

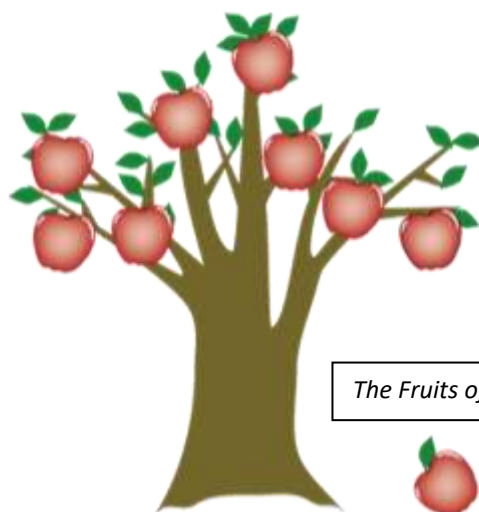
# CENTER FOR TRANSFORMATIVE RESEARCH IN METABOLISM

Annual Report, FY2021

GY02 Year in Review

National Institutes of Health, Institutional Development Award

NIGMS of the NIH Grant Award Number P20GM130443



*The Fruits of Hibernation*

**Dr. Kelly Drew, Principal Investigator**

**UAF Institute of Arctic Biology**

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UNIVERSITY of  
ALASKA ANCHORAGE.



TRiM's vision: *Transforming hibernation research to improve human health.*



As I reflect back on 2020, it is with mixed emotions. On the one hand, this year was filled with enormous challenges. The urgent and persistent risks posed by the COVID-19 pandemic to the health and safety of our communities in addition to the threat of financial exigency for the University of Alaska tested us in ways never before imagined. Yet, despite the fact that 2020 brought us many of our darkest days, it also delivered some of our brightest moments.

COVID-19 affected our day-to-day operations. The pandemic required us to remain physically distant from each other, but virtually connected through on-line meetings, with many working remotely. The pandemic resulted in closure of much of the University's campus and research facilities which resulted in temporary suspension of our research activities and core utilization.

Despite these challenges, we made substantial progress this year. The UAF administration formally recognized the Transformative Research in Metabolism (TRiM) as an established *Center*. This achievement has increased our reputation in the scientific community as leaders bringing together research activities related to hibernation, metabolism, and metabolic health that is inspired by the unique metabolic adaptations of hibernating arctic species. Our focus on transforming hibernation research into a translational platform in order to address metabolic health disorders and improve prospects for healthy aging is of significant importance to Alaska's fast-growing population of older adults as age increases the risk for metabolic disease.

In addition, we enhanced cooperation between investigators to form strategic teams across campuses that resulted in new directions for research and grant applications now pending. Research productivity also increased measurably in our second year as evidenced by a rise in both grant proposals submitted by TRiM investigators (83%) and manuscripts published (87%), in comparison to our first year's efforts. Looking forward to GY03, the Center is proud to announce three new pilot projects coming on line that will advance the research and career development goals of our faculty and Center.

There is much to be said about the strength and hope of the Center for TRiM as we enter our third year. Despite our challenges, we remain committed to pursuing our mission to transform hibernation research to improve human health. TRiM is the first and only biomedical research center in the U.S. to adopt a model of natural adaptations of hibernating mammals as an approach to treat metabolic diseases and related conditions. Please let us know if you would like to become involved with TRiM by contacting me ([kdrew@alaska.edu](mailto:kdrew@alaska.edu)) or Denise Daniello, our Program Coordinator ([dldaniello@alaska.edu](mailto:dldaniello@alaska.edu)). We thank you for your interest and support of the Center for TRiM!

Sincerely,

A handwritten signature in black ink that reads "Kelly Drew".

Kelly Drew, PhD

Director, Center for Transformative Research in Metabolism  
University of Alaska, Fairbanks / Institute of Arctic Biology

## Turning COVID Challenges into Opportunity for the Center for Transformative Research in Metabolism (TRiM)

The COVID-19 pandemic and its associated disruptions have had major impacts on our health care systems, economies, social relations, not to mention academic research, changing every facet of life as we knew it. TRiM's research activities were not spared as evidenced by several setbacks including the suspension of participant recruitment in Dr. Coker's clinical trial research (Project 3); a dramatic decline in use of the Molecular Imaging Facility, under the Health and Metabolism Research Core; transportation-related setbacks in microRNA sequencing and ribosomal profiling of arctic ground squirrel (AGS) muscle tissue conducted by Dr. Fedorov's lab (Project 1); and delayed completion of the newly renovated Arctic Ground Squirrel (AGS) Breeding Colony at the UAF Large Animal Research Station due to supply problems. Despite these challenges, TRiM is proud to report several significant accomplishments made this past year:

- Achieved formal recognition of the Transformative Research in Metabolism (TRiM) as an established *Center*, as approved by the UAF administration, has increased our outreach and professional activities that have resulted in requests for formal presentations, service as NIH reviewers, and invited contributions to programs such as the NASA Translational Research in Space Health-sponsored Biomedical Research and Space Health 2101 solicitation. This important designation as a Center not only satisfies our grant commitment to NIH as described in TRiM's P1C NIH application, but advances our long-term goal of increasing and contributing to the professional development of Alaskan-based biomedical research scientists, leverages strategic investments made by the University of Alaska to support transformative metabolism research, and enhances TRiM's reputation in the scientific community.
- Coordinated the virtual Hibernation Research International Symposium 2020 to increase opportunities for scientific collaboration in hibernation research with approximately 65 participants attending. Participants noted high satisfaction regarding the planning and quality of the information presented, according to the external evaluation report, as well as improved awareness of the potential for translation of hibernation research to treat metabolic disease and improve human health.
- Significantly increased research productivity in GY02 as noted by the number of publications, professional presentations, and proposal awards in comparison to GY01.
- Utilized resources of the Advanced Instrumentation of Microbiome Studies (AIMS) Core, led by Dr. Brandon Briggs, to support COVID-19 testing through state and community contracts to mass produce Viral Transport Media (VTM) used for testing samples at the State's Virology Lab (UAF), and conducted statewide surveillance testing of untreated community wastewater to detect evidence of COVID-19.

- Developed strict protocols for a COVID-Risk Mitigation Plan to prevent and reduce the risks of COVID exposure for clinical trial research involving vulnerable adults. This effort led by Dr. Robert Coker, PI for *Nutrient Strategies for Metabolic Health in Aging* (Project 3), involved collaborations with the Institute of Translational Health Sciences, University of Washington and a committee of study physicians with input from state and local policymakers and physicians that will increase oversight of the clinical trial, with the end result putting the Center ahead at other much larger medical research institutions.
- Received NIH approval for TRiM's three pilot project focused on sled dogs, bears, and the arctic ground squirrel model of peripheral arterial disease that will advance the research and career development goals of the UA Center for TRiM. The approved pilot projects will commence research activities in July 2021 (GY03).
- Completed the 5,000 sq. ft. renovation of the UAF Large Animal Research Station Arctic Ground Squirrel (AGS) Breeding Colony to reliably and sustainably produce pathogen-free arctic ground squirrels to meet the research needs of TRiM's scientists and collaborators as well as to mitigate the risk of over-harvesting free-ranging AGS animals.



TRiM's External Advisory Committee (EAC) members, Dr. Kelly Drew, and Dr. Carl Murphy met with Dr. John Blake, Director and Attending Veterinarian of the UAF Animal Resource Center and toured the newly renovated Arctic Ground Squirrel Breeding Colony during the EAC virtual meeting in Fairbanks (6.2.2021).

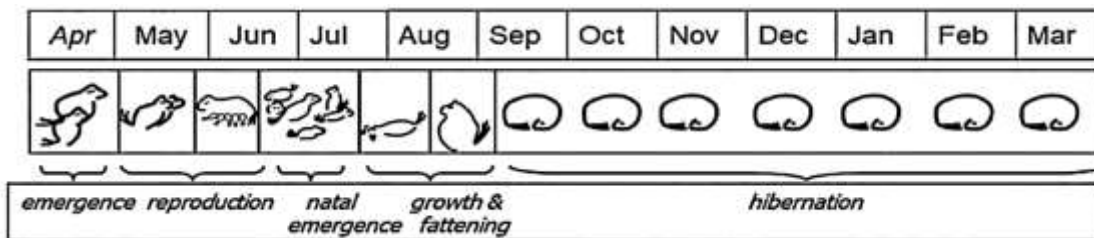
## Why study hibernation?



Photos courtesy of Dr. Oivind Toien,

Hibernation is a highly regulated, adaptive, and reversible state of metabolic flexibility and anabolic sensitivity exhibited by diverse mammalian species to withstand long periods of harsh

environmental conditions and insufficient food supply. The Arctic Ground Squirrel (*Urocitellus parryii*, AGS), used as a model for TRiM's hibernation research, is native to the Arctic and Subarctic regions of North America and Asia, and prevalent in the tundra habitat of the Brooks Range in Northern Alaska. During hibernation, the AGS reduce their metabolic rate to conserve energy by dramatically lowering their body temperature from 99° to 27° Fahrenheit, reducing their basal metabolic rate to 1-2%; dropping their respiratory rate from 1-2 breaths per minute from 90-100 breaths/minute, and decreasing their heart rate from 200-300 beats/minute to 5 to 6 beats/minute. The seasonal life cycle of the Arctic Ground Squirrel consists of 8 months of hibernation from September through March, followed by arousal in the spring, reproduction, birthing puppies, and fattening up for winter's hibernation as described in the graphic below.



