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ELECTRONIC NOSES AID IN RESEARCH EFFORTS

Of his five senses, Kumar Mallikarjunan is most aware of his sense of smell. That's because electronic noses are key to his research.

Mallikarjunan, associate professor of biological systems engineering in the College of Agriculture and Life Sciences, and fellow researchers use electronic noses in two vastly different endeavors: to find prostate cancer cells and to evaluate fruit ripeness. Both applications rely on the electronic nose's ability to detect biomarkers using algorithms, polymers, and sensors that hone in on irregularities in biological systems.

Steve Van Sutphin, at left, vineyard manager Chateau Morrisette in Floyd, Va., talks with Associate Professor Kumar Mallikarjunan as he demonstrates the electronic nose as a way to test the ripeness of grapes.

"Electronic noses are much more sensitive than our human noses," Mallikarjunan said. "They read unique 'smellprints' similar to our fingerprints that are made up of chemical patterns that can be recognized time and again."

Capitalizing on the electronic nose's ability to evaluate biomarkers specific to malignant cells,Mallikarjunan partnered with researchers at the Virginia Tech Carilion School of Medicine and Research Institute to make the detection of prostate cancer more accurate and to make testing less invasive.

The artificial nose could revolutionize how prostate cancer is diagnosed and treated. Requiring a surgery for the detection of prostate cancer could be a thing of the past.

Because certain metabolites are passed through urine in a patient with cancer, the artificial nose works by sensing or "sniffing" metabolites in a urine sample. The process can take as little as a few minutes.

“One of the potential benefits to using the nose would be the real-time, noninvasive ability to detect cancer cells,” said Dr. David Buck, assistant professor in the Department of Internal Medicine at the Virginia Tech Carilion School of Medicine.

“Employing noninvasive methods to diagnose cancer means patients experience less discomfort, less time from work is lost, and less recovery time,” Buck said. “The artificial nose could work very well as part of an integrated plan to detect prostate cancer.”

Mallikarjunan also works with Bruce Zoecklein, professor emeritus of food science and technology, to evaluate grape ripeness using a handheld device called the Cyranose 320, named as a nod to the French poet Cyrano De Bergerac.

Electronic noses such as the Cyranose 320 can help grape growers pinpoint harvest dates to make a better product for consumers.

Growers spend months waiting for grapes to ripen, followed by a hasty harvest. Pinpointing the moment wine grapes are ready is a guessing game that affects the bottom line of wine sales. Pick too soon and your product may have heavy tannins and low sugar content. Pick too late and the higher sugar content may increase the alcohol percentage in your final product making it too “hot.” Although there are methods for testing such things, the electronic nose is more accurate.

“Fruit ripeness is very difficult to judge even with chemical measurements, and even among scientists there is no real consensus for one simple measurement to evaluate it,” Mallikarjunan said.

The Cyranose 320 analyzes gases to measures ripeness. The user places a plastic bag over the grape cluster and inserts an electronic sensor to detect chemical vapors. Advanced pattern recognition algorithms then measure the degree of ripeness.

In one study, Mallikarjunan’s artificial sniffer went nose-to-nose with traditional methods in evaluating Sauvignon grapes. The artificial sniffer held its own in detecting ripeness and could determine which side of the vineyard the grapes grew.

- *For more information on this topic, contact Zeke Barlow or 540-231-5417.*