Drexel Researcher Develops Sensor to Test for E. coli in 10 Minutes

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The latest outbreak of E. coli cases — now in 12 Western states and involving 6 million pounds of fresh and frozen meat — shows a need for better detection in food processing exists.

Dr. Raj Mutharasan, a professor of chemical engineering at Drexel University, has developed over the past five years sensor technology that can test for E. coli bacteria in just 10 minutes. He is working with a company that has licensed Drexel's technology to commercialize the device and expects it to be in the hands of food-safety experts soon.

The sensor could also have wide applications in medical diagnostic testing (prostate cancer) and monitoring for biothreat agents (anthrax). In medical testing, the sensor can be used to analyze the four most widely tested fluids: blood, urine, sputum and spinal fluid.

The standard detection process of E. coli bacteria in food processing requires about 24 hours and involves a trip to a laboratory. Mutharasan's sensor can be contained in a handheld device that is accurate and easy to use.

No direct test for minute amounts of proteins exists on the market. A study published in the April 1, 2007, issue of *Analytical Chemistry* using Mutharasan's sensor detected E. coli in ground beef at some of the lowest concentrations ever reported.

Unlike salmonella, for example, no Food and Drug Admistration requirement to test food for E. coli exists. Requirements are in place, however, to ensure proper food-manufacturing practices are met to help avoid contamination, says Dr. Stanley Segall, Drexel professor emeritus of food science and nutrition.

E. coli outbreaks have increased in recent years because reporting systems have been more efficient and effective and food production has become more centralized, with distribution spanning the country in rapid time frames, Segall says.

The near-prototype sensor Mutharasan has developed contains a sensitivity of four cells per milliliter of solution. The sensor uses E. coli antibodies to detect the bacteria in a way similar to how our bodies work. Those antibodies are affixed to a narrow sliver of glass. A ceramic layer, attached to the other end of the glass, generates voltage in response to applied mechanical stress.

The sensor affixed with antibodies against E. coli can detect as low as four cells per milliliter of solution. A voltage is applied to a ceramic layer, causing it to expand and contract, vibrating the glass sliver. The sensor detects changes in the glass sliver's resonate frequency (the point where vibration is the greatest) and determines the presence and concentration of E. coli bacteria.

Because the same principles of resonate frequency apply, the sensor can test liquid and solid samples. The sensor can be equipped with a range of antibodies to detect many pathogens or it can be homozygous with a single antibody, enabling the sensor to detect even the smallest amounts of the harmful bacteria.

Source: Drexel University

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