Researchers devise a fast and sensitive way to detect ricin

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Scientists at Albert Einstein College of Medicine of Yeshiva University have developed a simple, accurate, and highly sensitive test to detect and quantify ricin, an extremely potent toxin with potential use as a bioterrorism agent. The report appears as a featured article in the April 12th issue of *Analytical Chemistry*.

Ricin, a protein extracted from castor beans, can be in the form of a powder, mist, pellet or solution. When injected or inhaled, as little as one-half milligram of ricin is lethal to humans. No antidote is available. The most infamous ricin attack occurred in London in 1978, when Bulgarian dissident Georgi Markov died after being stabbed with an umbrella that injected a ricin-coated pellet into his leg.

The ricin assay described in the journal article was developed in the laboratory of Vern Schramm, Ph.D., professor and Ruth Merns Chair of Biochemistry at Einstein and corresponding author. The assay detects small amounts of ricin more accurately and faster than ever before.

Users of the assay would place samples of potentially adulterated food, or swabs used to wipe potentially contaminated surfaces, into a few drops of a mixture of reagents; the mixture will emit light if ricin is present, with higher luminescence indicating greater concentrations of the toxin.

Dr. Schramm believes the assay's most immediate application is for discovering drugs that could serve as antidotes for ricin poisoning.

"Previously we had to rely on laborious, multi-step methods to see if a compound was preventing ricin from working, which is probably why no antidote to ricin has yet been discovered," explained Dr. Schramm.

After ricin enters cells, it kills them by interfering with their ability to make proteins—a basic cellular function. Ricin does this by disrupting ribosomal RNA (the key component of ribosomes, the cell's protein manufacturing "machines"). The ricin attack causes ribosomal RNA to release a molecule of adenine. Dr. Schramm's assay detects and quantifies ricin by measuring the amount of adenine released by cells.

"Our lab's expertise is in enzymes," says Dr. Schramm. "One day I realized we could use a specific enzyme to convert the adenine released by ricin into ATP—a molecule whose presence can be easily detected by an already-available assay based on the light-emitting gene from fireflies. In retrospect, like many scientific advances, it's such a simple idea that I'm surprised it wasn't thought of earlier."

Ricin has also been used as an anticancer agent by linking it to antibodies that home to tumors and deliver the ricin 'warhead' to kill cancer cells. Einstein scientists indicate that detection of ricin in cancer trials may be an early use of this technology. While the researchers emphasize that the ricin detection method is now laboratory-based, they also predict that relatively minor changes will be needed to make detection of ricin by light practical for field and clinical applications.

Albert Einstein College of Medicine has filed a patent application on the ricin detection method and is interested in licensing the technology to a company or organization that would develop it further for drug discovery and public health applications.

More information: The paper by Matthew B. Sturm and Vern L. Schramm is titled "Detecting Ricin: Sensitive Luminescent Assay for

Ricin A-Chain Ribosome Depurination Kinetics" appears in the April 12th issue of Analytical Chemistry.

Source: Albert Einstein College of Medicine