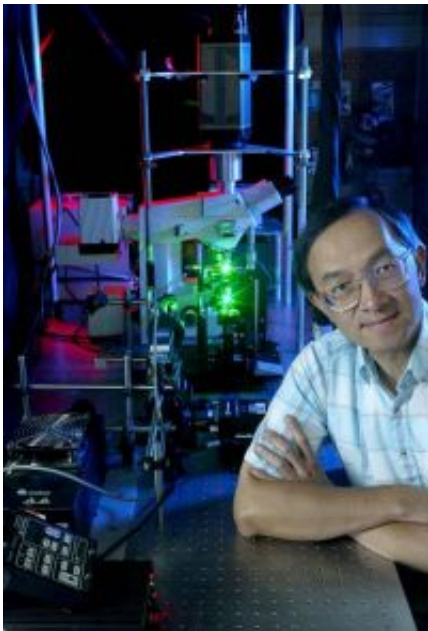


Researchers develop technology for early detection of viruses

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Edward Yeung uses laser beams to light up tags that indicate molecules of human papillomavirus are present in a cell. Credit: Jim Heemstra

Iowa State University researchers have developed a technology that detects a single molecule of the virus associated with cervical cancer in women.

That's a significant improvement over the current test for the human papillomavirus, said Edward Yeung, an Iowa State Distinguished Professor and the Robert Allen Wright Chair in Chemistry who led the

research team that developed the new test. The current test, the Nobel Prize-winning polymerase chain reaction technique, requires 10 to 50 virus molecules for detection.

“We are always interested in detecting smaller and smaller amounts of material at lower and lower concentrations,” Yeung said. “Detecting lower levels means earlier diagnosis.”

The discovery by Yeung, who’s also a senior chemist and deputy program director for the U.S. Department of Energy’s Ames Laboratory at Iowa State; Jiangwei Li, an Iowa State doctoral student; and Ji-Young Lee, a former Iowa State doctoral student; will be published in the Nov. 1 issue of the journal *Analytical Chemistry*.

Their work was funded by a five-year, \$950,000 grant from the National Institutes of Health with additional support from The Robert Allen Wright Endowment for Excellence at Iowa State.

The project advanced just as human papillomavirus made national headlines. In June of 2006, the U.S. Food and Drug Administration approved a vaccine developed to prevent cervical cancer, precancerous lesions and genital warts caused by four types of the virus. The vaccine has been approved for females ages 9 to 26.

The Centers for Disease Control and Prevention reports the human papillomavirus is the most common sexually transmitted infection in the U.S. The agency estimates about 6.2 million Americans are infected every year and over half of all sexually active Americans are infected at some time in their lives.

Yeung said single molecule detection of the virus could help women and families decide to get vaccinated. He said vaccines administered after such early detection could still have time to stop the virus.

The new detection technology improves current technology by eliminating a step to amplify DNA samples for testing. Although the current test is efficient and well understood, the amplification can cause small contaminants to create test errors.

Yeung's single molecule spectroscopy technique involves creating chemical reagents that recognize and fluorescently tag the genetic sequence of the human papillomavirus. Test samples pass through a laser beam that lights the tags. Cameras capture the images for computer analysis.

The research team tested the technique using samples from normal Pap smears. They also spiked some of those samples with the virus to make sure the tests picked up known amounts of the virus.

Although this test concentrated on detecting the human papillomavirus, Yeung said it should detect HIV, avian flu and other viruses as well.

Will the technology make it to medical labs?

Yeung -- who helped start CombiSep Inc. in 1999 to develop and market chemical separation instruments for pharmaceutical and life sciences research (the company merged with Advanced Analytical Technologies Inc. of Ames late last year) -- said he won't be directly involved in taking the detection technology to market. But he said companies have expressed some interest in licensing and developing the technology.

As that project moves on, Yeung will continue looking for ways to detect chemical targets at the smallest limits. He said the next challenge is to figure out how to detect single molecules of proteins.

Source: Iowa State University

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