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OU scientists designing anthrax biosensor

*By **Ryan Poquette**, contributing writer*

Imagine a hand-held device that instantaneously detects a single molecule of anthrax, smallpox, HIV or SARS. While it sounds like a tool for science fiction, thanks to the combined ideas of two Oakland professors, the device may well become science fact.

With the backing of a $2 million grant from the National Institutes of Health (NIH), Assistant Professor of Chemistry Xiangqun Zeng and Assistant Professor of Biology Gabrielle Stryker are attempting to create a novel biosensor to distinguish the presence of hazardous biological or chemical agents.

“We think our model will make a breakthrough,” Stryker says. “The best biosensors out there take 20 minutes to tell you what an agent is. With ours, you would know immediately.”

Like many biosensors, the proposed model involves manipulating antibodies. The body produces these specialized proteins in response to the presence of antigens, potentially harmful substances such as anthrax. Antibodies bind to their respective antigens, neutralizing them in the process. Zeng and Stryker propose using a Quartz Crystal Microbalance (QCM), a highly sensitive measuring device, to gauge the change in mass between the original antibody and the antibody-antigen combination. By doing so, the researchers can detect the presence and identity of a specific antigen — at least in theory. Unfortunately, while quartz crystal is stable, antibodies are not. Each natural, human antibody contains several antigen-binding sites, some oriented in a way that prevents them from working.

“What you end up with is a big mass of protein with very few antigen-binding sites available and a whole lot of area for other nonspecific interactions to occur,” Stryker says.

For 20 years, these fluctuating interactions frustrated researchers’ attempts to create a working, consistent biosensor. To impose order on this molecular chaos, Zeng and Stryker turned to recombinant, or genetically engineered, antibody fragments.

“We take one little piece of the antibody and make it in such a way that we have a small, uniform surface area with all of the antigen-binding sites correctly oriented,” says Stryker, who creates these customized fragments. Zeng then places a field of the fragments on the QCM to function as a detection layer.

The Zeng and Stryker biosensor could be used in military, environmental, clinical and forensic applications. While one device can detect a specific chemical or biological agent, several biosensors could be combined to detect multiple agents.

“This could be mounted inside the ventilation system of a building or even on the front of a tank,” Stryker says.

Full funding by NIH is contingent on reaching first-year milestones and establishing the validity of the concept.

SUMMARY
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