Use of image courtesy of Drs. Cory Williams and Brian Barnes, UAF Institute of Arctic Biology.

Bears, being more like humans in size and cold tolerance, also hibernate during the winter and show remarkable metabolic changes related to hibernation. Normal body temperature for an active summer bear is a bit higher than humans, at about 38° C (or 100.4°F). Bears drop their body temperatures 5.5° C during hibernation to 33.5°C approximately (or about 92.3°F). Other metabolic changes include a 75% reduction in metabolic rate, slowing of heart rate from 55 beats/minute to 8-12 beats/minute, and diminished respiration from 6-10 breaths/minute down to 1-2 breaths per minute (Tøien et. al 2011).

Hibernation is the scientific focus for TRiM's research as this platform presents an opportunity to study metabolic extremes under natural conditions absent in traditional laboratory models that may unveil novel mechanisms for translation into improved therapies for metabolic and related diseases in humans.

## Who we are:



To accomplish our goals, TRiM utilizes the collaborative expertise and resources of faculty and staff located at the University of Alaska Fairbanks (lead institution) and the University of Alaska Anchorage (partner institution). We are working towards sharing technical capacity using a *team science approach* and building on the “shared resource model” to increase efficiencies through administrative coordination and scientific collaboration in order to pave the way for developing new COBREs at the UA, generating cost savings and intellectual synergy. TRiM’s vision, mission, and values guide the Center’s research mission and interpersonal relations emphasizing ethical conduct, respect for diversity, and empowerment.

### TRiM’s Vision, Mission, & Values

**Our Vision:** Translating hibernation research to improve human health.

**Our Mission:** To seek *fundamental knowledge* about the nature and behavior of hibernating mammals and the *translation* of that knowledge to enhance human health, lengthen life, and reduce illness and disability.

#### Our Values: “TRiM”

- **T for Team Science:** Multiple, diverse perspectives, and expertise empowers great and innovative science.
- **R for Respect:** Respecting each person for their unique perspective, expertise, and contribution to the overall effort.
- **I for Integrity:** Helping people to be the best at what they do best and keeping a high ethical standard.
- **M for Motivation:** Motivating oneself and others to do the job better than it has been done before in order to create a cycle of empowerment and accomplishment for both the scientific community and the Institute.

**What We Do:** *Translating Hibernation Research to Improve Human Health.* TRiM's Overall Specific Aims build infrastructure and support research by UA investigators until it is competitive and successfully funded.

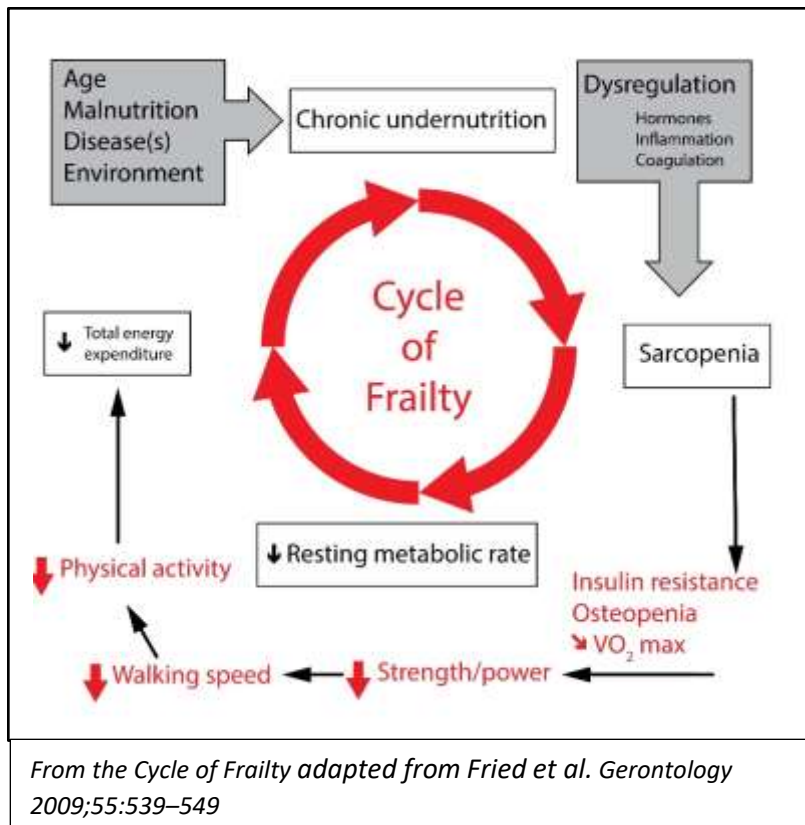
Building on a distinguished legacy of hibernation physiology at the University of Alaska Fairbanks, the Center for Transformative Research in Metabolism (TRiM) is an interdisciplinary biomedical research center at the University of Alaska. Funded through the National Institutes of Health (NIH), National Institutes of General Medical Sciences (NIGMS) using the Centers of Biomedical Research Excellence (COBRE) funding mechanism ([P20GM130443](#)), TRiM supports complementary pre-clinical and clinical research initiatives that connect hibernation discoveries to innovative treatments for metabolic diseases. Therapeutic advances designed to mitigate Type 2 diabetes, disuse muscle atrophy, sarcopenia, obesity, cardiovascular disease, and brain disorders associated with vascular dementia and Alzheimer's disease are of high priority. TRiM also supports the research and career development of both new and seasoned scientists in all stages of translational studies related to hibernation, metabolism, and microbiome research in Alaska. Our goal is to establish a self-sustaining Center of Biomedical Excellence that translates hibernation science platforms towards treatments that will reduce the incidence of chronic diseases throughout the lifespan and reduce the economic burden of health care in urban, rural and remote communities.

According to the NIH grant proposed by TRiM, the Center includes four overall objectives:

- SA 1: Establish an organizational structure and research infrastructure comprised of an *Administrative Core*, a *Microbiome Core (Advanced Investigations in Microbiome Studies or AIMS)*, and a *Health and Metabolism Core (HaMR)* to support and promote a multidisciplinary framework that defines mechanisms of metabolic adaptations in hibernating mammals in order to lower barriers for research productivity.
- SA2: *Enhance the careers* of experienced project leaders and new investigators leading pilot projects by using effective mentoring and collaboration plans involving established NIH-funded investigators that will allow new investigators to submit high quality, competitive proposals to NIH for their individual grants.
- SA3: Support research and pilot projects to develop an understanding of hibernation mechanisms – physiologic, genetic, and gut microbial – and define how these mechanisms may play a role in treating metabolic disease and muscle atrophy or sarcopenia.
- SA4: Support clinical research projects related to the theme of this Center.

## What we are doing... Translating hibernation research to improve human health, adding life to years.

Understanding frailty as a disease is key to developing therapeutics that focus on the aspects of anabolic sensitivity in aging and disuse. These mechanisms are present in the metabolic adaptations of arctic hibernators that are used to preserve muscle mass and strength. Through hibernation science and human clinical trials, we are working to uncover the post-transcriptional regulation of genes involved in skeletal muscle metabolism during hibernation of arctic ground squirrels and black bears in order to identify targets that can be developed into therapies and diagnostics for sustaining skeletal muscle mass and strength during prolonged disuse in humans and that can be tested through clinical trials.



Sarcopenia is defined as a loss of muscle mass and strength observed in humans who are physically inactive due to rehabilitation, immobilization, and bedrest. Sarcopenia may be linked to a decrease in anabolic sensitivity, reducing muscle protein synthesis, that may lead to frailty. Although not eating or moving for 8 months of the year, arctic hibernating mammals, like the arctic ground squirrel and black bear, utilize metabolic and signaling pathways to maintain their skeletal muscle and strength by increasing anabolic pathways during arousal and down regulating catabolic pathways during hibernation.

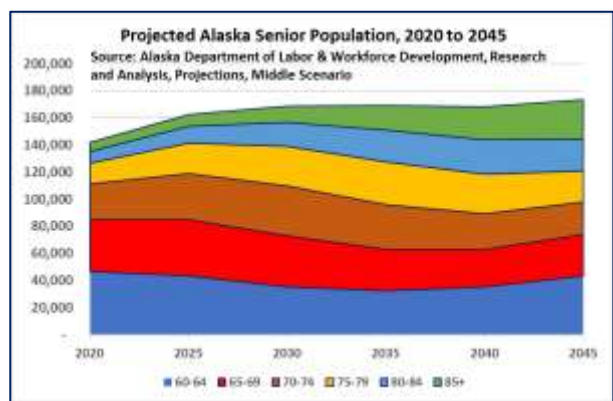
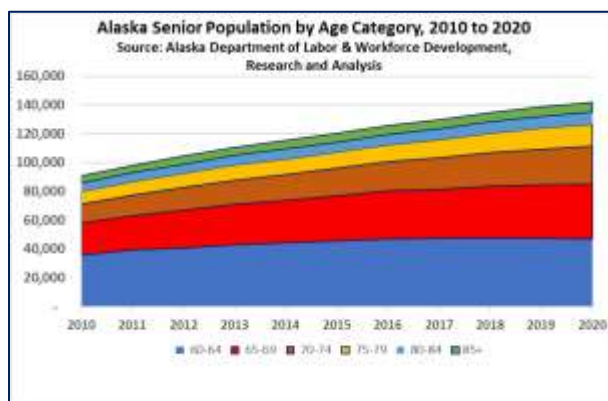
Hibernating mammals modify their metabolic pathways to provide essential nutrients and build up muscle and other tissues even during long periods of fasting and lack of exercise. In this way they completely avoid a cycle of malnutrition and inactivity that in humans would lead to frailty. TRiM's research is unraveling how hibernating mammals modify metabolism to obtain clues about how to mimic what they do in humans who are at risk for frailty and frailty related diseases and morbidity in order to potentially reverse this degenerative process and improve prospects for healthy aging.

