

Squirrel sleeps at a fluid subzero

Researchers have discovered for the first time a warm-blooded animal that can survive, without freezing, at a body temperature below the freezing point of water. The hibernating arctic ground squirrel, *Spermophilus parryii*, can drop as low as -2.9°C , reports biologist Brian M. Barnes of the University of Alaska at Fairbanks. Although scientists have found a few cold-blooded vertebrates that can live at subzero body temperatures, they previously had found no mammal that survives below 0.5°C , Barnes writes in the June 30 *SCIENCE*.

Barnes and his co-workers captured 12 arctic ground squirrels from their native habitat on the North Slope of Alaska. They implanted miniature temperature-sensitive radio transmitters in the squirrels' abdomens and released them in partially buried outdoor wire cages in Fairbanks. The squirrels dug burrows in the cages and hibernated for eight months starting in September, Barnes writes.

The scientists recorded the lowest body temperatures in February and March. The squirrels maintained these temperatures, which averaged -1.9°C , for over three weeks. Then several days before the animals' brief monthly arousal, the squirrels gradually warmed to about 0.5°C before rapidly climbing to normal body temperature, says Barnes' collaborator Alison D. York.

In a second experiment, the scientists held arctic ground squirrels in a -4.3°C laboratory chamber, where they could measure temperatures at different locations and examine their blood for clues of freezing survival mechanisms. They found subzero temperatures only at the rear of the animal, not in the brain or heart, Barnes says. And from measurements of molecules in blood plasma drawn from six squirrels with subzero body temperatures, Barnes concluded that the measured concentrations could not lower the blood's freezing point enough to account for the squirrels' survival at the temperatures observed.

Barnes' team also found that the freezing and melting points of plasma from these animals were identical, ruling out the presence of antifreeze molecules, which lower freezing points below melting points. And since these animals' fluids do not freeze, the only possibility, Barnes reasons, is that the animals use supercooling, in which a fluid is somehow prevented from freezing below its freezing point.

Despite decades of research, no previous scientist has found a mammal able to remain supercooled for longer than an hour. Prolonged supercooling is probably unique to arctic species, many of which must live for many months at extremely low temperatures, says H. Craig Heller of Stanford University. Barnes suggests that supercooling to -3°C could save 10 times the energy needed to keep up a body temperature above zero, giving the squirrels a selective advantage.

Expert system homes in on forest foes

Two scientists have developed computer software to recognize certain signs, symptoms and circumstances suggestive of pest infestation of red pines in order to diagnose which of 28 forest pests are responsible for the damage. The software, endowed with the knowledge of forest experts, represents the most comprehensive forest pest diagnostic program yet developed, says Daniel L. Schmoltdt of the USDA Forest Service in Riverside, Calif.

The program proved significantly better than two trained foresters when asked to point out the most likely mammalian, insect, pathogenic or environmental perpetrators of the observed pine ills. The IBM-compatible PREDICT "is able to improve the diagnoses of field foresters to a level comparable to experts," conclude Schmoltdt and George L. Martin of the University of Wisconsin-Madison in the June *FOREST SCIENCE*.

Melanoma: Can the sun be protective?

It's that season when sunbathers by the droves seek to soak up some rays, largely ignoring dermatologists' strenuous warnings against intentionally baking up a tan. The concern is over melanoma — a virulent skin cancer whose incidence appears to have practically doubled since 1980 (SN: 12/17/88, p.396). Though understanding of melanoma's cause is cloudy at best, sun exposure appears to play a role in the development of at least some of these deadly skin cancers — which annually claim about 6,000 U.S. lives. However, one new study appears to challenge the blanket prescription that everybody cover up. It suggests those who bronze easily may actually derive some melanoma protection from a moderate tan.

Neil Dubin and colleagues at New York University Medical Center surveyed the sun-exposure history of 289 melanoma patients and 527 adults with noncancerous skin problems. Their data show that those who worked "mostly outdoors" had nearly twice the melanoma risk as those who worked "mostly indoors." However, "partly outdoor" work appeared "somewhat protective" of melanoma risk among those who tan easily. The same was not true for those having a poor ability to tan. Partly outdoor work increased their melanoma risk by 50 percent, and mostly outdoor work more than tripled their risk, when compared with those who worked indoors. Similarly, among the easy tanners, a mix of indoor and outdoor recreation appeared to offer some protection against melanoma. Among the hard-to-tan crowd, mixing indoor and outdoor recreation was no more protective than playing indoors only.

Overall, the chronic and intermittent sun-exposure data suggest "that moderate sun exposure may actually protect against melanoma" in those who tan easily, the authors write in the newly released May *ENVIRONMENTAL HEALTH PERSPECTIVES*. For poor tanners, however, the more sun they got, the higher their risk of melanoma. But age also proved important. Cumulative sun exposure was linked to melanoma risk — but only in those over age 60. Meanwhile, those aged 20 to 40 who had *ever* gotten a blistering burn faced a melanoma risk 5.6 times that of those who *never* had. Older individuals, however, faced no increased risk from any blistering sunburns.

In general, these findings are "typical" of several major studies, notes Boston University dermatologist/oncologist Howard K. Koh. However, he believes, it's still too early to know whether the newly identified apparent protective effect from tanning is real. Even if it is, he notes, the magnitude of protection reported — 20 percent — is quite small.

Leg moles? Get out the sunblocker

An even greater melanoma-risk factor than being hard to tan is the presence of moles on the skin. In the past, researchers often attempted to gauge relative melanoma susceptibility by counting moles on the arm or whole body, notes dermatologist Martin A. Weinstock of Brown University in Providence, R.I. But data he and Harvard colleagues report in the June 21 *JOURNAL OF THE NATIONAL CANCER INSTITUTE* show that leg moles — especially lower-leg moles — offer the best predictor of melanoma risk. Twelve or more moles there were nearly twice as powerful a predictor as 27 or more arm moles and roughly 25 percent more predictive than whole-body counts. Moreover, the study showed, where someone's moles predominate bears no relation to where an eventual melanoma will develop.

This study suggests it's not the moles themselves that cause melanoma, Weinstock points out. Rather, he says, they serve as a sentinel of who stands an especially high risk.

Another study by the same team, due in the August *PEDIATRICS*, suggests living in the southern United States poses roughly double the melanoma risk — probably from enhanced ultraviolet radiation — of living in the North.