

## Jackson researchers on forefront of combating Alzheimer's

BY KYLIE MOHR  
JACKSON HOLE NEWS AND GUIDE

JACKSON (AP) — What do algae blooms, British explorers and neurodegenerative diseases have in common? A lot, it turns out.

Century-old samples from an Antarctic expedition are helping researchers fighting to find a cure for Alzheimer's and Lou Gehrig's diseases.

Scientists at Brain Chemistry Labs, formerly the Institute of EthnoMedicine, worked with the Natural History Museum in London and the University of Dundee in Scotland for over five years to analyze samples of cyanobacteria mats collected in the summer of 1902 by explorer Robert Falcon Scott from ponds and sediment accumulated in the Antarctic.

The samples have been preserved for more than 100 years at the museum in London. After testing them in Jackson, Drs. Sandra Banack, Paul Cox, Rachael Dunlop and James Metcalf found the samples contained toxins produced by cyanobacteria, including toxins linked to liver cancer and neurodegenerative diseases.

"We jumped at the chance," Metcalf said of the collaboration. "We thought, 'Well, we can't lose.' If there are toxins, great. That helps us understand exposure. If not, then it helps with the pollution aspect.

"But it seems like they've always been there and we've always been exposed to them. And it's important for our research to find ways to combat their effects and provide cures for people who may be susceptible to the actions of these toxins," he said.

### A CLOSER LOOK AT CYANOBACTERIA

This discovery, the result of years of collaboration between scientists, is promising for the future of medicine.

The samples were run through the lab two to three years ago, but the analysis was published April 4 in the European Journal of Phycology.

"What drives us is results," Banack said. "Our only goal is to change patient outcomes."

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Amyotrophic lateral sclerosis, also known as Lou Gehrig's disease, is also a progressive neurodegenerative disease. It affects nerve cells in the brain and spinal cord, weakening muscles and affecting physical functions.

The discovery of the toxins in the Antarctic samples provides a much-needed baseline for cyanobacterial toxin levels before pollution and climate change, the scientists say.

"What this shows is that there is a background amount of toxin exposure for people," said Cox, the executive director of Brain Chemistry Labs. "And we're really interested in how that fits into the puzzle because we know that for certain neurological illnesses, there is a background rate. What this puzzle piece suggests is that we've always been exposed to these toxins as people, as human beings."

The low-level exposure to cyanobacteria could account for a low but constant rate of certain diseases. Recent increases in frequency and duration of cyanobacterial blooms may be associated with increases of neurodegenerative diseases, the scientists believe.

They point to Guam ALS/PDC, a disease that presents traits of ALS and Alzheimer's and Parkinson's diseases. As the name suggests, it is found in people living in Guam.

A cyanobacterial toxin, BMAA, found in contaminated traditional food-stuffs appears to trigger the disease, Cox said. The presence of BMAA has been discovered in the brains of those with the disease but not the brains of the control patients who died of causes unrelated to neurodegeneration. Confirmation of that pattern was found in replicated experiments, showing that chronic dietary exposure resulted in brain tangles and plaques that were chemically, structurally and positionally identical to the people in Guam with ALS/PDC.

These results were published in the 2016 issue of the Proceedings of Royal Society in London.

"The suggestion that exposure to BMAA can trigger ALS in vulnerable individuals comes from findings by investigators at the Dartmouth Medical School that shows that residences of ALS patients in New Hampshire, Vermont and Maine tend to cluster near lakes or rivers with frequent cyanobacterial blooms," Cox said. "We do not have similar data for Alzheimer's disease. Thus, we suggest that exposure to cyanobacterial blooms could trigger Alzheimer's disease, but this has not yet been conclusively proven."

A better understanding of the interactions between genes and the environment, Metcalf said, could lead to new therapeutic approaches.

"The discovery also shows the importance of going to explore alpine, mountain, polar environments," Metcalf said. "They can lead to great breakthroughs in understanding science and human health."

These organisms can be found in our backyard, though scientists say there is no cause for alarm. The lab is testing fossilized cyano-

bacteria from the Eocene Epoch, 56 million to 33.9 million years ago, from the Kemmerer area.

"These are the same organisms that are in Yellowstone," Metcalf said. "All the greens and reds you see in Yellowstone are these organisms."

The same cyanobacteria were found when dangerous levels of toxins caused Toledo, Ohio, to temporarily shut down the drinking water supply for a half-million residents in 2014. Toxic algae blooms also took over Utah Lake near Provo, Utah, and Florida's St. Lucie River in 2016.

"These are the same organisms that we've found growing in Antarctica and that we've analyzed," Metcalf said. "So they are everywhere, and we certainly believe that people are exposed. This was a pristine environment prior to industry and pollution, and they are there."

The Jackson scientists' colleagues from London are in Antarctica collecting contemporary samples for analysis. In the meantime, they are continuing their work at Brain Chemistry Labs in addition to conducting a variety of clinical trials with institutions like the Geisel School of Medicine at Dartmouth University.

"We're really pushing on having cures for these diseases come out of here," Cox said.

### COLLABORATION FOR A CURE

Dr. Martha Stearn, who founded St. John's Medical Center's Cognitive Health in 2009, is excited to see research into the fields of dementia and specifically, Alzheimer's, taking off.