## Hibernation Science Offers Clues to Understand Frailty and Age-Related Health Conditions

Alaska is the state with the fastest growing older adult population (age 65+) that increased 72% over the last decade (2020 Profile of Older Americans, Administration on Aging). This is the top growth rate in the U.S. and twice the national growth rate of 36% for the senior-age demographic. Older adults are the fastest growing age segment in Alaska that reached 142,099 in 2020, representing 19.5% of the state's total population. Continued growth in Alaska's older adult population is expected until 2030, when the population 80 and older will continue to grow over the next thirty years. (Alaska Dept of Labor and Workforce Development Population Estimates, 2020).

Many older adults live with chronic metabolic health conditions, as age increases their risk, that may lead to disability, disease, and premature death. Based on hibernation science and using Arctic mammal models, TRIM's scientists are working to identify the metabolic mechanisms underlying the physiological changes in mammalian hibernation to address unresolved health issues including:

- Sarcopenia
- Disuse muscle atrophy
- Type 2 diabetes
- Cachexia
- Obesity
- Anorexia
- Cerebral Ischemia and stroke
- Cardiac disease
- Fatty liver
- Fall Risk
- Vascular Dementia and Alzheimer's Disease



## Who We Are: Research Projects and Cores

*Meet our Researchers, Up Close and Personal*



*Director Kelly Drew,  
PhD, Center for TRiM*

**Dr. Kelly Drew**, UA Center TRiM Director and Principal Investigator (PI), is a biomedical scientist and UAF Professor for the Department of Chemistry and Biochemistry, Institute of Arctic Biology (IAB). She has published over 70 papers, with 40 papers related to metabolic adaptations in hibernation. Dr. Drew is an established NIH-funded investigator who is recognized for her excellence in mentoring new investigators, pos-docs, and students. She coordinates the PhD degree program in Biochemistry and Neuroscience at the University of Alaska Fairbanks. She is also founder of BeCool Pharmaceuticals, a small molecule drug development company focused on creating therapeutics for treatment of brain and spinal cord injury by mimicking mechanisms used in hibernation.

Dr. Drew is an alumnus of the University of Alaska Fairbanks receiving her Bachelor of Science degree in Psychology (1981). Dr. Drew earned her PhD in Pharmacology (1987) from Albany Medical College and completed post-doctoral work at the Pharmacology Karolinska Institute, Stockholm Sweden (1987-1990). Dr. Drew is a recipient of several teaching and mentoring awards and has the unique distinction of being the *second tenured woman faculty member* at the Institute of Arctic Biology. She is a self-described “scientist nerd” and “workaholic,” traits she learned from her father, Dr. James “Jim” Drew, former Director of the UAF Agriculture Experiment Station and first Dean of the School of Natural Resources and Agricultural Sciences, 1975-2000. Dr. Drew is known for her vivacious personality, quick wit, and helpful nature by her students, colleagues, and collaborators. She looks forward to translational approaches that use hibernation science as a platform to cool the body’s temperature and reduce inflammation in order to treat metabolic disease, improve outcomes for emergency transport of patients in critical care, as well as for hospital patients undergoing surgeries. Dr. Drew has her sights set high as she is currently exploring the possibilities for long-distance human space travel by inducing a state of torpor!

**Dr. Vadim Fedorov** is a Research Associate Professor with the UAF Institute of Arctic Biology (IAB) since 2002. Vadim’s research interests include functional genomics, population genetics, Arctic phylo-geography (which is the study of the historical processes that may be responsible for the past to present geographic distributions of genealogical lineages, especially those within and among closely related species), and is widely published having authored 78 journal articles and abstracts. Dr. Fedorov’s research focuses on the post-transcriptional regulation of genes involved in skeletal muscle metabolism during hibernation of AGS and black bears in order to identify targets for sustaining skeletal muscle mass and strength during prolonged disuse. This work has significant biomedical translation for people who are physically inactive due to



*PI Vadim Fedorov, PhD,  
Post transcriptional  
mechanisms of muscle  
atrophy prevention in  
hibernating mammals.*

prolonged periods of rehabilitation, immobilization, and bedrest. Dr. Fedorov seeks to identify those mechanisms through microRNA expression, ribosome profiling, transcripts translated to proteins, and other metabolic and signaling pathways that underlie the ability to reduce muscle loss during the inactivity of hibernation. Professor Esther Dupont-Versteegden, PhD, Dr. Fedorov's scientific advisor, is the Director of the Rehabilitation Sciences Doctor program at the University of Kentucky with research interests in skeletal muscle atrophy, aging, skeletal muscle plasticity, and muscle stem cells.



*PI Khrys Duddleston, PhD  
Microbial provision of essential amino acids: Protein conservation in hibernation*

**Dr. Khrys Duddleston**, Professor and Director of Biological Sciences at the University of Alaska Anchorage, is a microbial ecologist with experience studying microbial processes in soils, wetlands, and sediments, as well as gut microbial ecology and host-microbe interactions. Research in the Duddleston lab focuses on three areas of inquiry including gut microbial ecology, soil microbial ecology and diversity, and aquatic environmental microbiology. Her current work examines the gut microbial community of arctic ground squirrels with particular interest in the potential beneficial role of gut microbes in protein conservation during hibernation, and the complex interactions between gut microbiota and their host as they relate to health and disease. Dr. Loren Buck, with the Department of Biological Sciences at Northern Arizona University, is a long-time collaborator of Dr. Duddleston, who currently serves as scientific advisor on her COBRE

project. His research interests focus on organismal physiology, specifically adaptations of animals to extreme environments and their responses to changing environments.

Dr. Duddleston serves as Chair for TRiM's Internal Steering Committee and is a member of our Strategic Advisory Committee. Among her many accomplishments, Dr. Duddleston received the *UAA Faculty Senate Distinguished Service to the University Outside of the Senate Award* in 2015 for leading the complete revision of the UAA Bachelor of Science (BS) in Biological Sciences degree to align with *AAAS Vision and Change in Undergraduate Biology Education*.

Dr. Duddleston credits her undergraduate microbiology courses and undergraduate research experiences at Virginia Polytechnic Institute and State University for inspiring her love of all things microbial, and for her desire to pursue graduate education and a career in academia.

**Robert "Trey" Coker, PhD** is a Professor of Biology, Clinical Nutrition and Exercise Physiology with the Institute of Arctic Biology at the University of Alaska Fairbanks (UAF). His research initiatives have been directed at the mitigation of metabolic perturbations under clinical conditions such as obesity, sarcopenia, and alcohol use disorder. He has also conducted several clinical studies describing the maintenance of physiological resilience during extreme physical and environmental stress. Having published over 100 original research articles, reviews and abstracts in



*PI Robert Coker, PhD  
Nutritional strategies for metabolic health in aging*

conjunction with features in TIME, The Guardian, SHAPE and Popular Science magazines, Dr. Coker's work truly bridges the gaps in translational biomedicine.

Dr. Coker is the co-founder and co-owner of *Essential Blends, LLC*, a clinical nutrition company. Dr. Coker and his partners developed three specific nutritional formulas to address heart failure, muscle atrophy/sarcopenia, and substance abuse. Dr. Coker's company received the first Small Business Innovations in Research (SBIR) Phase I grant from the National Institutes of Health, with a subaward to UAF, as well as a Phase 2 Small Business Technology Transfer grant. His company filed 2 patent applications for their products. In 2020, the Alaska State Committee on Research inducted Dr. Coker into the Innovators Hall of Fame to recognize his research and business ventures. Dr. Coker is a Fellow of the American College of Sports Medicine and The Obesity Society.

Dr. Coker's service record is impressive! He is the Chair of the Steering Committee for the Northwest Participant Clinical Interactions Network affiliated with the University of Washington Institute of Translational Health Sciences (ITHS); supervising almost 1,000 clinical trials in the Pacific Northwest. He serves as Regional Director for two UW ITHS-led programs: "Translational Workforce Development" and the "Integrating Special Populations Core." He is a Regular Member of the NIH National Institute for Diabetes and Digestive and Kidney Diseases B study section. He is also the Chair of TRiM's Translational Advisory Committee and Director for the American Indian/Alaska Native Clinical and Translational Program Professional Development Core.

Dr. Robert Wolfe, Professor of Geriatrics at the University of Arkansas for Medical Sciences and Director of the Center for Translational Research in Aging and Longevity at the Reynolds Institute on Aging, serves as scientific advisor for Dr. Coker with research interests in the regulation of muscle metabolism that is particularly affected by aging and conditions such as injury, sepsis, and cancer.

