

COVID-19 TREATMENT RESEARCH BLOSSOMS FROM PLANTS THAT PREY

They have a fearsome reputation, but they are contributing to the battle against COVID-19. Carnivorous plants have inspired a group of UCI scientists to conduct promising research into treatments for people with the disease.

Their effort began in March 2020 when the pandemic forced UCI scientists to close their laboratories and halt all but the most critical experiments. “Around the time that we were thinking of how to shut things down safely, I began to consider how we could get involved in the fight against the virus,” said Rachel Martin, professor of chemistry and molecular biology & biochemistry, who is leading the research team.

As a chemist, she studies the structures of molecules and how they interact. A key goal in her lab is to investigate unique proteins known as enzymes that speed up biochemical reactions. The proteases, which are common throughout nature and break apart other proteins, are a class of enzymes that have been of particular interest.

Before the lockdown, Professor Martin’s lab was researching proteases known as cysteine proteases in carnivorous plants. “I realized they might have some relevance because the COVID-19 virus also uses a cysteine protease,” she said. “That realization was the inspiration to start the project.”



Prof. Rachel Martin

Her lab began a new collaborative effort to study the protease of SARS-CoV-2, the virus causing COVID-19. The first step was investigating emerging mutations in the virus protease called MPro, which stands for main protease. The mutations help scientists understand how the MPro changes over time, knowledge that influences how to design drugs to target it. A detailed publication about this phase of the project appeared in fall 2020 with UCI undergraduate T.J. Cross as lead author.

The lab is now making the MPro and subjecting it to various inhibitory compounds to see how well they can block its function. “Inhibiting the function of a viral protease is a strategy that has already been used successfully against HIV,” says Professor Martin. “Protease inhibitors are the class of drugs that have played a critical role in making HIV a manageable chronic disease rather than a fatal one.”

As the team continues the arduous but necessary experiments testing potential inhibitory compounds, they are also analyzing several of the enzyme’s other properties. Marquise Crosby, a molecular biology & biochemistry graduate student in Martin’s lab, has led this portion of the project.

Professor Martin and her collaborators have made rapid progress toward testing compounds in cell culture that could also protect against emerging SARS-CoV-2 variants.

Additional Martin lab researchers who contributed to this work were Marc Sprague-Piercy, Gemma Takahashi, Brenna Norton-Baker, Vesta Farahmand and Fatemeh Safizadeh. Other UCI collaborators included Adam Kreutzer, Liz Diessner, Zixiao Zong, Professor James Nowick and Chancellor’s Professor Carter Butts.

INHIBITORY COMPOUNDS MAIN PROTEASE
ENZYME MUTATIONS BIOPHARMACEUTICS
VIRUS STRUCTURE CARNIVOROUS PLANTS
MOLECULAR MODELING POLYPROTEIN SUBSTRATE MIMETIC
THERAPEUTICS COLLABORATION
CORONAVIRUS

