DHS intern helps develop portable virus detection

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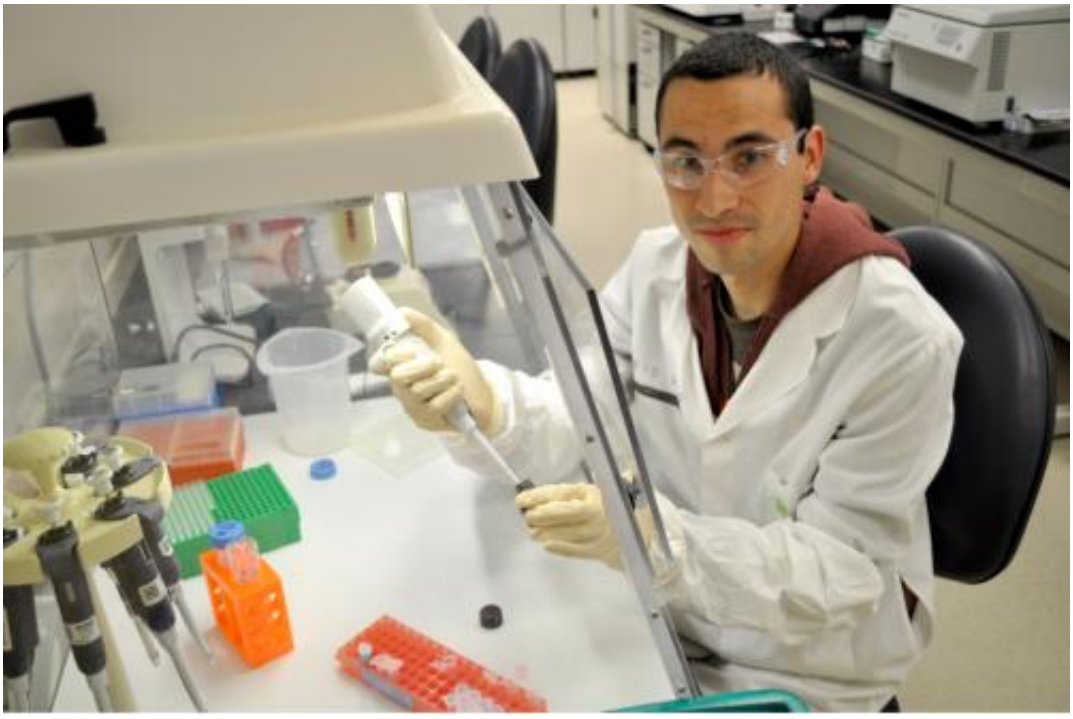

Stanford student Cesar Ambriz, a participant in the U.S. Dept. of Homeland Security's HS-STEM Summer Internship Program, is helping develop a portable diagnostic test to determine the presence of various viruses like Ebola in biological samples like blood. The goal is to have a reliable assay to aid in quick detection.

(Medical Xpress)—When Cesar Ambriz's father discovered a tomato-farming job in northern California, he and his family left their relatives and crossed the Mexican border to establish a life ripe with promise. "In

Mexico it's really tough for anyone to go to college, especially to get financial aid. It's a challenge if you don't have money," Ambriz says. After obtaining a high GPA and standardized test scores, he made the step marking history in his family line. He became a first-generation college student by enrolling in a private school with a 7 percent acceptance rate.

Currently, he is spending a summer away from the green lawns of the prestigious Stanford University to participate in the U.S. Department of Homeland Security (DHS) HS-STEM Summer Internship Program administered by the Oak Ridge Institute for Science and Education (ORISE).

The 10-week summer internship program seeks to engage a diverse, educated and skilled pool of scientists and engineers in issues of concern to the DHS and to promote long-term relationships between student researchers, the DHS Science and Technology (S&T) Directorate and federal research facilities.

Ambriz is pursuing biomechanical engineering with plans to obtain bachelor's and master's degrees. Before his freshman year at college he attended Stanford's four-week Summer Engineering Academy where he fell in love with the idea of an engineering career and what it could offer him, especially the possibility of working with biological systems. "I love how things work; I like the way our bodies are super complex," he says.

At Lawrence Livermore, he uses his textbook knowledge in a practical setting to create an efficient molecular assay, or investigative procedure, for virus-detection using a biological sample like blood or sputum.

"The hands-on work really, really does make a difference. I think it's invaluable to see the stuff you see in textbooks actually working at the Lab. I think that's the most rewarding thing," Ambriz says.

Pejman Naraghi-Arani is Ambriz' mentor, and Alda Celena Carrillo directs the hands-on training for the work performed in the Lab's Molecular Assay and Virology Group in the Biological Response and Countermeasures Program of GS S-Program.

Currently, most viruses are cultured in a lab, a time-taxing and expensive process often dependent on molecular tests with limitations on the detections of new emerging viruses. The ultimate goal of Ambriz's research is to develop a portable assay with minimal sample preparation that could be modified to test for new pathogens, and could handle 72 samples in 24 hours. "If there was ever a bioterrorist attack, [the assay] could quickly detect whether or not the virus is infectious, whether or not it can kill or have an outbreak, et cetera," he says.

The project is still in its developmental stages. Ambriz's main tasks are to troubleshoot and analyze data generated using NanoString technology. The technology uses manufactured strands, or probes, of RNA of a virus. For example, one might have specific probes for the Ebola virus. These probes are labeled with certain codes, just like a barcode on a box of cookies in a grocery store. If the sample of interest—blood, cerebrospinal fluid, etc.—contains the Ebola virus, then one probe binds to the target RNA of the virus within the sample of interest and immobilizes it. A second probe binds to the front of the RNA, allowing for detection and target identification. An optical lens machine counts the number of bound codes to the target RNA within the sample and the higher the number of counts the higher the probability that the virus was successfully detected.

One of the challenges is to optimize the assay for single-test detection of all 35 viruses of concern to the National Institute of Allergy and Infectious Diseases (NIAID). Another challenge is figuring out why some of the samples are generating high counts when they shouldn't be. "We're thinking they're false results," Ambriz says. "We're trying to

figure out whether or not the probes we used, or the samples, were contaminated."

During his time at the Lab, Ambriz says he has become more conscious that a life in science isn't easy, but has "overwhelming" rewards. He thinks the program is building a really strong foundation for future research opportunities by preparing him to work in a team, learn to use new technologies, and overcome challenges.

Ambriz enjoys being a part of a program that could help change society. In the meantime, when he's not eyeing the robotic arm of his favorite piece of equipment—the NanoString machine—he's at the beach or movies with his friends, biking around campus, taking photographs, attending all kinds of concerts and riding roller coasters at the nearby amusement park. "You just gotta go for it!" he says, regarding riding a coaster for the first time. But he'd say the same thing of the program.

Provided by Lawrence Livermore National Laboratory