Scientists participate in month-long experiment to study indoor air pollution

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Emily Reidy, a Ph.D. student in chemistry, sets up the detection cell for measuring chemicals inside the test house. Credit: University of Texas at Austin

Scientists can tell us a lot about outdoor air pollution and its effects on human health and the environment, but less is known about the air we

breathe in homes, offices and other indoor spaces.

To help address that situation, Indiana University atmospheric scientist Phil Stevens and several of his graduate students are participating in an ambitious project taking place in Texas. Together with researchers from a dozen other universities, they are conducting research to gain a better understanding of the indoor environments where most Americans spend 90 percent of their time.

"It is the largest indoor air experiment conducted on an actual occupied environment," said Stevens, Rudy Professor in the School of Public and Environmental Affairs and professor of chemistry in the College of Arts and Sciences.

Called HOMEChem—for House Observations of Microbial and Environmental Chemistry—the project is funded by the Alfred P. Sloan Foundation and led by scientists at Colorado State University and the University of Colorado Boulder. For the month of June, researchers are studying indoor pollution under various conditions in a manufactured home on the campus of the University of Texas at Austin.

Operating from a tiny trailer adjacent to the test house, the IU scientists are measuring concentrations of chemical oxidants, including ozone and the hydroxyl radical, a highly reactive and short-lived compound that plays a key role in air pollution. Stevens' lab uses a laser-based instrument that is one of the few in the world capable of accurate measurements of hydroxyl radicals.

Stevens said that much of the previous research on indoor air pollution focused on the presence or absence of the radioactive gas radon and on volatile organic compounds that escape carpets and furniture. But everyday indoor activities produce chemical mixtures that can vary and transform in response to light, temperature and air flow. Not much is

known about how that works.

"We've done a lot of measurements of outdoor chemistry, and we continue to do that," he said. "But until now, there have been very few measurements of what happens indoors."

Teams of scientists from other universities are studying the production and transformation of volatile organic chemicals, airborne particulates, microbes and other components of indoor air pollution as part of HOMEChem. The researchers are conducting experiments to learn how chemical processes respond to cooking, cleaning, use of personal-care products and other typical indoor activities.

Modeling experts will draw on the vast data being produced to create models of how indoor activities affect air quality. The aim is to develop better methods to reduce pollution and protect health.

"What we're finding is, it's a very active environment," Stevens said. "With the surfaces in the environment, cooking and cleaning can produce a lot of transformations that we didn't know about."

Working on the experiment for the IU Bloomington team are Brandon Bottorff and Emily Reidy, doctoral students in chemistry, and Colleen Rosales, a doctoral student in environmental science. Preliminary results are expected to be shared at an indoor air conference sponsored by the Sloan Foundation in October. Analysis that includes whether the chemicals are potentially harmful will be published in academic journals.

Provided by Indiana University

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