Dr. Coker's research contributes to the translational significance of TRiM's research by testing the efficacy of an evidence-based essential amino acid nutritional formulations on the preservation of skeletal muscle and physical function during weight loss and weight management in older, obese adults. During the COVID-19 pandemic, he worked closely with several physician scientists at UW to develop protocols and offer protection for his staff and research participants. Most if not all of these strategies were adopted and implemented by all individuals working in pre-clinical and clinical research environments at UAF.



Denise Daniello, M.A.  
Program Coordinator  
UAF

**Denise Daniello** serves an important outreach role to develop relationships between the Center and local/state-wide stakeholders. Ms. Daniello holds a M.A. degree in Anthropology from the UAF with a specialty in cultural studies and is the former Executive Director for the Alaska Commission on Aging, a state agency in the Alaska Department of Health and Social Services with the mission to improve the quality of life for Alaska's older people. Denise served in this State leadership

role for 13 years and coordinated advocacy efforts with senior providers, seniors, and family caregivers in support of legislation and budget items for older Alaskans targeting state and federal policymakers. Denise remains connected to a broad network of stakeholders and policymakers. As Program Coordinator for TRiM, she continues her advocacy work for seniors by serving as a member of AgeNet, the statewide senior service provider association, and as a board member for both the Fairbanks North Star Borough Senior Advisory Commission and the Alzheimer’s Resource of Alaska, a statewide nonprofit agency providing support and services for people with Alzheimer’s disease and related dementias. During legislative session, Denise joined with AgeNet members to advocate for senior programs and educated legislators about the research being conducted by the Center for TRiM. Using her professional network, Denise assists Director Drew to build support for TRiM, particularly its translational benefits for older adults, and make our research responsive to stakeholders’ needs.

## TRiM’s Cores and Key Personnel

**Admin Core:** Our role is to provide leadership, vision, and effort needed to guide and support development of TRiM’s Junior investigators into competitive senior biomedical scientists and to build UA’s infrastructure capacity in translational metabolic health research grounded in the study of hibernation. The Admin Core provides overall support for the administrative, fiscal, and scientific aspects of the Center and to build and sustain a multi-disciplinary program at UAF/UAA.



*Kelly Drew, PhD  
Center Director, UAF*



*Denise Daniello, M.A.  
Program Coordinator  
UAF*



*Dawniel Dupee  
Fiscal Technician/  
Admin Assistant,  
UAF*



*Hoshi Sugiura, B.S.  
Licensed Veterinary  
Technician, UAF*



*Pat Rivera  
Research Technician,  
UAF*

**Health and Research Metabolism (HaMR) Core (UAF):** The HaMR Core supports the Molecular Imaging Facility (MIF) to provide technical assistance, expert consultation, and state-of-the-art instrumentation for in-vivo and in-vitro basic, translational and clinical research. The Core supports the Center’s investigators in the collection and processing of metabolic and physiological data using animal instrumentation. The Core includes the MIF that houses a research-dedicated Toshiba 1.5 Tesla MRI, two NMRs (300 and 600MHz), and a Dual-energy X-ray Absorptiometry (DXA) instrument. This facility is identified as a clinical research center site within the Northwest Participant and Clinical Interactions Network (NW PCI). The HaMR Core provides animal instrumentation services including technical support and expertise in methodologies for monitoring metabolism via open-flow respirometry and biotelemetry, in hibernating species and laboratory rodents.



*Dr. Carl Murphy, Core Leader  
and MIF Manager, UAF*



*Dr. Oivind Toien,  
Animal Instrumentation  
Manager, UAF*

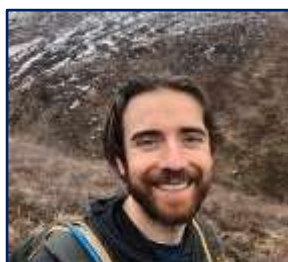


*Dr. Scott Jerome,  
Research Navigator, UAF*

**Advanced Instrumentation in Microbiome Studies (AIMS) Core (UAA):** The AIMS Core provides the expertise, equipment, and software required for organismal, molecular, and bioinformatic analysis used to characterize microbial communities and isolates. In whole, the Core offers a comprehensive pipeline for characterization of microbial communities and isolates to inform testable hypotheses explaining the host-microbiome symbiosis. Services include advice on experimental design and sample collection to data analysis and bioinformatics. The AIMS Core supports a unique combination of modules that researchers can plug into at any point along the pipeline or access the full pipeline to characterize either isolates or microbial communities. Key equipment maintained by the Core includes aa chemostat and microbial bioreactor that allows users to set up experimental conditions similar to host guts and perturb the system to identify key microbial processes. An Illumina MiSeq and Nanopore MinION provide the sequencing power to analyze the molecular underpinnings. In collaboration with the INBRE Bioinformatics Core, the Microbiome Core provides expertise on bioinformatic algorithms needed for microbiome research.

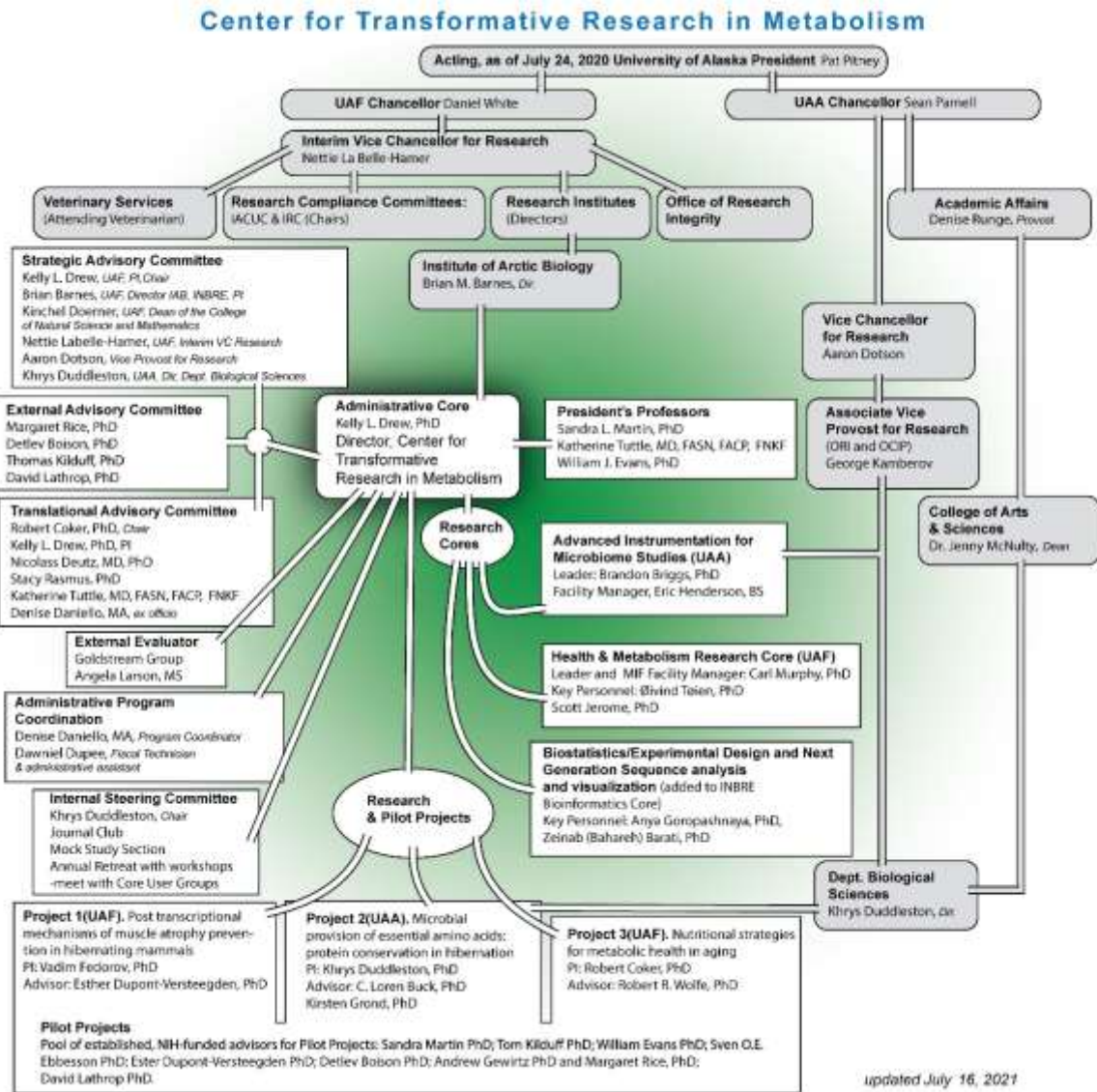


*Dr. Brandon Briggs,  
Core Leader, UAA*



*Eric Henderson, BS  
Lab Manager, UAA*

# Organizational Chart (as of 7.1.2021)



updated July 16, 2021

## Committees of the Center for Transformative Research in Metabolism

TRiM's Committees, including the External Advisory Committee, President's Professors Program, Translational Advisory Committee, and the Strategic Advisory Committee, are designed to provide scientific guidance and broaden professional networks to enhance opportunities with NIH-funded investigators. The Internal Steering Committee, with support from the Strategic Advisory Committee and the External Advisory Committee, set direction for program research, adjust Core services to meet investigator needs, and promote the sustainability of the Center for TRiM based on feedback, input, and their perspectives.

