Food Science

A spoilage test to nose out the nose

"Flat-sour spoilage" is a particularly insidious form of food decomposition in canned goods. Caused by bacteria that thrive at high temperatures, it gains its name from the smell it imparts and the fact that it doesn't cause the characteristic swelling that so frequently signals canned goods gone bad. Most common in imported foods, especially meats, it can result from even short-term storage above 104°F. Though not a hazard to health, it is a true spoilage and imparts an objectionable taste.

To find flat-sour spoilage, the Agriculture Department's Food Safety and Inspection Service (FSIS) officials stick their noses into random samples of canned imports. Since even one sour whiff may cause the whole shipment of a food to be denied U.S. entry, "producers and our inspection people can get involved in some heated disputes over whether or not it's a sour odor," notes Ralph Johnston of FSIS in Washington, D.C. Judgments can be fairly arbitrary, he admits, since of the basic taste types — sweet, salty, bitter and sour — sourness is hardest to detect. But a test he and two FSIS colleagues have developed will retire the nose and, they hope, the debates.

Most of the microbes responsible for any flat-sour spoilage produce active catalase, an enzyme, as they grow. Mixing hydrogen peroxide with a sample of meat in a zipper-sealed plastic bag will quickly show whether catalase — and hence contamination — is present, even when the spoilage has caused no detectable smell, according to Johnston, George Krumm and John Damaré in the most recent (November-December) JOURNAL OF FOOD SCIENCE. Within 15 seconds, active catalase causes oxygen to begin bubbling out of the sample.

According to Johnston, FSIS is so confident about the new test that its use will become standard within a month or two.

Fiber may bind colon carcinogens

High-fiber diets have been associated with a reduced risk of human colon cancer. Possible explanations include: that fiber's bulk makes it less likely that carcinogens passing through the digestive tract will touch the colon's surface; that, by accelerating food's passage through the digestive tract, fiber reduces a carcinogen's time in contact with the colon's walls; and that fiber may bind to the carcinogens, pulling them out of the body before they can do harm. New research by food chemists at the University of Lund in Sweden offers further support for this last hypothesis.

The researchers used three chemicals known to produce tumors in the intestinal tract of laboratory animals. These heterocyclic amines — members of the quinoline family — form during the cooking of meats at high temperatures. In test tube environments meant to roughly simulate conditions that might occur during digestion, each was mixed with one of 13 different food fibers, including whole rye flour, whole barley flour, oat bran and wheat bran, among others.

According to a report of the work in the November-December JOURNAL OF FOOD SCIENCE, all fibers bound at least 8 percent of the quinolines, and some bound as much as 22 percent, depending on the fiber and the particular quinoline. In a category by itself was whole sorghum flour, which bound roughly 50 percent of the available quinoline, regardless of the quinoline concentration present.

This suggests that there may be different structural forms of these quinolines, with different binding affinities, says Padmanabhan Nair, a chemist with the Agriculture Department's Human Nutrition Research Center in Beltsville, Md. The researchers also found that an acidic pH caused maximum binding. But since the pH of the post-stomach phase of digestion is highly alkaline, Nair says, one should test whether fibers release quinoline in an alkaline environment.

Health Physics

Calculating homely radon's daughters

"Radon in houses is now believed to be causing more deaths than all other types of radiation exposure — natural and man-made — combined," says University of Pittsburgh health physicist Bernard Cohen in a new report. The decay product of naturally occurring radium, radon is released by rocks, soil and groundwater. Most of the radon found in homes enters from the soil, through basement floors. In order to plan radon-control strategies for homeowners in areas where background levels of the radioactive gas are high, one has to know what factors most affect exposure to radon, and its decay products, at home. And that is the subject of a study by Cohen and another by Miron Israeli of Israel, who was a visiting scientist with the Environmental Protection Agency (EPA). Both studies are reported in the most recent (December) HEALTH PHYSICS.

"Radon is an inert gas; you breathe it in and breathe it out — it doesn't stick," explains Allan Richardson of the EPA's Office of Radiation in Washington, D.C. But as electrically charged ions, radon's decay products — or "daughters" — will adhere to surfaces, including minute airborne particles. If those particles are breathed into and adhere to the lung, the attached daughters will get a permanent home from which to irradiate the lung. He says that's why, from a health perspective, the daughters are the real cause for concern.

In an 18-month EPA study in radon-rich Butte, Mont., Israeli collected data from 70 to 80 heavily monitored homes. Data from a subset of 20 homes monitored continuously for 12 months showed that even where indoor radon levels varied little, radon-daughter levels could double, depending on whether the inhabitants smoked. The reason, Richardson says, is that once the daughters adhere to smoke particles, their speed slows down by a factor of 10. A major mechanism for removing radon daughters from the breathable air is their adherence to walls and furniture; the more slowly they move, the longer they take to reach a wall.

Israeli also observed a sharp decrease in airborne daughters during winter months. He speculates that they may be more likely to adhere to surfaces in winter, perhaps because of static-electricity buildup.

Cohen's year-long survey of 169 Pittsburgh-area homes showed that in general, radon levels were lower in drafty houses and in homes sheltered from high winds. While basement levels were predictably highest, forced-air heating systems moved more of that radon-rich basement air upstairs than did radiator heating systems. Richardson points out that though forced-air systems may increase radon upstairs, they may also reduce airborne daughters by accelerating their natural movement toward surfaces to which they can adhere.

New rules and term for irradiation

Final regulations confirming the Food and Drug Administration's intention to broaden the use of ionizing radiation as a pesticide (SN: 3/3/84, p. 138) have been submitted to the Office of Management and Budget (OMB) for approval. They would permit irradiation with up to 1 kilo-Gray (100,000 rads) to kill insects in fresh produce and to inhibit spoilage, and the use of up to 30 kilo-Gray — triple the old limit — to kill insects and bacteria in dry or dehydrated herbs and spices. In addition, all foods treated with ionizing radiation, including those allowed under previous regulations (wheat, potatoes and pork), would have to carry labeling at the retail level that includes a logo (shown) and an explanation that the food has been "picowaved" (a new term). With OMB approval, the law would go into effect immediately, says FDA spokesperson James Greene.