Food & Nutrition

E. coli can take flight

Unpasteurized apple juice and cider tainted with an especially virulent strain of *Escherichia coli* triggered a series of lethal food-poisoning outbreaks that made headlines—first in 1991 and again 5 years later. While the source of the fecal bacteria might have been poor hygiene by juice processors, a new study opens the possibility that the culprit might also have been a factor largely out of the industry's hands: contamination of apples still on the tree by fruit flies.

Wojciech J. Janisiewicz stumbled onto the potential role of flies while developing natural biocontrol agents—bacteria and yeasts—to stem the growth of rot-triggering pathogens in stored apples and pears (SN: 6/4/94, p. 359). A plant pathologist at the Department of Agriculture's Appalachian Fruit Research Station in Kearneysville, W.Va., he observed that even sterilized apples could develop microbial contamination when fruit flies dropped by. Now, in the January APPLIED AND ENVIRONMENTAL MICROBIOLOGY, his team describes laboratory experiments demonstrating that fruit flies can transmit the deadly *E. coli* O157:H7 from a contaminated apple to a clean one.

To be vulnerable, apples must have an open wound, Janisiewicz says. When exposed inner tissue becomes infected, even small populations of the food-poisoning agent can grow exponentially, his data show.

Though pasteurizing kills *E. coli*, this heat treatment is not an option for those who sell sliced, fresh fruit. The growing commercial market for such produce—in salad bars, for instance—makes increasingly important an understanding of what may even be rare modes of orchard contamination.

The good news, Janisiewicz says, is that his preliminary studies indicate that some of the rot-inhibiting microbes he works with appear effective in deterring *E. coli.* Although these natural biocontrols won't kill it, "they do prevent *E. coli* from growing in apple wounds," he notes—provided that they get into these sites before pathogen-ferrying flies stop by. —*J.R.*

Food poisoning: Sprouts linked to bouts

Alfalfa and other sprouts provide a rich source of vitamins, minerals, and even natural cancer-fighting compounds (SN: 9/20/97, p. 183). However, the seeds from which these nutritious shoots are grown may be tainted with germs, a new analysis finds. Indeed, researchers have traced a protracted North American *Salmonella enterica* outbreak 3 years ago to alfalfa sprouted from seed contaminated with the bacterium.

The investigation was kicked off in the Pacific Northwest by 133 poisonings caused by an unusual type of *S. enterica* known as Newport. Initial probes showed that many Newport victims in Oregon recalled having eaten sprouts. Chris A. Van Beneden of the Centers for Disease Control and Prevention in Atlanta and his colleagues traced the sprouts to a batch of Dutch seeds. Upon testing, the seeds proved to harbor Newport *Salmonella* germs. The researchers eventually linked many earlier Newport cases in the central and eastern United States to consumption of sprouted seeds from the same Dutch source.

On the basis of the number of Newport cases in these outbreaks and the fact that only about 5 percent of *Salmonella* poisonings tend to be reported, "we estimate that more than 20,000 persons contracted Newport infections from eating these contaminated alfalfa sprouts in North America alone," Van Beneden's team concludes in the Jan. 13 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

Such outbreaks, the researchers say, "heighten concern about the safety of a familiar food"—especially one that is rarely washed or cooked. Indeed, they argue, sprouts appear to constitute a high salmonella risk because the commercial sprouting process "contains no 'kill step' that would eliminate pathogens without compromising a seed's germination." —*J.R.*

Physics

Tiny satellite tests gravity's grip

When Sir Isaac Newton first described the law of gravity, he postulated a fundamental constant, G, that relates force to mass and distance. Precise determination of G's value has long frustrated scientists, and in the past 5 years, carefully conducted measurements have shown puzzling discrepancies (SN: 4/29/95, p. 263; 5/18/96, p. 319).

A new measurement of G suggests that prior efforts probably do not suffer from some common, hidden source of error, as had been suspected, says James E. Faller of the National Institute of Standards and Technology in Boulder, Colo. The results, however, leave unsolved the mystery of why a 1994 measurement from Germany's standards institute, the Physikalisch-Technische Bundesanstalt in Braunschweig, falls well above the most widely accepted value, he says.

Researchers usually gauge G by suspending masses in a balance. Faller's group took a radically different approach, described in the Dec. 18, 1998 SCIENCE. They dropped a block of specially machined glass down a vertical vacuum tube and tracked its motion using lasers. "In effect, we're doing a satellite-tracking experiment," says Douglas S. Robertson of the National Geodetic Survey, also in Boulder.

Since Earth's mass isn't known precisely, the researchers must filter out the effect of the planet's gravity to get at G. They place a 500-kilogram tungsten doughnut around the tube, either below or above the glass block. The doughnut's gravity slightly quickens or retards the fall of the "satellite."

By measuring the difference in the block's acceleration rate for the two doughnut positions, the researchers can deduce the acceleration due to the doughnut alone. Knowing block and doughnut masses and the dimensions of the apparatus, all with great accuracy, the experimenters then calculate G.

Although plagued by more error than expected, the satellite-trackers' figure for G lies near the most widely accepted value. Given that it was reached by such a different path, the agreement should help dispel concerns that prior measurements are off base for some common reason, Faller says. —*P.W.*

Fusion hopeful hits temperature high

An extraordinary X-ray machine considered the comeback kid of fusion-energy research has burned past the 2-million-degree temperature mark. Above that hellish threshold, nuclear fusion of hydrogen atoms becomes possible.

The machine at Sandia National Laboratories in Albuquerque, N.M., known simply as "Z" (SN: 1/17/98, p. 46), propels a huge electric charge into a hollow cylindrical array of thin wires. The current vaporizes the strands into a plasma, an intensely hot gas of atoms shorn of electrons. It also creates magnetic fields that crush the plasma, unleashing X rays.

With the milestone now exceeded—the plasma has reached 2.3 million°C—research on so-called pulsed-power fusion enters a new era, says Donald L. Cook, Sandia's pulsed-power program leader. Already, scientists have made four tests of Z's ability to squeeze capsules of hydrogen fuel placed inside the wire cages. The intense X rays can compress fuel pellets to enormous densities, approaching the requirements for fusion. After 30 years of pulsed-power development, Cook says, "we've crossed the threshold to where we can do capsule experiments" that were formerly possible only in laser fusion chambers (SN: 10/19/96, p. 254).

Although Z already exceeds lasers in power and energy and is now invading their temperature range, pulsed power has a long way to go to surpass lasers as a step toward self-sustaining fusion, Cook says. For instance, Z crushes capsules into minuscule cigars rather than keeping them spherical, a shape needed to ignite a thermonuclear reaction. Sandia announced Z's temperature achievement on Dec. 17. —*P.W.*