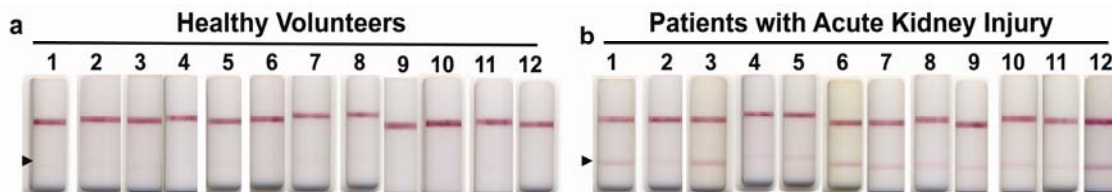


**TATRC Highlighted Research News Article:  
RenaStick: A Rapid Urine Test for Early Detection of Kidney Injury**

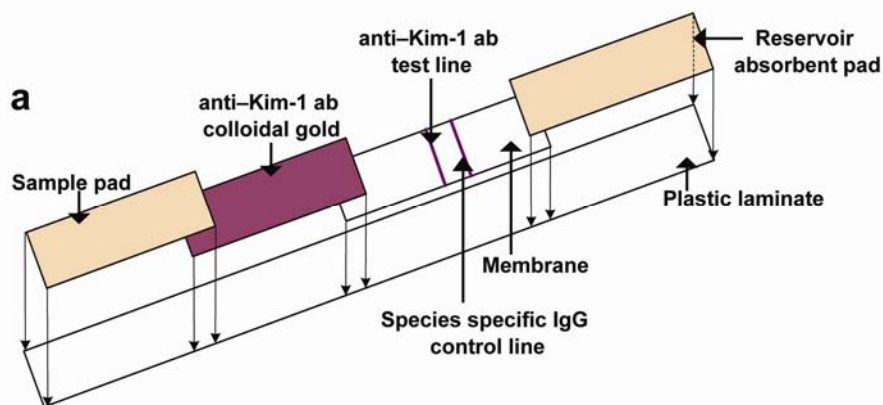
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**New Life-saving Test to Detect Kidney Injury**



*A red line below the test line on the RenaStick indicates acute kidney injury. The darker the line, the worse the injury.*



*The RenaStick principle: any KIM-1 molecules in the urine attach to antibodies on a small strip of paper and are absorbed up until a different antibody stops the KIM-1, making a clearly visible red line.*

Images courtesy of CIMIT

Acute kidney injury, a common result of crush injuries, severe burns and exposure to toxic chemicals, may be deadly in up to 50 percent of the Soldiers it affects. A wide range of other factors, including hemorrhagic fever, diabetes and heart bypass surgery, can also lead to kidney injury.

Yet there hasn't been a way to detect changes in the kidney before serious damage occurs—until now. A new technology, the RenaStick, will enable medical staff to provide early, aggressive treatment to prevent or reverse the injury.

According to the test's developers, nephrologist Dr. Joseph Bonventre and toxicologist Dr. Vishal Vaidya, "The current test to diagnose AKI—the same test we've been using for 100 years—detects molecules in the blood that are produced *after* kidney cells have already begun to die off. Our approach detects a new molecule we've discovered, which can be identified in the urine within three to six hours of trauma, compared to 12 to 24 hours for the blood test. This provides us with a new tool to be able to monitor kidney disease at an early stage in Soldiers as well as the general population."

Those few hours can mean the difference between life and death if a gunshot or crush wound turns out to be reducing blood flow to the kidneys, or if a toxin needs to be flushed out. Bonventre explains, "We can treat the patient with fluids if we know the extent of the injury—but waiting 12 hours may be too late."

He adds, "The RenaStick is also much more accurate and easier to use than the blood test."

Bonventre and Vaidya's work is one of several projects of the Center for Integration of Medicine and Innovative Technology (CIMIT), a nonprofit consortium of world-leading research institutions in Boston. The U.S. Army Medical Research and Materiel Command's (USAMRMC) Telemedicine and Advanced Technology Research Center (TATRC) is collaborating with CIMIT to fund development of the RenaStick and support the process of making it available on the battlefield.

Says TATRC Chief Scientist Dr. Charles M. Peterson, "TATRC is delighted to support the development of solid phase reagent chemistries to aid the warfighter through the detection of early renal injury."

The successful results of Bonventre and Vaidya's new approach, published in the journal *Kidney International*, rely upon the kidney injury molecule-1 (KIM-1) protein. Bonventre's team discovered this molecule and together with Vaidya's lab developed a dipstick that can detect it in the urine even at levels only slightly above normal.

"KIM-1 increases more than a hundredfold when the kidney is injured, an unusually pronounced change that makes it easy to detect," Bonventre explains. "In addition, in all the tests we've run, it's *only* found due to kidney injury. Results are unambiguous—we can say either there is definitely no injury, or we can diagnose and treat AKI early on."

The procedure consists of adding a drop of urine sample to gold nanoparticles coated with KIM-1 antibodies placed on a small strip of paper. Any KIM-1 molecules in the urine attach to the antibodies and are absorbed up into the paper. At a certain point on the strip, a different antibody stops the KIM-1, making a clearly visible red line. The darker the line, the more of the KIM-1 molecules, and the worse the injury. A portable machine reader quantifies the level of KIM-1 for exact results.

Bonventre and Vaidya expect the RenaStick to be in use by next year.

According to the team, “The FDA and its counterpart in Europe are also encouraging the use of KIM-1 detection in drug development in their Critical Path Initiative to ensure kidney safety. In addition, it could be used to predict how severe diabetic kidney damage is, or as a way to monitor for toxins in the environment that affect the kidney.”

TATRC Biomonitoring Technologies Portfolio Manager Dr. Eva Lai says, “Dr. Bonventre’s discovery and study of KIM-1 is a true breakthrough. KIM-1 is a fascinating protein because it is so clearly and sensitively linked to kidney injury.”

TATRC seeks to harness advanced technologies and new knowledge to address evolving health and medical needs both on the battlefield and in hospitals of the future. The center has been exploring and implementing telemedicine and other advanced medical technology solutions for more than 15 years. It is supporting approximately 500 ongoing research projects.