## External Advisory Committee (EAC)

The EAC, the scientific advisory board for the Center, reviews program process, critiques scientific progress of the Center, advises the Center's Director on scientific and policy matters, and works with the Director to facilitate development of a sustainable, collaborative interdisciplinary research environment to support competitive R01 proposals and research programs. Members meet at least twice per year, once for a 2-day, in-person or hybrid meeting in Alaska and once by video-conference, due to the cost and time commitment for travel to Alaska. The EAC prepares a final report during its in-person meeting that is submitted to NIH and shared with TRiM's committees and staff. In addition, the EAC makes funding recommendations for the Center's pilot projects. EAC members include Drs. Tom Kilduff, EAC Chair, Margaret Rice, Detlev Boison, and David Lathrop.



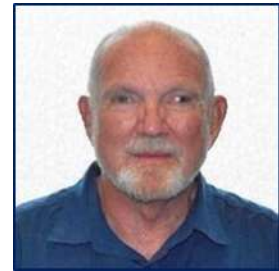
**Tom Kilduff, PhD**, Chair of TRiM's EAC, is the Director of the Center for Neuroscience at SRI International (formerly known as the Stanford Research Institute). Dr. Kilduff is an internationally-known neuroscientist for his research on sleep/wake regulation, sleep disorders, and the biological clock. Government agencies, private foundations, and pharmaceutical companies have supported his research. He has been Principal Investigator on NIH grants from the National Institute of Aging (NIA), National Heart Lung Blood Institute (NHLBI), National Institute of Mental Health (NIMH) and National Institute of Neurological Diseases and Stroke (NINDS). Dr. Kilduff has authored/co-authored more than 200 published abstracts, scientific articles, book chapters and has mentored over 20 postdoctoral fellows during his professional career.

**Margaret Rice, PhD** is Professor and Vice Chair for Research in the Department of Neurosurgery and Professor at the Department of Neuroscience and Physiology at the NYU Grossman School of Medicine. Dr. Rice's NIH-funded laboratory studies factors that regulate the release of dopamine, which is a key transmitter in motor and reward pathways of the brain. Dr. Rice is an investigator in the NYU Neuroscience Institute, a member of the Marlene and Paolo Fresco Institute for Parkinson's and Movement Disorders at NYU Langone, and serves on the Scientific Advisory Board of the Parkinson's Foundation.



**Detlev Boison, PhD** is Professor and Vice Chair of Research and Training at the Department of Neurosurgery, Robert Wood Johnson Medical School and New Jersey Medical School, at Rutgers, The State University of New Jersey. He has a passion for translational research and seeks to translate fundamental mechanisms of biochemistry and energy metabolism into novel therapeutic approaches for the treatment of neurological conditions. Dr. Boison has maintained a rigorous research program on translational adenosine research and has been continuously NIH-funded since 2008. Dr. Boison has published 160 papers with an h-index of 53 and has delivered over 130 invited lectures.

**David Lathrop, PhD** is the former Chief of the Heart Failure and Arrhythmias Branch in the Division of Cardiovascular Sciences at the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health. At NIH, he conducted and managed an integrated basic and clinical research program to study normal cardiac function and pathogenesis to improve diagnosis, treatment, and prevention of heart failure and arrhythmias. Dr. Lathrop promoted opportunities to translate promising scientific and technological advances from discovery through preclinical studies to multisite and network clinical trials. During his professional career, Dr. Lathrop has been Principal Investigator on several research grants from the NIH/NHLBI, the National American Heart Association, the Norwegian National Heart Association, among others, and has authored/coauthored more than 100 publications.



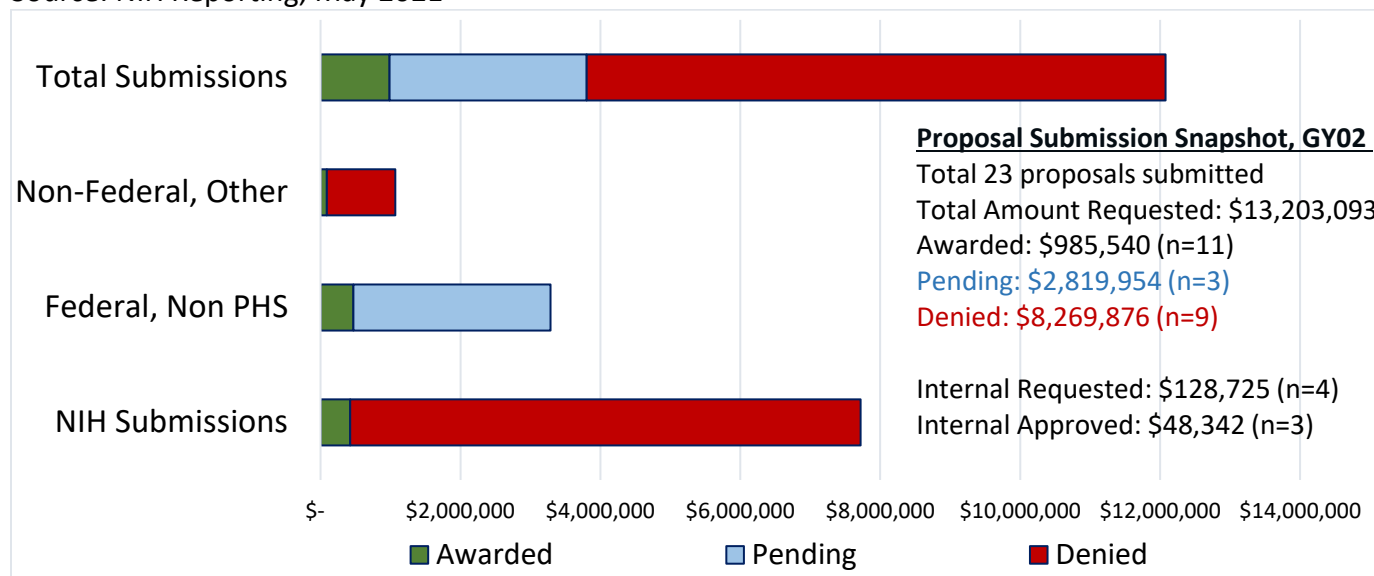
**EAC Meeting at the UAF campus, June 1-2, 2021:** TRiM held a hybrid EAC meeting on June 1-2, 2021 at the Murie building on the UAF campus for EAC members to meet in-person and virtually with Dr. Drew, the Center’s Director, TRiM’s key personnel, and UA administrators. This meeting, providing the first opportunity for EAC members to visit the research facilities at the UAF campus and to remotely view UAA’s research facilities, included presentations from TRiM’s research projects, pilot projects, and core facilities; a Focus Group discussion with TRiM’s research project principal investigators, their mentors, and core leaders, as well as tours of TRiM’s core facilities and the newly renovated Arctic Ground Squirrel Breeding Facility located at the UAF Large Animal Research Station (LARS). TRiM thanks Dr. Oivind Toien, UAF IAB Center for TRiM, for use of the images below.



# How well are we doing?

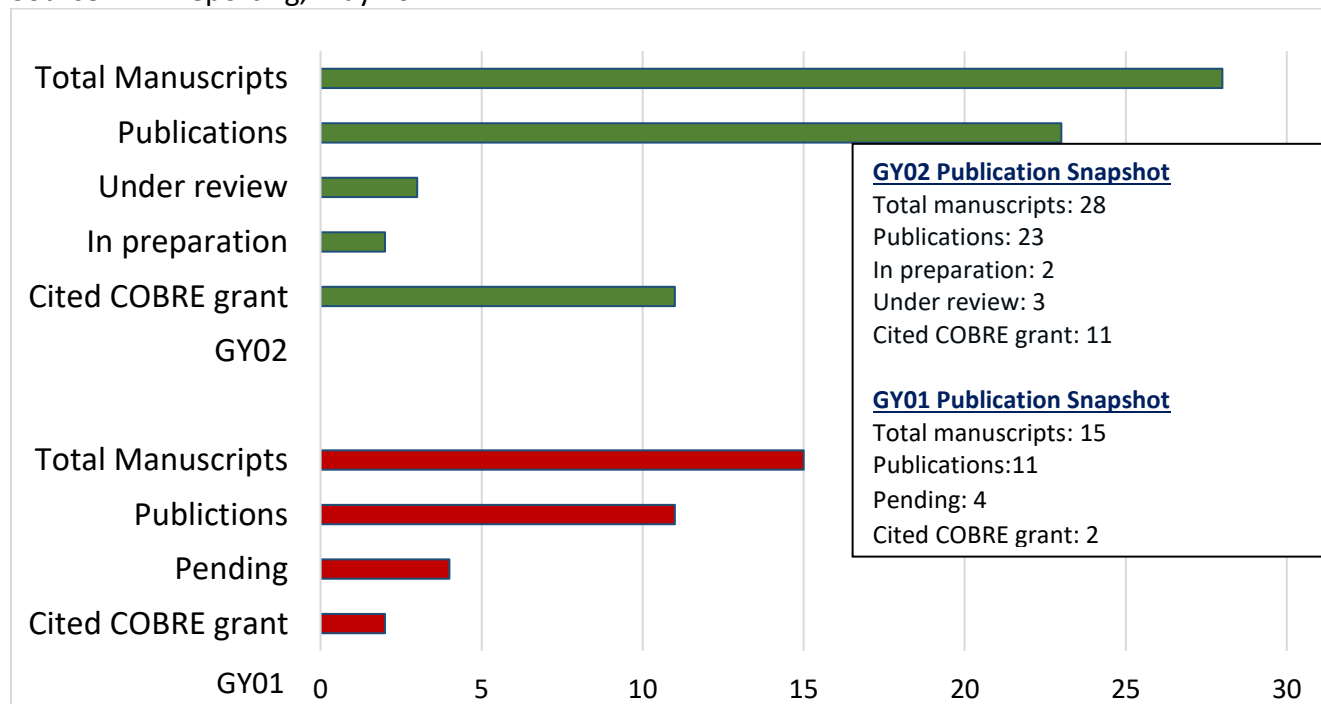
## TRiM Proposal Submissions by Funding Source and Status, GY02

