The long and short of tapeworm infection

When four members of an Orthodox Jewish community in New York City developed an infection with the larval form of the pork tapeworm, epidemiologists were mystified. How did these individuals — who shunned pork for religious reasons — pick up the parasite?

Peter M. Schantz of the Centers for Disease Control in Atlanta and his colleagues took on the medical mystery. To begin with, they noted that none of the patients reported a recent trip to an area in which tapeworm infection is common. Travelers to parts of Asia, Africa, or Latin America can develop such infections, perhaps by eating contaminated food, says epidemiologist Ralph T. Bryan of the Centers for Disease Control, who is familiar with the investigation.

After ruling out travel and pork consumption, the researchers seized upon an important clue: The families of the four patients had employed a series of housekeepers who were recent emigrants from various Latin American countries. Further investigation showed that several of these housekeepers harbored antibodies to the larval pork tapeworm, a sign of infection with the parasite, Bryan says.

Schantz and his colleagues describe their findings in the Sept. 3 NEW ENGLAND JOURNAL OF MEDICINE. In a separate article in the same issue, Mexican researchers compare several methods of treating people infected with the larval pork tapeworm.

All four patients in the Schantz report developed neurocysticercosis, an infection of the central nervous system caused by the larvae of the pork tapeworm, *Taenia solium*. Epidemiologists suspect that people can contract the illness by transferring the microscopic tapeworm eggs from their hands to their mouths after direct contact with a tapeworm carrier, or by eating food that becomes contaminated when infected cooks don't wash their hands before meal preparation. The larvae make their way from the gastrointestinal tract to the bloodstream, which carries them to the brain. Once in the brain, they cause inflammation and seizures. All four patients in this report were brought to hospital emergency departments after they suffered seizures.

Schantz and his colleagues also looked for signs of parasite infection among the patients' immediate family members and discovered seven others with *T. solium* antibodies.

In a separate study, Julio Sotelo and Victoria Vazquez of the National Institute of Neurology and Neurosurgery in Mexico City focused on 240 people with seizures caused by infection with larval *T. solium*. Some participants received the drugs albendazole and/or praziquantel. Others received brain surgery to remove the larvae, while still others received careful monitoring but no drug treatment or surgical intervention.

After monitoring all patients for nearly eight years, the researchers discovered that people who received drug treatments fared better than those in the two other groups. People getting drug treatments showed fewer signs of larval infection in the brain and experienced fewer seizures, the team reports.

Those findings may help settle a controversy over whether or not to treat people for infections with larval *T. solium*. Some researchers believe it's better to let the infection follow a natural course, relying on the immune system to destroy the larvae. The drugs used to treat the infection can cause side effects such as nausea, headache, and other symptoms arising from the destruction of the larval pork tapeworm. But Sotelo and Vazquez assert that the reduced likelihood of seizures outweighs the potential side effects of drug treatment.

Both new reports underscore the fact that tapeworm infection remains a major threat in Mexico and in Central and South America, comments Dickson D. Despommier of the Columbia University School of Public Health in New York City. Despommier wrote an editorial accompanying the research reports. In the United States, the infection most often appears in communities populated by recent immigrants. For example, health officials see tapeworm infections in southern California, where migrant workers from Latin America work for farmers during the growing season, he notes.

Scientists don't know the exact route by which the tapeworm eggs are transmitted from one person to another. However, Schantz and his co-workers say their findings strengthen the theory that infected people can pass the eggs during food preparation. The researchers recommend that people at high risk of the infection undergo screening for *T. solium*. If infected, such people should be treated, they add. — *K.A. Fackelmann*

Buckyballs combine to make giant fullerenes

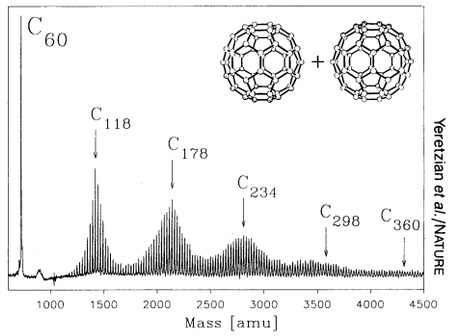
When magicians wave their wands, objects go *poof!* and disappear. But when those round, all-carbon molecules called fullerenes go *poof!* they sometimes just turn into bigger versions of themselves.

Scientists often use lasers to make fullerenes by evaporating carbon atoms from graphite rods. But zapping fullerene films with lasers causes the 60-carbon buckyballs and their 70-carbon big brothers to vaporize and combine like soap bubbles, says Chahan Yeretzian, a physical chemist at the University of California, Los Angeles. These united molecules sometimes billow to form stable fullerenes with 400 or more carbon atoms, he and his colleagues report in the Sept. 3 NATURE.

Most molecules would fall apart when subjected to such intense laser pulses, but fullerenes just open up their cages and then reseal themselves as bigger, smaller, or sometimes metal-filled molecules, says Mark M. Ross, a physical chemist at the Naval Research Laboratory in Washington, D.C. "I don't know of any other molecules that do this sort of thing," he says. In addition, the new results suggest that fullerenes form not only by the incremental addition of carbon atoms, but also by the linking of large precursors, says Ross.

"This could be a very efficient way to produce specific larger fullerenes that today are very hard to get," says Yeretzian.

Other scientists had suggested that fullerenes energized by lasers might temporarily open up their cages. Already, at the Naval Research Laboratory, physical chemist Stephen W. McElvany had used lasers to promote the entrapment of one or two yttrium atoms inside fullerenes. He reported on his work in the June 11 JOURNAL OF PHYSICAL CHEMISTRY.



Peaks show range of fullerene sizes.

For his experiments, Yeretzian flowed helium into the chamber where he zapped the fullerene film. The helium briefly confines tens of trillions of vaporized fullerenes into a space much smaller than the head of a pin. Thus the fullerenes behave like molecular bumper cars, Yeretzian explains. A mass spectrometer detected new fullerenes with 70 to 400 carbon atoms. By varying experimental conditions, the researchers can skew the sizes of molecules produced, he adds.

With pure C_{60} as the starting material, the mass spectra peaks revealed that many molecules contain carbon atoms in near-multiples of 60; the rest increase or decrease in size by two-carbon increments (see figure). The researchers suggest that coalescence causes the molecules to eject two-carbon fragments, which other merging molecules then take on. — *E. Pennisi*