Researchers improve biosensors to detect E. coli

June 14 2016, by Erik Gomez

Washington State University researchers have developed a portable biosensor that makes it easier to detect harmful bacteria.

The research team, led by Yuehe Lin, professor in the School of Mechanical and Materials Engineering, recently published the work in the journal, *Small*.

As in the case of several recent food recalls, harmful pathogens are most often only discovered when people start getting sick. Researchers have been working to develop better biosensors that could quickly, accurately and automatically detect everything from cancer biomarkers in the blood to harmful bacteria in the environment. Even tiny amounts of pathogens can create serious health risks, but the available sensors are unable to quickly and easily detect these quantities.

The WSU research team created a simple sensor that is able to detect and amplify the signal of the food pathogen *Escherichia coli* (*E. coli*) 0157:H7, which can cause severe diarrhea and kidney damage in people.

The key to a better sensor is maintaining a large amount of enzyme activity for detecting antigens in a sample. To address this issue, the researchers developed a particle at the nanoscale that includes organic and inorganic components and looks like a tiny flower. Smaller than a speck of dust and made up of a group of molecules, the nano-sized flower and petals provide a large surface area for immobilizing the highly active enzymes that are needed to detect the bacteria at low levels.

The nanoflower is able to recognize the bacteria and amplify its signal so that it can be seen with a simple handheld pH meter or pH indicator paper strip.

"We want to take these nanoflowers and create a simple-to-use, handheld device that anyone can use anywhere," said Lin. "It'll be as simple as using a pregnancy test strip or a glucose meter."

The researchers have filed a patent for the handheld device concept and are working to switch out components of the nanoflower to detect disease markers as well as other pathogens such as salmonella.

The team includes Lin and his group at the WSU Voiland College of Engineering and Architecture and his collaborator, associate professor Meijun Zhu from WSU's School of Food Science. The work was supported by the U.S. Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health.

The research is in keeping with WSU's Grand Challenges, a suite of research initiatives aimed at large societal issues. It is particularly relevant to the challenge of Sustaining Health and its theme of changing the course of disease.

More information: Ranfeng Ye et al, Bioinspired Synthesis of All-in-One Organic-Inorganic Hybrid Nanoflowers Combined with a Handheld pH Meter for On-Site Detection of Food Pathogen, *Small* (2016). DOI: 10.1002/smll.201600273

Provided by Washington State University