Source: NIH Reporting, May 2021



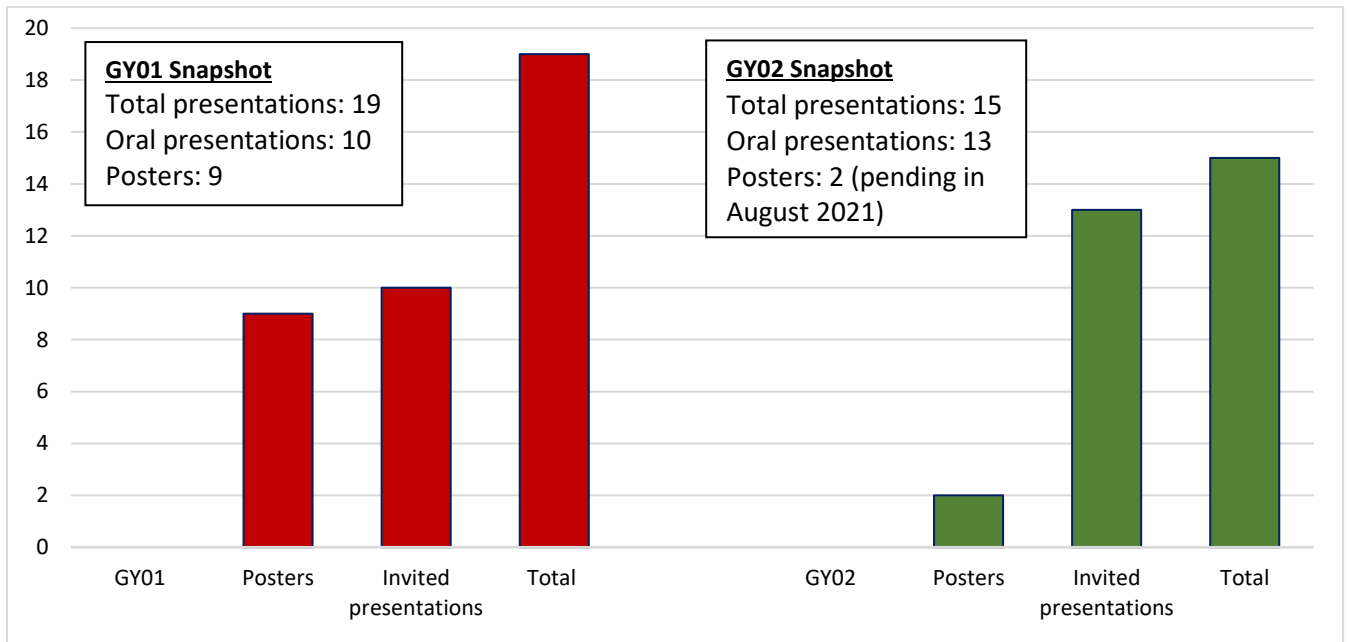
## TRiM Investigator Publications: A Comparison of GY01 and GY02

Source: NIH Reporting, May 2021



## Professional Presentations by TRiM Personnel, Comparing GY01 and GY02

Source: NIH Reporting, May 2021



Squirrel trapping in Alaska's Brooks Range



PHOTO BY: DR. JULITA SADOWSKA

# How We Are Doing It?

## Business Model

### Expenses

- *Retain and nurture* competitive investigators and Core resources
- Health and Metabolism Research (HaMR) Core
  - Clinical research capacity – Human
  - Clinical research capacity – companion and working animals (dogs)
- Advanced Instrumentation in Microbiome Sciences (AIMS) Core
  - Comprehensive service including organismal analysis, molecular analysis and bioinformatics

### Revenue

- Institutional Support
- Current COBRE award
- Competitive COBRE renewal in 2024
- Increase NIH R-series grants and equivalent funding
- Run cores as recharge centers. Expand core user base to offset UA support
- Develop discovery platforms for corporate partnering opportunities

## Revenues and Expenses: Overall Center for TRiM Program

COBRE TRIM	Category	FY20	FY21	FY22	FY23	FY24
<b>Revenue</b>						
	COBRE Grant Direct Cost	\$ 1,689,639	\$ 1,509,786	\$ 1,493,335	\$ 1,620,274	\$ 1,621,542
	COBRE Carryover		\$ 120,904			
	Institutional Support	\$ 462,560	\$ 409,051	\$ 412,872	\$ 416,730	\$ 420,628
<b>Total Revenue</b>		<b>\$ 2,152,199</b>	<b>\$ 2,039,741</b>	<b>\$ 1,906,207</b>	<b>\$ 2,037,004</b>	<b>\$ 2,042,170</b>
<b>Expenses</b>						
	Salaries & Benefits	\$ 1,060,364	\$ 1,361,623	\$ 1,259,960	\$ 1,039,755	\$ 1,043,519
	Travel	\$ 18,430	\$ 5,050	\$ 74,064	\$ 57,338	\$ 57,389
	Contractual Services	\$ 343,423	\$ 375,595	\$ 307,333	\$ 583,133	\$ 585,871
	Commodities	\$ 221,743	\$ 162,829	\$ 264,850	\$ 339,156	\$ 337,769
	Equipment	\$ 348,251	\$ 98,295	\$ -	\$ -	\$ -
	Tuition	\$ -	\$ -	\$ -	\$ 17,622	\$ 17,622
<b>Total Expenses</b>		<b>\$ 1,992,210</b>	<b>\$ 2,003,392</b>	<b>\$ 1,906,207</b>	<b>\$ 2,037,004</b>	<b>\$ 2,042,170</b>
<b>NET GAIN (LOSS)</b>		<b>\$ 159,989</b>	<b>\$ 36,349</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>

*Note: The gains reported in FY20 and FY21 include unused funds for travel, transportation, and research resulting from restrictions due to the Covid-19 pandemic. These funds were requested from the NIH as carryforward.*

## **Appendix A: Center for Transformative Research in Metabolism Products in GY02, May 2020 – June 2021**

*With the exception of three proposals (noted by \*), all applications submitted were based on research funded by the Center's COBRE award.*

### **Grants awarded, GY02. TRiM-supported investigators in bold.**

**Briggs, Brandon.** *ANT LIA: Collaborative Research: Genetic Underpinnings of Microbial Interactions in Chemically Stratified Antarctic Lakes*, National Science Foundation, \$437,657 awarded, (submitted 6.01.2019).

**Briggs, Brandon.** *FY21 COVID-Test Kit Assembly*, Alaska Division of Public Health, \$91,668 awarded (submitted 7.21.2020).

**Briggs, Brandon.** *Measurement of COVID-19 RNA in Wastewater, City of Kodiak*, City of Kodiak, AK, \$7,480 awarded (submitted 11.05.2020).

**Briggs, Brandon.** *Measurement of COVID-19 RNA in Wastewater, City of Galena*, City of Galena, AK, \$6,411 awarded (submitted 12.01.2020).

**Briggs, Brandon.** *Measurement of COVID-19 RNA in Wastewater, City of Sitka*, City and Borough of Sitka, AK, \$26,716 awarded (submitted 9.1.2020).

**Briggs, Brandon.** *Measurement of COVID-19 RNA in Wastewater, City of Hoonah*, City of Hoonah AK, \$19,769 awarded (submitted 9.1.2020).

**Coker, Robert.** *Year 5 ITHS/NW PCI Network*, NIH National Center for Advancing Translational Sciences, \$14,948 awarded (submitted 8.20.2020).

**Coker, Robert.** *Institute of Translational Health Sciences/NW PCI Network*, NIH National Center for Advancing Translational Sciences (U01), \$229,840 awarded (submitted 12.14.2020).\*

**Drew, Kelly.** *Upgrades for the Center for Transformative Research in Metabolism (TRiM) Health and Metabolism Research (HaMR) Core instrumentation at UAF*. INBRE Exceptional Support Request, \$7,800 awarded (submitted 1.25.2020).

**Drew, Kelly.** *Upgrades in equipment and supplies for the bioinstrumentation area in the HaMR Core*, NIH INBRE Exceptional Support Request, \$10,450 awarded (submitted 10.16.2020).

