Wyoming IDeA Networks for Biomedical Research Excellence Spring Research Conference

April 24th-25th, 2025

University of Wyoming, UW Conference Center (UWCC), Laramie, WY

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Wyoming IDeA Networks for Biomedical Research Excellence (INBRE)

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- William Finney Ph.D., Central Wyoming College
- Chris Wenzel M.S., Eastern Wyoming College
- Ami Wangeline Ph.D. and Zachary Roehrs Ph.D., Laramie County Community College
- Eric Atkinson M.S., Northwest College
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- Ami Erickson Ph.D., faculty and Project Lead, Sheridan College
- Dagmara Motriuk-Smith Ph.D., faculty and Project Lead, UW at Casper
- Gerald Hawkes Ph.D., Vice President for Academic Affairs, Casper College

Wyoming INBRE Spring Research Conference (April 24-25, 2025): **SCHEDULE**

THURSDAY APRIL 24TH, 2025

*All oral presentations are scheduled in the **University of Wyoming Conference Center (UWCC), Salon E** (West end of Hilton Garden Inn Hotel); Alternate locations for specific meetings and poster sessions are indicated in the schedule table below.*

Morning Sessions:

Time	***DRPP Project Type***	***Presenter*** *(University of Wyoming department)*	***Title***
9:00-9:20 am	Welcome & Introduction	Wyoming INBRE Program Director: Dr. Scott Seville	
9:20-9:40 am	Administrative Supplement 1	Amy Navratil	Sexually Dimorphic JNK Signaling in the Gonadotrope is Important for Female Fertility Regulation
9:40-10:00 am	Pilot 1	Utkarsh Kapoor (Department of Chemical and Biomedical Engineering)	Uncovering How a Disordered Linker in the Polycomb Protein Polyhomeotic Shapes Self-Association and Nucleosome Array Folding
10:00-10:20 am	Thematic	Christina McDonnell (Department of Psychology)	Efficacy of a PTSD Intervention for Autistic Adults on Biobehavioral Health
10:20-10:40 am	Break		
10:40-11:00 am	Pilot 2	Cherrington Brian (Department of Zoology and Physiology)	Anti-citrullinated Protein Antibody Production in the Female Reproductive Tract
11:00-11:20 am	Administrative Supplement 2	Nicole Bedford (Department of Zoology and Physiology)	Diurnal Regulation of Urinary Behavior and Gene Expression in Aged Mice
11:20-11:40am	Pilot 3	Jennifer Stephens (Fay W. Whitney School of Nursing)	The Experience of Cancer for Rural and Frontier Wyoming Adult Oncology Patients: A Two-Phase Mixed Methods Study
11:40am-1:20 pm	Lunch on your own		

Afternoon sessions:

Time	***DRPP Project Category***	***Presenter*** *(University of Wyoming department)*	***Title***
1:20-1:40 pm	Administrative Supplement 3	John Oakey (Department of Chemical & Biomedical Engineering)	Granular Cell Scaffolds: Fundamental Studies Toward Translational Development
1:40-2:00 pm	Collaborative 1	John Oakey (Department of Chemical & Biomedical Engineering)	"Soil on a Chip" Platform to Directly Study Inter-Organismal Interactions
2:00-2:20 pm	Pilot 4	Jesse Gatlin (Department of Molecular Biology)	Characterizing Cell Cycle-Dependent Changes in the Dynein Interactome
2:20-2:40pm	*Break*		
2:40-3:00 pm	Collaborative 2	Cody Gifford (Department of Animal Science)	Effects of Higher Protein or Western Style Diets on Metabolic Health Indicators in a Biomedical Swine Model
3:00-3:20 pm	Collaborative 3	Riley Bernard (Department of Zoology and Physiology)	Ongoing Evaluation of Growth and Viability of *Pseudogymnoascus destructans*, the Causal Agent of White Nose Syndrome in Bats
3:20-3:40pm	Pilot 5	Jason Gigley (Department of Molecular Biology)	Theft of Host Iron Machinery to Acquire Iron by *Toxoplasma gondii*
3:40-4:30pm	*Break*		
12:00-4:00pm	***Graduate Poster Set Up*** (UW Conference Center Salon C/D)		
4:30-6:00 pm	Graduate Poster Presentations/ Reception (UW Conference Center Salon C/D)		

