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## UAF research looks to heart of rehab

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FAIRBANKS — Scientists believe research on hibernation of black bears and ground squirrels at the University of Alaska Fairbanks' Institute of Arctic Biology could contribute to treatment of heart attacks and strokes in humans as well as the long-term recovery of people after surgery and of soldiers' recovery from battlefield wounds.

The U.S. Army is particularly interested in the latter and U.S. medical researchers are increasingly interested in the former. Both are helping fund work at the institute.

In another program, researchers at the Center for Alaska Native Health Research, which is part of the Institute of Arctic Biology, have found a connection between consumption of Alaska Native subsistence foods — particularly sea mammals — in Yup'ik Eskimo people of Southwest Alaska and remarkably low levels of diabetes in comparison to the general Native population.

UAF has long been known as a research center for geophysics and northern studies, as well as its academic programs in wildlife. But in recent years the university has carved a niche in the biological sciences.

The National Science Foundation, American Heart Association, National Institutes of Health and the Department of Defense now provide funding for the institute's research. But the institute's capabilities and potential to grow have been limited by cramped quarters and obsolete laboratories and classroom space.

Last year the Legislature and Alaska voters approved funding for the \$108 million new life sciences building at the Fairbanks campus as part of a general statewide bond issue. The building is now under construction and it will allow UAF to further expand its research and teaching programs in the field.

### Hibernation links

The link between animal hibernation and heart attack survival is one result that could come from work being done at the institute. Black bears live in captivity in an outdoor research facility at UAF in conditions similar to what they experience in the wild, in terms of seasonal hibernation, and Arctic ground squirrels are studied at the Toolik Field Station operated by the institute on the North Slope, an area where the squirrels live naturally.

"Our interest has been in the basic science of how these animals survive the winter but we're finding applications that are important for medicine," said Brian Barnes, director of the institute.

Barnes has researched Arctic ground squirrel hibernation for 25 years, but the Army became interested seven years ago.

UAF researchers have found that during hibernation the pulse in the animals slows dramatically and blood supply to the brain drops to as low as 2 percent of normal, Barnes said. Oxygen supply to the brain is also reduced.

Researchers at Duke University School of Medicine, who are now working with UAF, were in Fairbanks last January and performed heart bypass surgery on 12 Arctic

ground squirrels that were in hibernation. The blood supply to two of the animals' bodies was cut off for 45 minutes.

"The animals were anesthetized during the surgery and bypass, including the 45 minutes when the pump supplying blood and oxygen were turned off. Then the bypass was ended and the animals revived," Barnes said. "The next day they were behaving normally and there was no evidence of harm to the heart or other organs."

Another surprise for researchers at UAF is that when the animals, both black bears and ground squirrels, resume activity in the spring there has been no loss of muscle or bone mass during the winter. This finding has direct implications for soldiers' long-term recovery after wounds.

"These animals are essentially doing six months' of bed rest with no loss of muscle or bone. We want to find out how they do it," Barnes said.

What has really surprised researchers is that the slowdown of heart rate and breathing begins before the animals' body begins cooling due to falling temperatures in their dens.

"It's as if they throw a switch," Barnes said, and he suspects that it is a genetic switch.

There also may be changes in the mix of fats and sugars in the reduced levels of nutrients that reach the blood and are used as metabolic fuel.

"If this is the case, and we find out what the mix is, it might be something we could put in a pill," that could be administered before heart surgery or after a stroke or heart attack.

"What we and others have found is that during hibernation, the heart stops using sugar and used exclusively fat for fuel. This may be part of what protects it from low blood flow and oxygen," Barnes said.

#### Human element

The possible genetic connection also has led UAF into the new medical research field of bio-informatics, which involves the analysis of huge sets of genetic data.

A collaboration in this has been established between the UAF Institute, Duke University's medical school and the Shanghai Institutes of Biological Sciences, which is part of the Chinese Academy of Sciences in Shanghai, where coordination on the Chinese side is by Dr. Jun Yan, who did research in the field at UAF from 2003 to 2006.

The UAF Institute of Arctic Biology's focus on "life sciences" includes people. The Center for Alaska Native Health Research is in a building adjacent to the Institute of Biological Sciences on UAF's west ridge research campus. Its researchers are working on a variety of programs related to rural health.

One that is attracting attention is the relation of nutrition and subsistence food to diabetes among Yupik Eskimos.

"We've suspected for a long time, and the village elders have suspected even longer, that eating traditional foods keeps people healthy longer," said Bert Boyer, director of the center and the principal investigator in research in the role genetics and nutrition in obesity and diabetes.

The project began with a study of increasing obesity in Yup'ik populations that researchers believed was linked to the increased consumption of western foods and less intake of traditional food. The initial focus on the research was to study this connection.

There are a number of complex health disorders linked to obesity, including diabetes and heart disease, and Boyer's primary objective was to see if there were genetic risk factors in these for Yup'ik populations.

A surprising discovery, however, was that rates of diabetes that is typically related to obesity was very low among the Yup'ik, and Boyer and other scientists believe this is linked to consumption of subsistence food like sea mammals and fish that are high in omega 3 fatty acids.

"Subsistence food is the original 'organic free range' diet, so this makes sense," Boyer said.

The connection is being further studied by the center, with support from the National Institute of Health.

Another scientist at the center, Andrea Bersamin, is working on related research

on whether a program to increase subsistence consumption among Alaska Native teenagers can alter health indicators among young people.

Surveys are showing that young Yup'iks in Southwest Alaska aged 14 to 18 now depend on western foods for about 90 percent of their food consumption, compared to older Yup'iks, aged 60 and older, who depend on traditional subsistence foods for about 65 percent of their food, Bersamin said.

The center recently received a \$1.12 million grant from the U.S. Department of Agriculture to coordinate a "fisheries-to-schools" demonstration project in Southwest Alaska school districts, Bersamin will work with seafood processors in the region to supply fish like salmon, whitefish or herring, which are also traditional subsistence foods, for school lunch menus.

The project's initial goal is to find ways to package and prepare seafood on school lunch menus so that young people will eat more of it, to supply seafood-based school lunches to a group of Southwest Alaska schools, and then to consider how the nutritional effects can benefit health.

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