**Drew, Kelly** and Bernard Laughlin. *Space Emergency Medicine: Drug Development at an Inflection Point*, NASA ESPSCOR, \$30,092 awarded (submitted 1.1.2021).

**Dunlap, Kriya.** *Vitamin D and Healthy Aging: Establishing the Sled Dog Sentinel for the Circumpolar North*, NIH, Center for TRiM Pilot Project, \$49,998 awarded (submitted 1.11.2021).

**Fedorov, Vadim.** *Proteomic changes in muscle of hibernating bears in relation to disuse muscle atrophy prevention*, NIH IDeA National Resource for Quantitative Proteomics, \$2,000 (submitted 10.26.2020).

**Goropashnaya, Anya.** *Molecular mechanisms underlying skeletal muscle temporal dynamics in a hibernating mammal as a pathway to peripheral artery disease intervention*, NIH, Center for TRiM Pilot Project, \$40,000 awarded (submitted 1.11.2021).

**Toien, Oivind.** *Role of Sleep and Cardiac Rhythms in a Large Hibernator*, NIH, Center for TRiM Pilot Project, \$71,087 awarded (submitted 1.11.2021).

### **Proposals - Pending or Denied. TRiM-supported investigators in bold.**

**Briggs, Brandon**, Patrick Tomco, and Don Spalinger. *Collaborative Research: MIM: Deciphering the mechanisms governing functional diversity and metabolic exchange in the microbiome of a variable substrate environment: Moose rumen*, National Science Foundation, \$3,000,000, (request pending) (submitted 2.23.2021).

**Briggs, Brandon**, Kelley Ireland, and Mary Beth Leigh. *Effect of Crude-oil exposure on three-spine stickleback fish health and role of host- microbiome interactions*, Oil Spill Recovery Institute, \$119,903 (request declined) (submitted 1.22.2021).

Sheets, Brent, Tatgata Ghosh, and **Brandon Briggs**. *Bringing Alaska's CORE-CM potential into perspective*, U.S. Department of Energy, \$1,500,000 (request declined) (submitted 12.21.2020). \*

**Coker, Robert.** *Nutrient Specific Strategies for Health and Longevity*, NIH R01, \$2,455,141 (request declined) (submitted 8.10.2020).

**Coker, Robert**, Abel Bult-Ito, Valerie Gifford, and Andrej Podlusk. *G-Rise at the University of Alaska Fairbanks*, NIH T32, \$1,147,435 (request declined) (submitted 8.01.2020).\*

**Coker, Robert.** *Sustaining Research Excellence – Offsetting the COVID-19 Pandemic*, NIH SRE INBRE, \$80,383 (request declined) (submitted 1.14.2021).

**Coker, Robert.** *Transformative Delivery of Clinical Nutrition to Market in Alaska and Beyond*, M.J. Murdock Charitable Trust, \$60,000 (request declined) (submitted 6.01.2020).

**Coker, Robert.** *Standardized Monitoring of Wildfire Smoke Impact on Human Health using Nasal Cells*, RFA Health Effects of Air Pollution, \$795,000 (request declined) (submitted 8.20.2020).

Buck, Loren C., Matthew Regan, Greg Caporaso, Courtney Kurtz, **Khrystyne Duddleston**, and **Kelly Drew**. *Harnessing the hibernator gut microbiota: an innovative and feasible approach to reduce risk and improve health outcomes during and following synthetic torpor*, NASA TRISH-BRASH, \$996,334 (request pending) (submitted 3.30.2021).

**Drew, Kelly, Vadim Fedorov, and Robert Coker.** *Sex-specific Strategies for Health and Longevity*, NIH Administrative Supplement, \$299,967 (request declined) (submitted 6.01.2020).

**Drew, Kelly and Cory Williams.** *NIH National Institute on Aging Supplement – “Mammalian Hibernation Research- A Path Towards a Center for Transformative Research in Metabolism*, \$380,952 (request denied).

**Duddleston, Khrystyne,** Loren Buck, Greg Caporaso, and Emily Cope. *Toward microbial intervention for lean mass loss: The role of the gut microbiome in essential amino acid synthesis*, NIH R01, \$2,931,105 (request denied), (submitted 7.05.2020).

**Williams, Cory.** *Collaborative Research: Trophic and Temporal Niche Partitioning in an Arctic Raptor Guild*, National Science Foundation, \$823,620 (request denied), (submitted 1.15.2021).\*

## **Appendix B: Manuscripts Published (since April 2020), GY02 – All manuscripts listed below cite TRiM’s COBRE grant. TRiM-supported investigators in bold.**

**Coker, Melynda S.,** Kaylee Ladd, J Kim, **Carl J. Murphy, Robert Coker,** et al. *Alaska backcountry expeditionary hunting promotes rapid improvements in metabolic biomarkers in healthy males and females.* *Physiological Reports*, volume 9, (no issue identified), p e14682, (12.28.2020), <https://doi.org/10.14814/phy2.14682>.

**Fedorov, Vadim, Anya Goropashnaya, Oivind Toien, Brian Barnes,** et al. *Transcriptional Changes and Preservation of Bone Mass in Hibernating Black Bear.* *Scientific Reports*, volume 2021, issue 11, p 8281 (4.14.2021) <https://www.nature.com/articles/s41598-021-87785-9>.

**Frare, Carla, Cory T. Williams, Kelly L. Drew.** *The Role of the Thyroid Hormones System.* *Molecular and Cellular Endocrinology*, volume 19, issue 2021, p 11105 (1.1.2021) DOI: <https://doi.org/10.1016/j.mce.2020.111054>.

**Goropashnaya, Anya, Brian M. Barnes, and Vadim B. Fedorov.** *Transcriptional Changes in Muscle of Hibernating Arctic Ground Squirrels (Urocitellus parryii): Implications for Attenuation of Disuse Muscle Atrophy.* *Scientific Reports*, volume 10, issue 1, p 9010 (6.02.2020) DOI: 10.1038/s41598-020-66030-9; PMID: PMC7265340.

Morrison, Michael L., Akiko Iwata, Merry L. Wick, **Carla Frare, Sarah A. Rice, Kelly L. Drew,** et al. *Iodine Redistribution During Trauma, Sepsis, and Hibernation: An Evolutionarily Conserved Response to Severe Stress.* *Critical Care Explorations*, volume 2, issue 10, p 215 (9.3.2020) DOI: 10.1097/CCE.0000000000000215. PMID: PMC7531756.

**Rice, Sarah A., M. Mikes,** D. Dibus, A. D’Alessandro, **Kelly Drew,** et al. *Omega 3 Fatty Acids Stimulate Thermogenesis During Torpor in the Arctic Ground Squirrel.* *Scientific Reports* (1.14.2021) DOI: 10.1038/s41598-020-78763-8 PMID: PMC7809411.

Rice, Sarah A., Carla Frare, Zeinab Barati, Robert Coker, Nicolaas E.P. Deutz, Kelly Drew, et al. *Nitrogen recycling buffers against ammonia toxicity from skeletal muscle breakdown in hibernating arctic ground squirrels*. *Nature Metabolism*, volume 2, pp 1459-1471 (12.07.2020) <https://www.nature.com/articles/s42255-020-00312-4>.

Sarah A. Rice, Gabriella A. M. Ten Have, Julie A. Reisz, Sarah Gehrke, Davide Stefanoni, Carla Frare, Zeinab Barati, Robert H. Coker, Angelo D'Alessandro, Nicolaas E. P. Deutz, Kelly L. Drew. *Metabolic tracing in vivo shows nitrogen recycling and myofibrillar breakdown in hibernation*. *Nature Metabolism*, (12.07.2020) <https://doi.org/10.1038/s42255-020-00312-4>.

### Manuscripts Published (since April 2020) which do not cite the TRiM's COBRE grant. TRiM-supported investigators in bold.

Chmura, Helen E., Victor Y. Zhang, Sara M. Wilbur, Brian M. Barnes, C. Loren Buck, Cory T. Williams. *Plasticity and repeatability of activity patterns in free-living Arctic ground squirrels*. *Animal Behaviour*, volume 169, issue 2020, pp 81-91 (11.01.2020) DOI: <https://doi.org/10.1016/j.anbehav.2020.09.007>.

Gagne, Kristin, Sara C. Ewers, Carl J. Murphy, Ronald Daanen, et al. *Composition and photo-reactivity of organic matter from permafrost soils and surface waters in interior Alaska*. *Environmental Science: Processes & Impacts*, volume 22, issue 7, p 1525 (6.22.2020) <https://doi.org/10.1039/DOEM00097C>. PMID: 32567618.

Glass, Thomas, Greg A. Breed, Martin D. Robards, Cory T. Williams, Knut Kielland. *Accounting for unknown behaviors of free-living animals in accelerometer-based classification models: Demonstration on a wide-ranging mesopredator*. *Ecological Informatics*, volume 60, issue 2020 (11.02.2020) <https://doi.org/10.1016/j.ecoinf.2020.101152>.

Johnson, Devin, Michael T. Henderson, David L. Anderson, Travis L. Booms, Cory T. Williams. *Bayesian stable isotope mixing models effectively characterize the diet of an Arctic raptor*. *Journal of Animal Ecology*, volume 89, issue 12, pp 2972-2985 (10.06.2020) <https://doi.org/10.1111/1365-2656.13361>. PMID: 33020919.

