive and driven, has been working in Salazar’s lab since his freshman year. As a Summer Scholar, he was able to focus all of this attention on the research. He wants to be part of the solution, part of the team that figures out how to slow or prevent leaky guts and keep people as healthy as possible, even into old age.

“I would love to be part of this huge discovery that cures all neurodegenerative diseases,” said Patton, who is determined to one day become a neurosurgeon. “But even just understanding the gut-brain axis better, and understanding where neurodegeneration comes from, and being able to play a role in that itself, would be worth it.”