"It's a very poorly funded field," she said, comparing it with research into cardiovascular disease and can-

cer — the top two causes of death in the United States.

Research funding for Alzheimer's lags compared with heart disease and cancer.

"So that's part of what's holding up research," she said. "I also think it's ageism, which is changing."

Research, she said, has "blossomed" over the last 20 to 30 years.

"It has a lot of catching up to do," Stearn said.

There's increasing urgency now more than ever. The prevalence of the disease is expected to nearly triple by 2050, according to a 2015 report published by Alzheimer's Disease International.

Alzheimer's is the most common cause of dementia, accounting for 60 to 80 percent of cases. Dementia is also related to aging — doctors tend to start seeing the onset around 65 years old. After age 65, the risk doubles every five years, according to the Alzheimer's Association.

"That's why we're seeing an increase in Alzheimer's and why it's being looked at now as an epidemic and extremely costly to Medicare and to society in terms of caregiver stress as well," Stearn said.

Over the years Stearn has seen several false starts in potential cures and treatments tested by research. Scientists believe that the protein amyloid could be one, if not the, culprit.

"There are two proteins in the brain that cause Alzheimer's, but nobody knows the mechanism," Stearn said. "We just know these proteins are there and they're causing damage and killing cells."

The other is a protein called tau.

Using immune antibodies directed to kill the amyloid proteins was hypothesized to be effective. Success was seen in studies on rodents,

but the results haven't been replicated in humans.

"The studies in humans have failed," Stearn said. "Every single one. In mice, they've been able to make the amyloid dissipate and in some cases, they actually had an improvement in cognitive function. In humans, that has not been the case."

Another vaccine against amyloid looked promising. "In humans, it looked like it was cleaning up the amyloid in their brains," Stearn said. "But the studies had to be stopped because some people were getting side effects like encephalitis, an infection of the brain."

Results like those send scientists back to the drawing board. Maybe, some say, it's tau, which explains the rise of "Tau Now" shirts at research conferences. Scientists are also looking at the apolipoprotein E3 and ApoE4 genes to explore genetic triggers.

Sharing data, Stearn said, seems more common in the field of Alzheimer's research than in others. That kind of collaboration allows studies, like the work of the Brain Chemistry Lab, to flourish.

"Some researchers are very possessive about their research," Stearn said. "But in Alzheimer's disease, there's this consortium of everyone agreeing to share data throughout the world because it's such a terrifying disease and we're so far behind in finding a cure or even a disease-modifying drug."

With initial findings still early in the scientific process, facing years of peer reviews and replications to come, Stearn is hopeful a cure could be on the horizon.

"You go to all these conferences and these researchers who come every year say, 'Probably not in our lifetime,'" she said. "But you never know."

### SENIOR HAPPENINGS

- The Hub will make a trip to Sheridan College for a pops concert at the Whitney Center for the Arts Tuesday at 7 p.m. Attendees will hear everything from marches and concert overtures to Appalachian folk tunes and film music, funk, jazz and blues. Those planning to attend are asked to chip in for gas money if possible. Early sign-ups are encouraged as there is limited seating on the bus to the event.
- The next round of Conversations in History will take place Wednesday

at 10:30 a.m. at The Hub on Smith, located at 211 Smith St. The topic is "Beatrice Gallatin Beuf and the Gallatin Ranch."

- Steve Stresky, Sheridan's own Appalachian Trail champion, has found a loop trail for local seniors to hike May 15 from 12:30-3:30 p.m. The trail is located 9 miles east of Sheridan on U.S. Highway 14 in the Prairie Dog Creek area. Meet at The Hub café for lunch at 11:30 a.m. The group will depart from The Hub at 12:30 p.m. Sign-up at the front desk by May 10.

The difficulty level for the hike is easy to moderate.

- The University of Wyoming Department of Theatre & Dance will present "Six Songs from Ellis" on May 15 from 1-2 p.m. at The Hub on Smith. Join Patricia Kessler, humanities scholar at the Laramie County Community College, for a discussion about Wyoming's history as it relates to immigration as well as the larger topic of immigration through Ellis Island. Kessler is traveling with the UW Theatre and Dance tour.



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Thurs- Breaded Cod w/Tartar Sauce  
Fri- Stuffed Peppers  
Sat-Baked Potato Bar  
Sun -Mothers' Day Chicken Cordon Bleu/Wild Rice  
Mon- Italian Pasta Bake

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No Salad Bar on  
Saturday or Sunday

\*entrée only offered for Home Delivered Meals

**MAY IS OLDER AMERICANS MONTH "ENGAGE AT EVERY AGE"**

Tue- Young at Heart Players	9:30 a.m.	Community Room
Wed- Eaton's Ranch Trip	leave The Hub 11:15 a.m.	Leave Throwers 11:00 a.m.
Thurs - Inspired Walkers	9:00 a.m.	Outdoor Walks
Fri - Conversation Pit	8:00 a.m.	Café
Sat- Foster Grandparents	9 a.m. to 1 p.m.	Community Room
Mon- Table Tennis	1 p.m. to 3:30 p.m.	Fitness Room

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