FRIDAY APRIL 25TH, 2025

All oral presentations are scheduled in the ***University of Wyoming Conference Center (UWCC), Salon E*** *(West end of Hilton Garden Inn Hotel); Alternate locations for specific meetings and poster sessions are indicated in the schedule table below.*

Community College students may find additional concurrent conference activities *for them listed below the main conference schedule. Additional pre- and post-WY INBRE Spring conference activities, URID Conference, and other events/visit/entertainment are also suggested for all (prices are as listed).*

Morning sessions:

Time	***DRPP Project or CC PL report***	**Presenters** *(University of Wyoming and/or Wyoming Community College)*	**Title**
9:00- 9:20 am	Welcome & Introduction	Wyoming INBRE Program Director: Dr. Scott Seville	
9:20-9:40 am	Collaborative 4	Grant Bowman (Department of Molecular Biology)	Analysis of Protein Connectivity in a Membraneless Microcompartment
9:40-10:00 am	Collaborative 5	Elliott Hulley (Department of Chemistry)	Efforts Towards Building a Protein Crystallography Lab
10:00-10:20 am	UWC and CC INBRE Activity Report	Dagmara Motriuk-Smith (University of Wyoming at Casper and Casper College)	Undergraduate research at Casper College and the University of Wyoming at Casper supported by INBRE
10:20-10:40 am	*Break*		
10:40-11:00 am	NWC INBRE Activity Report	Eric Atkinson (Northwest College)	Bioinformatics and Basic Research in the Big Horn Basin: Opportunities for project-based inquiry while building laboratory skills and knowledge of theory: building momentum.
11:00-11:20 am	WWCC INBRE Activity Report	David Tanner (Western Wyoming Community College)	INBRE Research at Western Wyoming College
11:20-11:40 am	NWCCD INBRE Activity Report	Ami Erickson (Northern Wyoming Community College District- Sheridan and Gillette Colleges)	Northern Wyoming Community College INBRE-Supported Research Activities
12:00-1:30 pm	Statewide Steering Committee meeting (Marian H Rochelle Gateway Center/MHRGC, Boyd Room, level 2): SSC, EAC members and Wyoming INBRE Executive Committee only (lunch provided)		
11:40 am-1:30 pm	*Lunch on your own for other attendees*		

Afternoon sessions:

Time	***CC PL report***	**Presenters** *(University of Wyoming and/or Wyoming Community College)*	**Title**
1:30-1:50 pm	LCCC INBRE Activity Report	Ami Wangeline / Zachary Roehrs (Laramie County Community College)	Focus on students and improved education through opportunities in the face of change – LCCC annual research report
1:50-2:10 pm	CWC INBRE Activity Report	Bill Finney (Central Wyoming College)	Spring 2025 Central Wyoming College INBRE Report
2:10-2:30 pm	EWC INBRE Activity Report	Christopher Wenzel (Eastern Wyoming College)	Eastern Wyoming College (EWC) INBRE Progress Report: Microbial Ecology
2:30-3:00 pm	Closing remarks (Dr. Scott Seville)		
3:00-4:30pm	*Break*		
All day until 4:15pm	***Undergraduate poster set up*** (UW Conference Center Salon C/D)		
4:30-6:00 pm	Undergraduate Poster Presentations/ Reception (UW Conference Center Salon C/D)		
6:00 pm	Conference adjourns		

Additional Activities for Community College Students

Concurrent WY INBRE Spring Conference Activities for CC Students:

Friday April 25th, 2025

Time	Location	Student Activities
11am-12pm	UW Conference Center (Salon F-G)	• Pre-Health Advising (medical, dental, DO, PA, PT, careers, etc…)-Craig Vaske and Krista Howe • COE Library-Access Services and Student Success (geared to transfer)-Shannon Smith and Sierra Pandy
1:30-3:00 pm	UW Department of Chemistry Department (Basile Lab)	UW Laboratory Visit hosted by Dr. Franco Basile (Analytic chemistry)
1:30-3:30 pm	UW Conference Center (Salon F-G)	Round Table Meet and Greet with UW Graduate and Undergraduate Students
2:10-3:00 pm	UW Classroom Building (CR) 103	Molecular Biology Departmental Seminar: Dr. Gad Shaluskey (Speaker; Baylor College of Medicine); Hosted by Dr. Dan Wall.

