

## Only the Nose Knows

A member of the odor-assessment team bends over the machine, positions his nose in the cup, and signals the operator seated at a computer terminal a few feet away that he is ready. With a couple of keystrokes, she directs the device—an olfactometer about the size of an ATM in a convenience store—to release a carefully calibrated puff of air and odor.

The odor component in the sample—from treated municipal wastewater biosolids—is so diluted that it's not detectable to “the sniffer,” so the operator manipulates the machine to slightly increase the percentage of odor and emit another

**A “sniffer” in the college’s Odor Assessment Laboratory takes part in a test to gauge the olfactory intensity of an agricultural material.**

ment team takes his place, repeating the same battery of tests.

After that, they move on to testing another biosolids sample that has undergone a different treatment to diminish odor. So goes a typical day at Penn State’s Odor Assessment Laboratory in the Department of Agricultural and Biological Engineering.

On this afternoon, the lab, under the direction of Eileen Wheeler, professor of agricultural engineering, was evaluating samples of municipal wastewater biosolids for a private consulting firm and another Pennsylvania university. Researchers were studying whether innovative treatments can make the material less odorous and more socially acceptable for various land applications.

In addition to providing services for other educational institutions and business and industry, the lab mainly collaborates with researchers across Penn State studying how

ed by a \$330,000 USDA grant to study how dairy productivity is affected by changing the feed rations of cattle and investigate the resulting changes in odors and gases produced by the animal manure.

“As tensions on the urban-rural interface have grown, it has become more important to measure and reduce odors,” says Wheeler. “Researchers are working on strategies and products to diminish agricultural odors. We will never get rid of all odors coming from livestock farms, but we believe we can reduce them. And that has become vital now that situations such as housing developments bordering dairy farms have become common.”

The centerpiece of the odor lab is the olfactometer, a \$35,000 piece of equipment that is the “international gold standard” when it comes to odor evaluation, according to Robin Brandt, a lecturer in agricultural and biological engineering who manages the lab.

similar labs around the world,” Brandt says. “Day-to-day data collection and quality-assurance duties are the responsibility of senior research technologist Pat Topper, who also played a pivotal role in getting the odor lab up and running.”

But despite the wondrous technology, the human nose still plays the key role in odor detection and evaluation. The sniffers on Penn State’s odor-assessment team were selected only after Wheeler and Brandt established that their senses of smell were neither extremely sensitive nor exceptionally dull. And they have been trained to quantify what their noses tell them about odors. Team members—primarily graduate students and College of Agricultural Sciences staff—mostly tackle their sniffing chores with an air of cheerful resignation.

“Some people think that this is really unpleasant work, but I don’t think so,” says a petite, middle-aged female staff assistant who concedes

**“The olfactometer allows us to compare our results to those from similar labs around the world.”**

she is an old hand at dealing with agricultural odors, having grown up on a central Pennsylvania dairy farm. “I have sniffed only one truly disgusting odor, and that was a high concentration of swine manure. That was kind of overwhelming.”

There has been some debate about odor analysis, Wheeler concedes. “There is agreement that the human nose is the ultimate sensor, but in most cases it is not a very accurate sensor because people have such strong emotions wrapped around certain smells,” she says. “Working with the olfactometer and a trained odor-assessment team, we have removed the emotion from the process. Only humans can characterize an odor. But whether I like an odor or not is completely subjective.”

—Jeff Mulhollem



er puff of air. This time he “smells” it so the “odor detection threshold” of the sample is recorded. The process is repeated until the sniffer correctly recognizes odorous air puffs two times in a row, and then another member of the odor-assess-

to reduce gaseous emissions from animal agriculture, most with significant odorous components. Scientists are looking at solutions that range from manure additives to alternative livestock feeds.

The odor lab is partially fund-

Penn State is the only university in the Mid-Atlantic and Northeast regions to have an agricultural environmental odor laboratory with an olfactometer, he points out.

“The olfactometer allows us to compare our results to those from