Rouse, Natalie M., Katrina L. Counihan, Caroline, E.C. Goertz, Khrystyne N. Duddleston. *Competency of common northern sea otter (*Enhydra lutris kenyoni*) prey items to harbor *Streptococcus lutetiensis* and *Streptococcus phocae**. *Diseases of Aquatic Organisms*, volume 143, p 69 (2.11.2021) DOI 10.3354/dao03562, PMID: 33570041.

Subhabrata Dev, Ankur Sachan, Fahimeh Dehghani, Tathagata Ghosha, Brandon R. Briggs, Srijan Aggarwalad. *Mechanisms of biological recovery of rare-earth elements from industrial and electronic wastes: A review*. *Chemical Engineering Journal*, volume 397, 124596 (10.01.2020) DOI: <https://doi.org/10.1016/j.cej.2020.124596>.

Williams, Cory T., Thomas W. Glass, Greg A. Breed, Go Iwahana, et al. *Permafrost ice caves: an unrecognized microhabitat for Arctic wildlife*. Ecology Society of America, volume 102, issue 5 (12.22.2020) DOI: <https://doi.org/10.1002/ecy.3276>. PMID: 33351185.

Zhang, Victor Y., **Cory T. Williams**, Rupert Palme, C. Loren Buck. *Glucocorticoids and activity in free-living arctic ground squirrels: Interrelationships between weather, body condition, and reproduction*. Hormones and Behavior, volume 125, issue 2020 p. 104818 (9.1.2020) DOI: <https://doi.org/10.1016/j.yhbeh.2020.104818> PMID 32698015.

## Manuscripts Pending (under review), GY02

**Coker, Melynda S**, Kaylee Ladd, Scott E. Schutzler, **Carl J. Murphy**, Robert R. Wolfe, **Robert Coker**, et al. *Once/day provision of essential amino acid meal enriched meal replacement improves body composition and physical function in the obese elderly*. Nutrients, in review.

Sonsalla, Michelle, Santidra Love, Lauren Summers, Hannah Follett, **Khrystyne Duddleston**, et al. *Development of metabolic inflammation during pre-hibernation fattening in thirteen-lined ground squirrels (*Ictidomys tridecemlineatus*)*. Journal of Comparative Physiology, in review.

Rouse, Natalie M., Katrina L. Counihan, Deborah Boege-Tobin, Caroline E.C. Goertz, and **Khrystyne N. Duddleston**. *Habitat associations between *Streptococcus lutetiensis* and *Streptococcus phocae* in the marine environment*. Marine Ecology, in review.

## Appendix C: Conference/Meeting Poster Presentations (GY02), TRiM-supported investigators in bold.

**Barati, Bahareh, Kelly Drew, Melissa Hoshi Sugiura, and Oivind Toien**. *Cerebral and peripheral blood flow changes during arousal in the Arctic ground squirrel*. International Hibernation Symposium, The Netherlands, 8.1.2021 (abstract submitted).

**Daniello, Denise, Robert Coker, Vadim Fedorov, Khrys Duddleston, Kirsten Grond, Kelly Drew**. *Translating Hibernation Research to Promote Healthy Aging Across the Life Span*. International Hibernation Symposium, The Netherlands, 8.1.2021 (abstract submitted).

**Kelly L. Drew**, Zachary A. Carlson, Carla Frare, Sarah A. Rice Julie A. Reisz, Angelo D'Alessandro *An adenosine model of hibernation*. International Hibernation Symposium, The Netherlands, 8.1.2021 (abstract submitted).

## Presentations: Invited Talks and/or Presentations

**Barati, Bahareh**. *Using a multimodal near-infrared spectroscopy and MRI to quantify gray matter metabolic rate for oxygen: A hypothermia validation study*. Metabolomics Journal Club, UAF virtual presentation, 9.11.2020.

**Coker, Robert**, L.R. Ladd, Kaylee Ladd, **Melynda S. Coker, Bahareh Barati**. *Muscle Mass: Evaluation of Analytical Methods*. American Physiological Society: Integrative Physiology of Exercise conference, virtual presentation, 11.10.2020.

**Coker, Robert** and Brandon Kowalski. *Modulation of Muscle Gene Expression and miRNA in Healthy Individuals during Alaska Backcountry Expeditionary Hunting*. American Physiological Society: Integrative Physiology of Exercise conference, virtual presentation, 11.10.2020.

**Coker, Melynda S. and Robert Coker**. *Essential Amino Acid Meal Replacement Improves Body Composition and Physical Function in Obese Elderly Adults*. Abstract, virtual presentation, 11.2.2020.

**Coker, Robert**. *Entrepreneurship in Biomedicine: A Multi-Faceted Approach*. Institute of Translational Health Sciences (ITHS, UW) Career Development Series, virtual presentation, 10.29.2020. Virtual presentation hosted by the Institute of Translational Health Sciences (ITHS, UW) Career Development Series.

**Coker, Robert**. *Translational Biomedicine in Alaska*. Texas A and M University, virtual presentation, 10.30.2020.

**Coker, Robert**. *MRI and Actigraph Presentation, K-Award Discussion*. Metabolomics Journal Club, virtual presentation, 10.02.2020.

**Coker, Robert**. *The Exercise Physiology of Backcountry Hunting, Podcast Interview with Mark Lindberg, Episode 13 (virtual presentation)*, 9.30.2020.

**Drew, Kelly and Denise Daniello**. *UA Center for Transformative Research in Metabolism: Exploring New Translational Research Frontiers in Hibernation Science & Brain Health*. Alzheimer's Resource Agency of Alaska, Virtual Statewide Stakeholder Presentation, 11.18.2020.

**Drew, Kelly and Denise Daniello**. *Fruits of Hibernation Research UA Center for Transformative Research in Metabolism (TRiM): Exploring New Translational Research Frontiers in Hibernation Science & Brain Health*. Fairbanks Memorial Hospital nursing staff, virtual community presentation to nursing staff, 2.18.2021.

**Fedorov, Vadim**. *Proteomics of Brown Bear*. Metabolomics Journal Club, UAF virtual presentation, 11.06.2020.

**Fedorov, Vadim B., Oivind Toien, Brian M. Barnes, Anna V. Goropashnaya**. *Transcriptional Changes and Preservation of Bone Mass in Hibernating Black Bears*. Experimental Biology 2021, virtual presentation, 4.27.2020.

**Goropashnaya, Anya**. *Skeletal Muscle Transcriptomic Comparison between Long-Term Trained and Untrained Men and Women*. Metabolomics Journal Club, UAF virtual presentation, 5.7.2021.

## Appendix D: List of all published works by Center for TRiM investigator:

Kelly Drew, PhD, Director, Center for Transformative Research in Metabolism and Professor, Department of Chemistry and Biochemistry, UAF

<https://www.ncbi.nlm.nih.gov/myncbi/kelly.drew.1/bibliography/public/>

Vadim Fedorov, PhD, PI for *Post transcriptional mechanisms of muscle atrophy prevention in hibernating mammals*. Research Associate Professor, UAF Institute of Arctic Biology

<https://www.ncbi.nlm.nih.gov/myncbi/1tAdSJFhcczQE/bibliography/public/>

Khrys Duddleston, PhD, PI for *Microbial provision of essential amino acids, protein conservation hibernation*. Professor and Director of Biological Sciences, UAA.

<https://www.ncbi.nlm.nih.gov/sites/myncbi/khrystyne.duddleston.1/bibliography/45704998/public/>

Robert Coker, PhD, PI for *Nutritional strategies for metabolic health in aging*. Professor of Biology, Clinical Nutrition and Exercise Physiology, Institute of Arctic Biology, UAF.

<https://www.ncbi.nlm.nih.gov/myncbi/robert.coker.1/bibliography/public/>.

Brandon Briggs, PhD, Advanced Instrumentation in Microbiome Studies (AIMS) Core Lead and Associate Professor, Department of Biological Sciences, UAA.

<https://scholar.google.com/citations?user=BSTge74AAAAJ&hl=en>.

Carl Murphy, PhD, Health and Metabolism Research Core (HaMR) Core Lead and Manager of the Molecular Imaging Facility, UAF.

<https://scholar.google.com/citations?hl=en&user=rRDM5icAAAAJ>

Oivind Toien, PhD, Animal Instrumentation Manager, HaMR Core, UAF.

<https://www.ncbi.nlm.nih.gov/myncbi/oivind.toien.1/bibliography/53972374/public/>

Scott Jerome, PhD, Research Navigator, HaMR Core, UAF

<https://www.ncbi.nlm.nih.gov/myncbi/1rkGix2DKHjsgn/bibliography/public/>

Kristin Grond, Post Doc, Key Personnel, *Microbial provision of essential amino acids, protein conservation hibernation*, UAA.

[https://scholar.google.com/citations?hl=en&user=vg\\_y3wkAAAAJ](https://scholar.google.com/citations?hl=en&user=vg_y3wkAAAAJ)

Melynda Sheri Coker, Clinical Research Coordinator, *Nutritional strategies for metabolic health in aging*, UAF. <https://scholar.google.com/citations?user=kJ35HNEAAAAJ&hl=en>