Tracking and tackling foodborne germs

Food poisoning sickens millions of people—and kills thousands—in the United States each year. Estimated costs of treatment and lost productivity associated with these cases run to $22 billion a year, according to a report released last week by the General Accounting Office, a congressional agency.

Researchers report, however, that they are homing in on the germs that cause food poisoning and are experimenting with novel strategies to keep them from spreading. The scientists spoke in New Orleans this week at a meeting of the American Society for Microbiology.

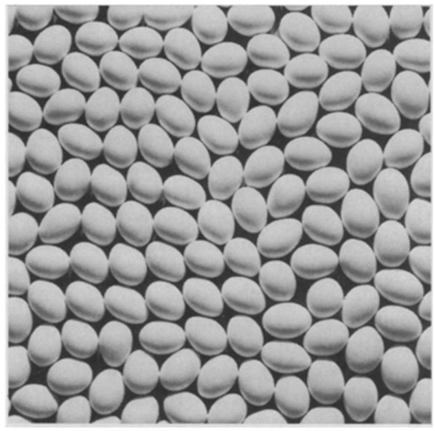
One research team revealed that kitchen sponges and dishrags may develop into rich reservoirs of germs. Carlos Enriquez and his coworkers at the University of Arizona in Tucson cultured microbes from 325 cellulose sponges and 75 cotton dishrags taken from households. Most harbored large numbers of virulent bacteria that commonly infect animals and people, as well as pathogens that cause illness only in infants or persons with unusually weak immune systems.

Moreover, *Staphylococcus aureus* turned up in 20 percent of the sponges and cloths. Each year, this bacterium causes 1.5 million cases of food poisoning and about 1,200 deaths in the United States. Another 14 percent of the sponges and cloths hosted *Salmonella*, bacteria that the GAO report linked to as many as 3,800 U.S. deaths in 1993.

Enriquez concludes that unless sponges and other cleanup materials are disinfected regularly, they may spread the germs they were meant to remove.

In hopes of reducing human exposure to eggs contaminated with *Salmonella enteritidis,* immunologist Peter S. Holt of the Agriculture Department's poultry research lab in Athens, Ga., has turned his attention to the spread of infection in the hen house. He recently showed that a common method of rejuvenating aging hens takes a toll on the birds' immune system.

After producing an egg a day for 30 or 40 weeks, a hen's output can wane dramatically. Farmers often put such a bird on starvation rations. Her weight can drop 30 percent in just 2 weeks, she molts, and her egg laying grinds to a halt. When returned to full feed after several weeks, Holt explains, "these molted birds can produce about 90 percent of what their optimum was before."



Eggs are not the only source of Salmonella.

While unmolted hens usually have to ingest about 50,000 *Salmonella* cells to become infected, molted birds need fewer than 10, Holt found. Once infected, these hens shed far more germs in their feces than unmolted birds and are more likely to lay contaminated eggs.

Moreover, Holt reports this week, *Salmonella* spread through the air among the molted birds, despite the conventional wisdom that this germ infects animals solely through ingestion of contaminated feces. This finding argues, he says, that farmers should find less stressful ways to increase egg production and become especially vigilant about preventing infections in molted hens.

At Texas A&M University in College Station, Steven C. Ricke and his colleagues have taken another tack. They found that a new antibacterial bath significantly reduces the number of *Salmonella* associated with eggs.

Brandt Rice of the Naval Medical Research Institute in Bethesda, Md., reported preliminary success with another approach to limiting foodborne pathogens: treating young broiler chickens with a human vaccine against *Campylobacter,* a bacterium that can cause severe diarrheal disease in people.

Before cooking, 40 to 80 percent of retail poultry products in the United States harbor the pathogen, Rice says. His data indicate that vaccinated birds exposed to *Campylobacter* do not host as many bacteria as exposed birds that have not been vaccinated—sometimes only 17 percent as many.

Finally, Gordon E. Schutze of Arkansas Children's Hospital in Little Rock points to the need for household sanitation that extends well beyond the kitchen. He reports tracing salmonellosis in infants to fecal contamination from infected family members—including several with symptomfree disease. In one house, a vacuum cleaner picked up *Salmonella* from the dust. *— J. Raloff*

Oxygen starvation decimated Permian oceans

Geologists trying to understand why almost all ocean life died out 250 million years ago have uncovered an important clue: widespread evidence of oxygen starvation in the seas at the end of Earth's Permian period.

"The world's oceans went stagnant, and you ended up with very little oxygen around…hence affecting most things living in the sea," says Paul B. Wignall of the University of Leeds in England.

The Permian extinctions mark the greatest crisis life has faced on this planet in the last 600 million years. Some 90 percent of ocean species disappeared, as did a smaller proportion of land plants and animals (SN: 3/16/96, p. 164). About the same time, an immense series of volcanic eruptions paved over much of Siberia with basalt—a coincidence that causes geologists to wonder whether the two events were linked.

Wignall and his colleague Richard J. Twitchett propose that carbon dioxide from the Siberian eruptions warmed the globe, reducing the temperature difference between poles and equator. This made the ocean currents extremely sluggish. With little circulation mixing the water to supply fresh oxygen, organisms would have suffocated, they suggest.

The two geologists report in the May 24 SCIENCE that oxygen depletion, or anoxia, affected all the oceans, from the tropics to the poles. Past studies had focused only on sites that would have been at low latitudes during the Permian, but Wignall and Twitchett found evidence of anoxia in the types of ocean sediments now preserved on the island of Spitsbergen, east of Greenland. During the Permian, this site was located at the northern edge of the vast supercontinent Pangaea.

The researchers also describe Permian ocean sediments exposed in the Alps of northern Italy and Austria. Their findings indicate that anoxia affected not only the deep ocean but also the shallow layer, where most organisms live.

To provide even more compelling evidence that the oceans were oxygen-deprived in the late Permian, Wignall and Twitchett measured the ratios of uranium and thorium in the sedimentary deposits. When the concentration of oxygen in water drops, dissolved uranium compounds become insoluble and fall to the seafloor, to be buried in sediments. Thorium is not affected by anoxia.

This test confirmed that when the Alpine deposits formed, the ocean held little dissolved oxygen. Spitsbergen is too remote for the team to have performed a similar test on deposits there.

The new findings have swayed critics of the anoxia idea, such as Douglas H. Erwin of the National Museum of Natural History in Washington, D.C. "There is growing evidence that there was a good degree of marine anoxia," he says.

While Erwin grants that oxygen problems may have played a role in the extinctions, additional factors must have contributed. Global anoxia at other times did not cause such severe extinctions, he notes. *— R. Monastersky*