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VCU Engineering

UNCOMMON ENGINEERING

VCU College of Engineering

CHEMICAL AND LIFE SCIENCE ENGINEERING

Pocillopora damicornis, commonly known as cauliflower coral or lace coral, from the lab of Nastassja Lewinski, Ph.D. Photo courtesy of Liza Roger, Ph.D.

Postdoctoral researcher receives award to conduct coral experiments

Coral bleaching is a threat to coral reefs around the world. **Liza Roger, Ph.D.**, is developing a strategy to mitigate this threat with funding from the 2021 NSF Coral Bleaching Research Coordination Network ECR Training Program and the HDR Award.

Roger is a postdoctoral researcher in the lab of **Nastassja Lewinski, Ph.D.**, CLSE associate professor specialized in sustainable nanotechnologies, who leads coral cell culture research as part of a multi-university team studying corals.

> ***Roger will investigate treating specimens of free-living symbiotic algae with antioxidant nanoparticles to protect them from oxidative stress when living inside coral hosts.***

Healthy corals live in symbiosis with algae in their tissue. However, excess heat or light causes oxidative stress resulting in the breakdown of symbiosis, the expulsion of the algae and the skeleton becoming visible through transparency of the tissue. The process is commonly referred to as coral bleaching.

Roger will investigate treating specimens of free-living symbiotic algae with antioxidant nanoparticles to protect them from oxidative stress when living inside coral hosts.

This delivery method is called reinfection. Roger introduces the algae containing cerium dioxide nanoparticles, a known antioxidant, into bleached corals in hopes the coral will form a new symbiotic relationship with the antioxidant algae and benefit from it. This research has been accepted for publishing in Frontiers of Marine Science.

Researcher works to thwart coronavirus mutations' improved ability to break into the body

CLSE professor **Michael Peters, Ph.D.**, continues researching how to disable "spikes" that give the coronavirus particle its familiar appearance — and its power to prey on cells.

Each spike is composed of subunits called protomers, which have an "up" or "down" state. Like grooves on a key, an "up" state appears to allow binding to human epithelial cells that line the lungs and vasculature, while the "down" state is believed to be relatively inactive.

Forcing protomers into a "down" state may be a step toward future COVID-19 treatments. Peters led research at VCU to map the entire spike protein, looking for points unique to the down state configuration, and identified molecules that may lock it down.

Peters recently published an analysis of the up-to-down states of SARS-CoV-2 variants and lineages, finding that viral variants have protomers appearing to stay in extended "up" states. This study also identified common glue points for the down states, which could be critical in tracking future variants and lineages. Peters and collaborators are also working to block spike protein binding using a novel peptide mimicking the way the virus binds to the cell's surface.

National Institute for Pharmaceutical Technology and Education welcomes VCU Engineering

The National Institute for Pharmaceutical Technology and Education (NIPTE) recently gave membership to VCU's College of Engineering, increasing and expanding NIPTE's scientific and technical capabilities in the areas of advanced active pharmaceutical ingredient (API) manufacturing and enabling collaboration with key industrial and federal partners.

> ***More recently, we have applied these same principles to address the global supply chain vulnerability for essential medicines highlighted by the COVID-19 pandemic.***

"Several years ago, the Medicines for All Institute at the VCU College of Engineering began working with the Bill & Melinda Gates Foundation with a goal of increasing access to medicines for the treatment of HIV, malaria and tuberculosis by developing more cost effective methods for the production of APIs. More recently, we have applied these same principles to address the global supply chain vulnerability for essential medicines highlighted by the COVID-19 pandemic," said **B. Frank Gupton, Ph.D.**, CEO, Medicines for All Institute and the Floyd D. Gottwald, Jr. Chair in Pharmaceutical Engineering; professor and chair of CLSE.

Researchers add air pollution measurements to map of Richmond

CLSE professor **Stephen S. Fong, Ph.D.**, led a group of students and volunteers in 2017 to find where Richmond's highest temperatures were during a heat wave. Researchers are now working to generate additional layers for that map, showing measurements of two forms of air pollution: particulate matter — tiny pieces of soot and other contamination — and ozone.

Efforts to develop the award-winning heat map that demonstrates the urban heat island effect gained national attention in discussions about the hottest parts of cities in modern times and the legacy of redlining policies.

To better understand what, in addition to extreme heat, may be impacting the health of residents in various neighborhoods, VCU and others have begun measuring air quality.

Seemingly minor increases in air pollution are multiplied because of their cumulative effect. Fong said, "There's growing evidence that long-term exposure to elevated levels of air pollutants can lead to noticeable cognitive impairment."

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