

# Clemson researchers look to biological sensors to detect food that's beginning to spoil

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CLEMSON – Clemson University researchers are working to develop packages that use communication between cells to detect food that's beginning to spoil.

This “intelligent” packaging uses sensors to detect biological processes – specifically, the signals cells send to each other when they start to break down. This cell-to-cell communication, called quorum sensing, uses signaling molecules called autoinducers. Kay Cooksey and Claudia Ionita of the Clemson Food, Nutrition and Packaging Sciences Department are designing sensors that identifies autoinducers present in packaged foods.

“The idea behind the quorum sensing is that it makes use of a biological process that microorganisms normally do,” said Cooksey, the Cryovac Endowed Chair in the department. “The idea is to take what the microorganisms do naturally, put that with being able to sense that they are starting to create a food spoilage situation and build that in to a sensor.”

Cooksey and Ionita will identify autoinducers present in packaged foods and design a biosensor array that can monitor the development of microbes that can cause food spoilage.

“We came up with this idea after reading some other papers,” Ionita said. “We are trying to build a sensor that can detect food spoilage (when it begins). We're trying to improve the detection elements currently on the market.”

Current methods to detect food spoilage with packaging use labels or materials that change color when they detect such volatiles as ammonia or sulfur from the breakdown of proteins in meat. According to Cooksey, using labels or materials that change colors are limited in use, not a direct indicator of spoilage and usually signal when it is too late to be useful.

“By the time the color change occurs, the human nose can just as easily detect the aroma of the volatiles,” Cooksey said. “Results from the proposed research will serve as a foundation for biosensors and ultimately intelligent packaging to effectively monitor changes in food and, in turn, improve food quality and safety.”

Between 30 percent to 40 percent of the edible food supply is wasted annually in the United States. According to the USDA, this amount of waste has far-reaching impact on food security, resource conservation and climate change. To help end food waste in the United States, the USDA and U.S. Environmental Protection Agency launched the U.S. Food Challenge in 2013.

Cooksey and Ionita have received a \$100,000 grant from the U.S. Department of Agriculture's National Institute of Food and Agriculture for the research project.

Others in the food, nutrition and packaging sciences department are working on packaging. Gregory Batt, director of the Clemson Package Testing Laboratory, and James Gibert, a Clemson alumnus and assistant professor at in the School of Mechanical Engineering at Purdue University, are collaborating on a project that involves developing packaging so smart it can energize itself. Read more at [http://bit.ly/Clemson\\_Smart\\_Packaging](http://bit.ly/Clemson_Smart_Packaging).

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