Extracts

Cell Sizes, Lives Influenced By Host Size

Cells from the smallest to the largest of mammals often seem to be "one size fits all." Now a closer look reveals that whether a cell lives in an elephant, mouse or something in between can make a big difference in its life.

Researchers from the UF Genetics Institute, Harvard Medical School and other institutions developed mathematical models that they used to examine 18 cell types from mammals ranging from mice to elephants. They found two basic categories — cells that stay the same size but have drastically different energy needs that depend on the size of the mammal, or cells that grow larger in larger mammals and use energy at the same rate, no matter the mammal's size.

The discovery, published in March in the *Proceedings of the National Academy of Sciences*, begins to answer questions about how the size of an organism helps determine the life span of its cells, a finding that could help cell biologists and physiologists understand cell and organ function and their relation to disease.

"Although cells are basic building blocks, their metabolic rates depend on where they find themselves living," said Harvard Medical School's Van M. Savage, the lead author of the research. "Conceptually this is important because huge amounts of research on human diseases are done on single cells or cultured cells that come from other animals and little is done to place these findings within the context of the size or other whole-body properties of the animals."

Generally, the size of a species of mammal sets the pace of its life, Savage said. The life spans of a mouse and elephant can differ by more than 70 years, and it takes a mouse 20 days of gestation before delivering a baby compared with more than 600 days for an elephant. The larger the animal, the slower its cellular metabolic rate — the speed at which it burns oxygen — and life processes.

The question of whether cells are bigger in larger mammals than in smaller ones — think of an elephant's liver cell compared with a liver cell from a mouse — is usually answered by saying that larger mammals don't typically have bigger cells, they just have more of them.

Liver cells, red blood cells and other cell types that frequently divide and replace themselves are about the same size, but more permanent, long-lived cells, such as brain and fat cells, are indeed larger in large mammals.

"Fat cells increase in size tremendously if you move from a mouse to an elephant," said James Gillooly, an assistant professor in the zoology department of UF's College of Liberal Arts and Sciences. "Neurons also increase in size. But red blood cells are the same size whether they are in a mouse or an elephant. The reason brain and fat cells grow bigger could be because they live longer and have important long-term functions. In these cases, the properties of the cell are linked to the whole organism. But the sizes of quickly dividing cells are independent of the organism."

Neurons are essential parts of brain networks that retain memory, the researchers said, while fat cells are storehouses of energy that are vital for an animal's survival when food supplies are short. As such, they are too valuable and would require a great deal of energy to be continually used and replenished in the body.

James Gillooly, gillooly@zoo.ufl.edu

John Pastor

Relocating "Nuisance Bears" May Not Work

For decades, state wildlife officials have been trapping and relocating so-called "nuisance bears" that get too close to humans.

But a new University of Florida study shows the policy may merit a second look.

"No one had any idea, when we move these bears, what becomes of them," said Kim Annis, the UF graduate student who presented her findings in April at the annual Eastern Black Bear workshop in West Virginia. "So the object of all this was — is relocating these bears doing what the state thinks it does?"

According to Annis' study, done in conjunction with the Florida Fish and Wildlife Conservation Commission (FWC), the widely held public perception that relocating problem bears means they scamper into the

A large bear helps himself to a drink from the swimming pool of an Ormond Beach home in the summer of 2006.

forest and live happily ever after isn't entirely accurate.

Nuisance bears tear up campsites, get into people's garbage, drink out of swimming pools, eat farmers' chickens or generally get too close for human comfort.

Annis and officials from FWC's Florida Wildlife Research Institute put radio-tracking collars on 41 such bears that were being relocated from nine Florida counties to the Ocala National Forest in North Central Florida. She followed them, on foot and by plane, from May 2004 through December 2006.

Eight bears died during the study. One was euthanized after repeatedly trying to enter a home. One died of natural causes. Two were hit by cars. Another died in a forest fire. Three were illegally killed.

While the mortality rate for the relocated bears wasn't radically different from typical rates for Florida black bears, humans were directly or indirectly responsible for seven of the eight deaths.

And relocating the bears didn't always stop the bad behavior.

Nearly half the bears engaged in at least one instance of nuisance behavior even after being moved — and 34 percent of them did so more than once.

UF wildlife ecology and conservation Professor Mel Sunquist, who supervised Annis' work, said it appears that if you move the bears far enough away, they're less inclined to return to their home turf.

But in Florida, as development has boomed, bear habitat has dwindled, so with only six large habitats left, moving every nuisance bear far enough away is expensive and inconvenient.

"If you are in someplace like Montana, you can cart them off, turn them loose and never see them again," he said. "But we don't have that luxury here."

Annis noted that four of the bears covered a lot of ground, traversing up to 541 miles and crossing busy highways repeatedly.

Walt McCown, an FWC bear research biologist, said the mileage some bears logged was a bit of a surprise. Black bears can live close to humans and are rarely aggressive, McCown said. Nuisance behavior is almost always a result of the bears looking for food.

And find food they do, especially around humans, Annis said.

Annis found several bears that were much fatter than they would be if they were living off the forest — and not people's backyards. One young male that should have weighed about 90 pounds was a portly 275, she said.

"In the fall, a bear can eat 20 hours a day and needs 20,000 calories — but why do that when they can get that from a bird feeder in 20 minutes?" she asked.

Though there are pockets of black bears in eight forests around the state, by far the most complaints come from residents who live near the 430,000-acre Ocala National Forest.

Of 1,600 nuisance-bear calls to FWC in 2004, more than half were from that area, McCown said.

Educating the public about ways to peacefully coexist with their large, furry neighbors may be a better option than spending thousands each year to move or euthanize them, the study suggests.

The Florida black bear has been a threatened species since 1974, when there were between 500 and 1,000 bears in the state. Bear hunting was banned statewide in 1994. The state's bear population is now believed to be between 2,200 and 3,000, with about 1,100 in the Ocala National Forest and the St. Johns River area, she said.

Kim Annis, kimannis@ufl.edu
Mel Sunquist, sunquist@ufl.edu

Mickie Anderson

Andrea Bolzek

Patricia Underwood/FWC

UF graduate student Kim Annis holds a male cub born to one of the female bears in Annis' study on what happens to relocated bears