Tropical fruits linked to parkinsonism

In the tropics, unusual illnesses resembling Parkinson's disease have baffled researchers for decades. One ailment, called Guam syndrome, causes neurological problems on that Pacific island. Scientists have suspected that eating a local food, such as a sago palm, might cause the condition, but the link hasn't been proved. To confuse matters, the disease has abated in recent years, perhaps because Western foods have replaced traditional fare.

Although Guam syndrome remains a mystery, a study in the July 24 LANCET from the Caribbean island of Guadeloupe suggests that three commonly eaten tropical fruits—soursop, custard apple, and pomme cannelle—and teas made from these plants may cause other Parkinson's-like diseases.

These conditions, called atypical Parkinson's and progressive supranuclear palsy (PSP), can mimic the muscle rigidity, tremors, slowness of movement, and poor balance of classical Parkinson's. They are more difficult to treat, however, because they don't respond to the drug levodopa, the best weapon against Parkinson's disease.

Unlike the classical disease, atypical Parkinson's and PSP affect both sides of the body equally. Moreover, they can cause incontinence, posture problems, slurred speech, and loss of eyelid control. Neurologist Dominique Caparros-Lefebvre noticed these symptoms in elderly patients while working at the Centre Hospitalier Universitaire des Antilles et de la Guyane in Guadeloupe. The observation prompted her to investigate what these patients had been eating.

Many patients mentioned the three fruits or tea made from them. All three belong to Annonaceae, a family of plants that harbor benzyltetrahydroisoquinoline alkaloids. Studies in animals indicate that these compounds are neurotoxins.

Caparros-Lefebvre examined 87 people, average age 65, who had been diagnosed with parkinsonism and compared their eating and drinking habits with those of 65 healthy adults.

Only 22 of the patients had classical Parkinson's disease; the other three-fourths of the group had atypical Parkinson's or PSP. Among European and North American patients, these proportions are reversed, says study coauthor Alexis Elbaz of Salpêtrière Hospital in Paris.

Of 31 patients with PSP, a mild paralysis that causes trunk and neck rigidity, 29 had eaten the fruits and 26 had drunk the teas regularly for at least 2 years. Of 34 patients who had atypical Parkinson's, all had eaten the fruits regularly and 28 had consistently drunk the teas.

In contrast, only 13 of 22 people with classical Parkinson's disease had eaten the fruits regularly and only 4 had drunk the teas. Similarly, among the 65 healthy participants, only 39 ate the fruits and 28 drank the teas.

When patients were asked to stop consuming the fruits and tea, many saw their conditions stabilize. Symptoms even abated in a few patients.

"This is extremely interesting," says neurologist Herman J. Weinreb of New York University. "It's another piece of evidence that parkinsonism is related to toxins in the environment."

Although many people eat these fruits, the neurological problems don't usually start until people are in their 60s, says Caparros-Lefebvre.

Younger people might more efficiently metabolize and excrete any neurotoxins present in these foods, says Paul A. Rosenberg, a neurologist at Children's Hospital and Harvard Medical School in Boston. Or it might simply take a long time for the body to ingest enough toxins to accumulate dangerous concentrations, Elbaz says. Also, the number of brain cells declines with age, leaving older people more vulnerable to neurotoxins.

The study authors caution that their work is preliminary and so it's too early to suggest that people change their diet. Another study is planned that will account for other lifestyle variables, Caparros-Lefebvre says. —*N. Seppa*

Craggy border corrals waves on tiny drum

Start with a square loop of metal the size of a fingernail. Fashion two of its sides into a rugged coastline of bays and promontories. Finally, stretch a membrane of liquid-crystal molecules across the jagged rim to make a tiny drum.

Voilà! This strange-looking instrument is called a fractal drum. Theory says it should vibrate in some places but not in others.

Catherine Even of Université Paris-Sud in Orsay, France, and her colleagues have made such a drum. In the July 26 PHYSICAL REVIEW LETTERS, they confirm that, at certain frequencies, its vibrations become confined, or localized. Some trapping, however, takes place in an unexpected way, they report.

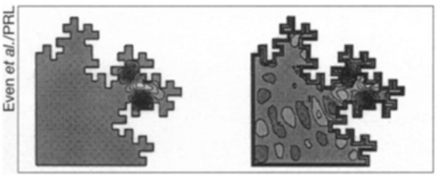
"It's a classically simple experiment, a very beautiful experiment," comments Benoit B. Mandelbrot of Yale University. In the 1970s, he pioneered studies of patterns known as fractals (SN: 3/1/97, p. S13).

Fractals are convoluted, toothed shapes that unfold in endless layers of similar detail upon close examination. Many natural phenomena, from coastlines to clouds to the branching airways in lungs, exhibit this nested complexity.

Fractal geometry furnished a precise mathematical way of describing irregular boundaries. Some researchers have elaborated on that description, investigating how a membrane fitted to such a boundary would behave. Vibrations of fractal drums share similarities with wave patterns of confined light, sound, and quantum particles (SN: 9/17/94, p. 184).

"Localization is usually an abstract notion," says Bernard Sapoval of the École Polytechnique in Palaiseau, France, who pioneered fractal-drum experiments and also led the new study. "Here, you can see it with your eyes."

The experimenters saw, as expected, that long-wavelength oscillations were barred from narrow promontories of the drumhead because of the physical mismatch. However, the scientists were caught off guard by observations that, at some short wavelengths, vibrations were trapped on those promontories despite plenty of room to escape.



Instead of resonating across its whole surface like an ordinary drum, a fractal drum traps short-wavelength vibrations in irregularly bounded zones during a simulation (left) and experiment (right). Black and white denote peaks and valleys of a contour revealed by laser reflections.

Imagine, Sapoval says, ringing a bell in a room with the door open but finding that the sound can't be heard just outside because it won't travel there. "Is that not a surprise?" he asks.

What's more, he adds, no one had seen the localization of both long and short wavelengths together before.

Convinced of wide implications to the study, Raymond L. Orbach of the University of California, Riverside calls it "just the beginning of an attempt to understand the nature of communication between regions weakly connected in nature."

By investigating how irregular borders shape wave patterns, researchers may discover why seacoasts become craggy and how walls in concert halls and echoless chambers affect sound, Sapoval says. Fractal drum studies might also shed light on heat flow in glasses and the localization of electrons in semiconductor structures known as quantum dots.

Richard P. Wool of the University of Delaware in Newark predicts that the study's finding of "fractal harbors" will have a major impact on the understanding of materials without regular crystal structure. "This is a fundamental cornerstone of a whole new way of looking at things," he says. —*P. Weiss*