

Myths and Truths about Hibernation, Metabolic Health and Biotechnology in Interior AK

HIBERNATION

Bears are not true hibernators.

False – While many elementary school textbooks continue to perpetuate the myth that bears do not hibernate, research at UAF and published in the journal Science Magazine in 2011 demonstrated that black bears are true hibernators, defined by the ability to suppress metabolism to 25% of basal rates while regulating body temperature from 30° to 36°C, in multi-day cycles.



Hibernating animals are sleeping.

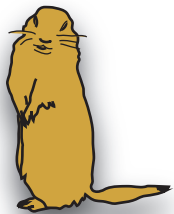
False – While hibernation is an extension of sleep, body temperature during hibernation in ground squirrels is so low that higher brain centers cannot express the slow wave activity pattern characteristic of slow wave sleep. Bears hibernate with a much higher body temperature that allows them to sleep, and bears may wake up briefly in response to disturbance.

Study of hibernation cannot apply to human health because humans do not hibernate.

False – Understanding how hibernation works in Arctic ground squirrels and bears gives clues to develop technology to improve human health. By example, UAF scientists and students discovered the switch in a ground squirrel's brain that allows the animal to enter hibernation by lowering their body's thermostat. This discovery is now being developed into a drug that will help lower body temperature after cardiac arrest and make this standard of care treatment available for rural and remote emergency medicine. The NIH invests nearly \$39.2 billion annually in medical research for the American people (<https://www.nih.gov/about-nih/what-we-do/budget>). NIH has recognized the biomedical value of hibernation by awarding an \$11.8 million grant to UAF to support the Transformative Research in Metabolism (TRiM) program whose mission is to translate discoveries made through the study of hibernation to improve human health.

After hibernating all winter bears and grounds squirrels emerge in a weakened, starved state.

False – Bears and ground squirrels come out of hibernation as strong as when they went into hibernation several months previously. Although they do not eat or drink during hibernation bears and ground squirrels lose fat, but retain lean muscle mass. The Center for Transformative Research in Metabolism (TRiM) seeks to discover how Arctic ground squirrels and bears maintain lean muscle mass and strength despite long-term fasting and inactivity. Scientists then plan to apply this new knowledge to develop evidence-based treatments to address human metabolic health disorders and improve prospects for healthy aging.



METABOLIC HEALTH

If we eat right, exercise and stay socially active we can decrease the risk of age-related disease.

True – But sometimes other factors can interfere with optimal preventative medicine. Bedrest, for example, can cause muscle weakness, symptoms of type 2 diabetes, and weight gain. As people age we lose muscle mass and strength. We also have trouble losing weight without losing muscle. The TRiM program seeks to develop new therapies discovered through the study of hibernation to optimize treatment strategies to promote healthy aging and fitness when bed rest or periods of inactivity cannot be avoided.

Metabolic syndrome, which is a cluster of conditions that occur together, increases your risk of heart disease, stroke, and type 2 diabetes.

True – Metabolic syndrome increases risk of death and decreased quality of life as people age. The cluster of conditions that define metabolic syndrome include increased blood pressure, high blood sugar, excess body fat around the waist, and abnormal cholesterol or triglyceride levels.

BIOTECHNOLOGY

Biotechnology is the broad area of biology involving the use of living systems and organisms to develop products or processes for specific use intended to improve the quality of human life. Such purposes may include agriculture, food science, and medicine.

True – Biotechnology is how value is added to discoveries made through university supported research.

Universities have programs to inspire faculty to identify and disclose intellectual property (IP) and to license these technologies to biotechnology companies.

True – UAF supports an Office of Intellectual Property and Commercialization (OIPC). Faculty, staff and students are encouraged to disclose IP that can be protected by filing provisional or full patent applications. A patent can be worth millions or even billions to a university (<https://www.bloomberg.com/graphics/2016-university-patents/>)

The path to monetize university IP begins when a biotech company licenses the patent and is realized when the company develops the technology and brings it to market or licenses it to a larger company who then brings it to market.

True – Monetizing university IP requires effective university-biotech company partnerships. Cereon Biotechnology LLC <http://www.cereonbiotech.com/>, Be Cool Pharmaceuticals <https://becoolpharma.com/>, and Barati Medical are biotechnology start-ups located in the Interior which are poised to license and develop pharmaceuticals and devices. Growth of biotechnology in Alaska is challenged by a lack of access to venture capital. The Alaska Permanent Fund has invested more than \$280 million into three upstart biotechs—Juno Therapeutics, Denali Therapeutics, and Codiak BioSciences. None of these companies are located in Alaska.



Senior biology major Colleen Bue assists Professor Kelly Drew with her research involving hibernating ground squirrels in Drew's lab.