Biology

Worms' hot ends set thermal record

If *The Guinness Book of World Records* had an entry for animals living at high temperatures, tube-dwelling worms near hydrothermal vents on the seafloor would win. The Pompeii worm keeps a cool head in that hot clime, however. While in its tube, the worm's rump may be immersed in water as hot as 81°C, while its head is in water of a moderate 22°C.

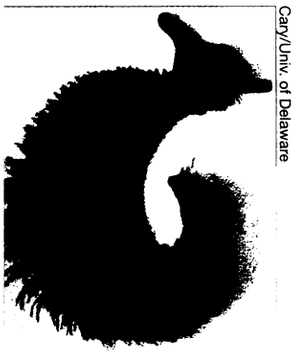
This worm lives at higher temperatures and routinely experiences a wider temperature range than any other multicellular organism known, report scientists in the Feb. 5 NATURE. The previous record holder, an ant that lives in the Sahara Desert, forages in air temperatures of 55°C.

Scientists thought that organisms whose cells contain membrane-bound structures like nuclei and mitochondria cannot tolerate rapid, extreme temperature changes or temperatures greater than 55°C. "Membranes can adapt, but they take time," says study coauthor S. Craig Cary of the University of Delaware in Lewes. "If you change the temperatures too abruptly, the membranes will fall apart or freeze."

Nevertheless, the Pompeii worms weather extreme temperature shifts with impunity, since they often leave their hot tubes to forage outside in the 10°C water. "The neat thing is the range of temperatures," says Verena Tunnicliffe of the University of Victoria in British Columbia.

The water inside the worm's tube would be thermally and chemically lethal for many animals, Cary says. It contains sulfides and heavy metals, such as lead, cadmium, cobalt, zinc, and copper. He believes that symbiotic bacteria living on the worm's back may detoxify the environment. If so, he says, enzymes from the bacteria may have practical uses, such as cleaning up toxic waste sites.

"There are many different possible applications of enzymes that can operate over broad temperature ranges," Cary says. "If you can find bacteria that have novel pathways to deal with metals, that might be an approach for bioremediation." —*M.J.*



Cary/Univ. of Delaware

Strands of symbiotic bacteria form a fleecy pelt on the back of a Pompeii worm. The red fronds at the forward end of the worm are gills. This specimen is preserved, since there is no way to keep the animals alive outside their deep-sea habitat.

Land hermit crabs spurn leftovers

Hermit crabs wouldn't eat last night's pizza for breakfast unless there was nothing else in the fridge. Eating the same kind of food repeatedly just doesn't provide the nutritionally balanced diet they need to grow big and strong.

The land hermit crab *Coenobita compressus* prefers foods with a different odor from that of its last meal, reports Robert W. Thacker of the University of Hawaii in Honolulu. His studies, described in the February ANIMAL BEHAVIOUR, also show that crabs on a mixed diet of flowers, crushed snails, and seeds grow faster than crabs fed only one type of food.

Every animal needs a balanced diet, Thacker says. He wanted to find out how the crabs achieved that goal, since they are generalists that scavenge whatever washes up or drops onto their home stretch of beach.

"Everyone said that hermit crabs just eat the first thing they walk up to," Thacker says. "But they're not just picking up anything on the beach, they're making active choices."

Even so, they won't hold out for new taste sensations indefinitely. Crabs that hadn't been fed for 9 hours were no longer picky eaters. —*M.J.*

Biomedicine

Stroke drug reveals a dark side

Quick treatment with a clot-busting drug can help prevent some of the damaging consequences of a stroke. However, new research suggests that this modern miracle may come at a price.

A stroke occurs when a blood clot blocks off an artery leading to the brain. Tissue plasminogen activator (tPA), a clot-dissolving substance produced by brain cells—and manufactured by drug companies—ordinarily forestalls these clots. When tPA can't handle the job, the clot squeezes off blood flow to parts of the brain.

Studies have shown that stroke patients benefit from the tPA drug if it is given within 3 hours of the onset of symptoms, notes Gregory J. Del Zoppo of the Scripps Research Institute in La Jolla, Calif.

Stuart A. Lipton of Harvard Medical School in Boston and his colleagues decided to study the benefits of the drug for stroke patients by creating the equivalent of a stroke in mice. The researchers temporarily blocked one of two brain arteries in two groups of mice. The first group, genetically engineered not to produce tPA, had less brain damage after the experimental stroke than the second group, which did make tPA. When the researchers injected the synthetic tPA into the brains of mice in the first group, the damaged areas doubled in size. The team describes its results in the February NATURE MEDICINE.

In an accompanying editorial, Del Zoppo questions whether a mouse study bears any relevance to human stroke patients.

Lipton doesn't deny tPA's benefits to humans. He points out that tPA may kill a few brain cells while preserving many more by restoring blood flow. Thus, treatment with tPA still offers human stroke patients a net benefit, he says.

Lipton's team is trying to design a drug that would aggressively dissolve blood clots without killing brain cells. In the meantime, Lipton, a practicing neurologist, still gives his eligible stroke patients tPA. —*K.F.*

Cancer treatment and memory loss

Researchers from the Netherlands have some bad news for women considering very high doses of chemotherapy to combat breast cancer. Frits S.A.M. van Dam of the Netherlands Cancer Institute in Amsterdam and his colleagues report that high doses of toxic chemotherapeutic drugs may raise the risk of cognitive deficits.

Van Dam's team studied 34 breast cancer patients treated with high doses of chemotherapy plus the hormonal drug tamoxifen, 36 patients who received the standard dose of chemotherapy plus tamoxifen, and a control group of 34 breast cancer patients who did not get chemotherapy or tamoxifen. The patients had been assigned at random to these groups.

About 2 years after therapy was completed, the researchers administered a standardized test to assess cognitive functioning. They discovered that 32 percent of women given high-dose chemotherapy had cognitive deficits, including memory lapses and difficulty concentrating. In contrast, 17 percent of the women who had received the standard doses of chemotherapy showed such deficits. Just 9 percent of the control patients had cognitive impairments.

The researchers suspect that chemotherapy is behind the cognitive impairments but say that tamoxifen may play a role as well. None of the women had experienced such lapses before the cancer treatment, they note.

High-dose chemotherapy is being increasingly recommended to women treated for breast cancer. Such treatment aims to rout all the cancer, thus giving patients a better shot at survival. The researchers warn against taking side effects lightly. "Long-term cerebral impairment, even when relatively subtle, may have profound consequences for the daily life of patients," they report in the Feb. 4 JOURNAL OF THE NATIONAL CANCER INSTITUTE. —*K.F.*