

# Researchers Develop RFID System to Monitor Acid Reflux

A University of Texas Arlington group has developed a passive RFID tag and reader for wirelessly detecting the presence of stomach acid, gas and water in the esophagus.

By Claire Swedberg

April 10, 2007—Members of the [University of Texas Arlington](#)'s electrical engineering department are set to begin using animals to test an RFID-based system that would replace the wired sensors currently employed to diagnose gastroesophageal acid reflux. The department has been working with the [University of Texas Southwestern Medical Center](#) (UT Southwestern) for the past two years to develop a device that would allow doctors to monitor a patient's reflux condition wirelessly.

Currently, acid reflux testing requires an uncomfortable procedure that makes it very difficult for a patient to eat and behave normally, which is necessary for accurate testing. A basic acid reflux test involves the use of a multichannel intraluminal impedance catheter, a wired sensor that runs through the patient's nostril and into the esophagus. The wires are attached externally to a PDA worn by the patient on a belt. The patient is then instructed to follow his or her normal dietary and activity routine for the next 24 to 48 hours, with the wire attached.

This testing does not always lend itself to normal eating or activity, however, says Shou Tang, an assistant professor of internal medicine at UT Southwestern. Instead, patients with the wire attached have a very difficult time eating and staying active.

Tang first spoke about the problem with his colleague Jung-Chih Chiao, an associate professor at UTA's electrical engineering department, in 2005. "He asked me, 'Can this be made wireless?'" Chiao recalls.

With that question in mind, UTA students under Chiao's guidance have spent the past two years developing a wireless solution. The result is a 1-by-1-centimeter device consisting of a sensor and a passive 850 kHz RFID chip and antenna. The RFID-enabled sensor can be inserted into the esophagus and attached to the esophagus wall, where it transmits to an RFID reader connected like a necklace around the patient's neck. The department has tested the second generation of the device on pork tissue, as well as working with simulated stomach acid in a test tube. It is now preparing to conduct testing on living animals this summer, and on humans by fall of this year.

According to Chiao, the device uses a flexible substrate made of Kapton, a plastic film developed by [DuPont](#), so it cannot be felt in the esophagus. The sensor is designed to measure the presence of stomach acid, gas and water in the esophagus, and that data is transmitted by the RFID chip, which the UTA students developed.

**RELATED\_ARTICLES** The receiver, an RFID interrogator measuring about 6 centimeters by 6 centimeters, is worn by the patient around the neck. The current reader being tested must be connected to a computer to collect and save data, Chiao says, but by fall the research team intends for the PDA device to be capable of

storing data from the sensor. This data could then be downloaded by a computer at the doctor's office, linked to the PDA via a wired connection. The reader also comes with a push button the patient can press when beginning a meal.

Upon completion of the test, the doctor would use an endoscope to remove the tag. Eventually, Chiao says, he would like to develop a sensor able to be dissolved or flushed through the body's digestive tract, but there is no immediate plan to develop such an ingestible tag. More immediately, Chiao says, he hopes to bring the size of the RFID sensor-tag down further by autumn, when he expects to begin human testing.

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