UCDAVIS COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

IMPACT

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IMPACT is a series of publications highlighting how UC Davis' College of Agricultural and Environmental Sciences makes a difference in the lives of Californians. Through research, teaching, and outreach programs, UC Davis research touches almost all aspects of Californian life. Today, millions of people eat safer foods, breathe cleaner air, and drink healthier water with the help of our researchers. We're making discovery work – for California and the world.

ADVANCING HUMAN HEALTH

THE ISSUE

Research in the agricultural and environmental sciences strives to improve the human condition. Given the interconnectedness of biological systems, discoveries made in pursuit of agricultural or environmental goals may also turn out to have an impact on human medicine. Translating scientific insights gleaned from the study of plants, animals, and the environment can lead to progress in the treatment of human disease.

ROBIN DERIEUX/UC DAVIS

WHAT WE'RE DOING

Scientists in the College of Agricultural and Environmental Sciences (CA&ES) at UC Davis have made discoveries in fields ranging from animal science to entomology to toxicology that hold promise for new advances in human health.

Animal science aids breast cancer research

Research on the mammary glands of pigs may help advance the treatment of breast cancer in humans. Animal science professor Russell Hovey is a lactation physiologist who sought a more authentic model for studying the human breast by using pigs rather than mice as a model organism. Hovey teamed up with Professor Robert Cardiff, a pathologist at the UC Davis Center for Comparative Medicine and the UC Davis Cancer Center.

Since all species on the planet are linked by common descent, research on one species can help scientists understand biological processes in another. During postdoctoral studies at the National Institutes of Health, Hovey used mice as the model organism for research on the basic biology of the mammary gland, as well as breast cancer. As a professor, Hovey has extensive research experience with milk production and the mammary glands of dairy cows and pigs. He wondered whether pigs would provide a more accurate model for studying cancer in the human breast.

"We had to start from scratch and find out how similar the normal developmental process of the mammary gland in pigs was compared to humans," said Hovey. "Every page we turned, we found more and more similarities."

Hovey and his colleague Cardiff expect that their research in pigs could lead to improved diagnostic

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imaging, drug treatment, and surgery for breast cancer in humans.

From entomology discovery to new medication
The discovery of an enzyme that helps caterpillars transform into butterflies may lead to the development of a whole new class of drugs to treat hypertension, diabetes, and a suite of cardiovascular problems for humans.

Bruce Hammock, now a distinguished professor in the UC Davis Department of Entomology and also the UC Davis Cancer Center, was a graduate student at UC Berkeley when he and colleague Sarjeet Gill discovered the s-EH enzyme in 1969. Initially, they were interested in using this fundamental knowledge on insect hormones to develop endocrine controls for caterpillars, which can cause extensive crop damage. As Hammock and Gill learned more about the role of the s-EH enzyme (which they found present in mammals as well as insects), they hypothesized that inhibiting the enzyme could reduce blood pressure, pain, inflammation, and blood sugar in humans. It took many years and the involvement of many laboratories throughout the world to prove this hypothesis.

Several decades after the initial discovery of a novel enzyme in hungry caterpillars, clinical pharmaceutical trials with s-EH inhibitors have begun. Hammock expects these medications to be approved for the marketplace within the next five to 10 years.

Promise for breast cancer treatment
Environmental toxicologist Fumio Matsumura made an unexpected discovery about dioxins that may lead to better treatments for breast cancer. Dioxins are highly toxic pollutants formed primarily through industrial processes, known to cause cancer and other adverse health effects. Matsumura wondered why a protein molecule called the aryl hydrocarbon receptor (Ah receptor) — which allows dioxins to deliver a toxic chemical message to human cells, thus endangering the organism — would have persevered through evolution.

The Matsumura team discovered that cells that overexpress Ah receptors are more difficult to kill, giving them a survival advantage. Matsumura, a distinguished professor in the departments of Environmental Toxicology and Entomology, as well as the UC Davis Cancer Center, also found that some malignant types of breast cancer cells produce extra Ah receptors, helping them to grow more aggressively. This means that the Ah receptor could possibly be a target for therapeutic approaches to cancer. The Matsumura laboratory has begun investigating natural compounds that will effectively block the Ah receptor in breast cancer cells, making them easier to kill.

A SHARED VISION

Medical research relies on knowledge gained through a variety of scientific pursuits. UC Davis faculty are helping to translate laboratory discoveries into clinical applications for human medicine.

That's impact—applying agricultural and environmental research discoveries for the advancement of human health.

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