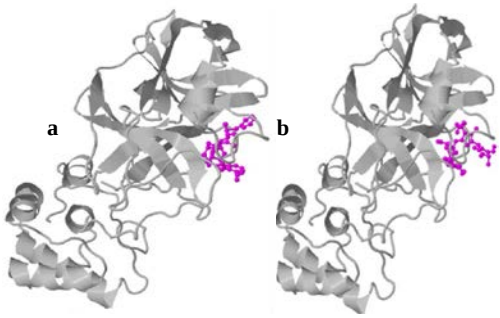
Tennessee State University Helping the Fight Against Covid-19

At Tennessee State University, Excellence is our habit. TSU College of Agriculture faculty have been engaged in research and Extension work to help our citizens understand and cope with the pandemic spread of COVID-19. Our Extension faculty have been developing several relevant research based fact sheets and our TSU county Extension agents have been distributing appropriate research-based information and conducting virtual educational outreach programs. Our research scientists have been busy developing scientific information to understand and cope with COVID-19.

The SARS-COV-2 virus has caused severe and fatal pneumonia in developing and developed countries and poses a global public health concern. We have seen the devastating effects when viruses jump from animals to humans as is the case with zoonotic viruses such as SARS and the COVID-19 coronavirus. Despite the magnitude of these problems, there is a lack of effective vaccines and antiviral treatments for veterinary and human uses. This virus can survive on the surfaces and can cause infections in public spaces. Airborne transmission of this viral particle is possible in specific circumstances and settings. No specific treatments are available for SARS-COV-2 virus yet.

A team headed by Dr. Ankit Patras at Tennessee State University has been focusing on developing optical based technologies for surface and air disinfection. Dr. Brahmaiah Pendyala and Dr. Ankit Patras conducted genomic modeling and mathematically calculated the UV sensitivity of the SARS-COV-2 virus in collaboration with Dr. Bharat Pokharel. This requires complete understanding of the nucleotide composition, and genomic sequence of SARS-COV-2 virus. The team developed a genomic model to predict the sensitivity of SARS-COV-2 virus to UV photons. Data will also be used to understand UV dose requirements for inactivating SARS-COV-2 virus on surfaces and in the air. A paper has been submitted for publication.

Secondly, to screen potential inhibitors of SARS-COV-2 virus, the team investigated the binding affinity of various food bioactive compounds towards the main enzyme that plays an essential role in virus replication. Results indicate that the bioactive compound Phycocyanobilin has binding affinity than superior to antiviral drugs, which may make it a possible potent inhibitor and a therapeutic agent to COVID-19. The figure shows best docked model visualization of antiviral drug Remdesvir [a], phycocyanobilin [b] with a virus replication enzyme. Literature studies reported the antiviral drug Remdesivir as a potent inhibitor of virus replication. To validate these docking results, further *in-vitro* and *in-vivo* studies with SARS-



COV-2 virus will be tested in the future. As future steps, team plans to partner with federal and state agencies, other universities, and companies to expand this research.

Another group at Tennessee State University, led by Dr. Yongming Sang, have addressed the lack novel virus treatments by searching for antiviral molecules that exist naturally in the wild, especially in livestock animals. These compounds, including those called natural immune interferons, have adapted over time to confront ever-changing viral threats. The TSU scientists centered their search on the omega type of immune interferon from pigs and cattle. These omega types of interferons have received relatively little attention in the search for new weapons to fight viral diseases. Pigs and cattle have a much greater number of omega immune interferons than humans do, and generally show a much greater antiviral activity than the most commonly studied interferon types.

Omega type interferons were isolated from pigs and cattle and refined using bioengineering procedures at Tennessee State University. Several of the interferons have shown superior antiviral activity in laboratory tests. Some of them have broad activity to fight viruses not only in pigs, but potentially in humans as well. In cell and tissue-based tests, several of the new omega interferon molecules have 100 to 1,000 times greater activity than the conventional interferon alpha type. These new interferon molecules are now being released for use in research applications and a process has been initiated for animal tests and antiviral development.

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