Other:
UW Art Museum 2111 Willett Avenue (walking distance from Conference Center; Open Tues-Saturday 10am-5pm)
Williams Conservatory (Botany Aven Nelson Building on 9th St.) Open 1-4pm: "*We encourage anyone to spend time in the Williams Conservatory during our regular business hours. To coordinate a class visit, please contact us at* conservatory@uwyo.edu"

Pre- and Post WY INBRE Spring Conference Activities for all:

Wednesday April 23rd, 2025:

Time	Location	Activities
7:30pm	Buchanan Center for the Performing Arts Concert Hall	The United States Army Field Band: Jazz Ambassadors (free event)

Friday April 25th, 2025

Time	Location	Student Activities
7:30pm	Buchanan Center for the Performing Arts Concert Hall	UW Theatre Presents: Noise Off (Comedy Play) *Regular ticket Price: $8-$16* Phone: 307-766-6666 Email: faticket@uwyo.edu Website: https://www.uwyo.edu/boxoffice/ *A limited **number of free tickets** may be available to attend this show the next evening for participants of the Undergraduate research and inquiry Day Conference.*

Saturday April 26th, 2025:
Undergraduate Research and Inquiry Day Conference (**mandatory** for all WY INBRE-sponsored undergraduates).

Time	Location	Student Activities
7am-8am	UW Classroom Building (9th street lobby)	Light continental breakfast (pastries and hot drinks)
8:00am-12:00 pm	CR building (multiple rooms)	Oral presentations by undergraduate students statewide
12pm-1:30 pm	UW Wyoming Union Ballroom	Luncheon (entertainment by UW Fine Arts)
1:30-3:00 pm	Wyoming Union	Undergraduate Poster Session and Engineering Senior Projects

Evening entertainment:

Time	Location	Activities
7:30pm	Buchanan Center for the Performing Arts Concert Hall	UW Theatre Presents: Noise Off (Comedy Play) *A **limited number of tickets** may be secured for **Undergraduate Research and Inquiry Day attendees**.* *Regular Ticket Price: $8-$16* Phone: 307-766-6666 Email: faticket@uwyo.edu Website: https://www.uwyo.edu/boxoffice/

DETAILED SCHEDULE AND ABSTRACTS

FACULTY ORAL PRESENTATIONS

All faculty oral presentations (DRPP Administrative Supplement, Thematic, Pilot, and Collaborative Projects, and Community College Project Lead updates) are held on Thursday April 24th and Friday April 25th, 2025, ***at the UW Conference Center*** *(UWCC; West end of Hilton Garden Inn),* **Salon E**.

THURSDAY, APRIL 24TH, 2025
UWCC Salon E

9:00-9:20 am. Welcome and Introductions by R. Scott Seville (Wyoming INBRE program Director/PI).

9:20-9:40 am. Administrative Supplement Project 1: **Sexually Dimorphic JNK Signaling in the Gonadotrope is Important for Female Fertility Regulation**. Elizabeth B. Quigley[1], Alexandra Verosky[2], Brian S. Edwards[3], Shaihla A. Khan[4], Ulrich Boehm[5], Roger J. Davis[6,7], Amy M. Navratil.[1]

[1]Department of Zoology and Physiology, University of Wyoming, 1000 E. University Avenue Laramie, WY 82071
[2] School of Medicine, University of Colorado, 1201 Larimer St., Denver, CO 80204
[3]Department of Physiology and Biomedical Engineering, Mayo Clinic, 200 1st St SW, Rochester, MN 55905
[4]Genus PLC, DeForest, WI 53532
[5]Experimental Pharmacology, Center for Molecular Signaling, Saarland University School of Medicine, D-66421Homburg, Germany
[6]Program in Molecular Medicine, University of Massachusetts Medical School, 281 Lincoln St, Worcester, MA 01605
[7]Howard Hughes Medical Institute, Worcester, MA 01605

Email: anavratil@uwyo.edu

ABSTRACT. Gonadotrope cells in the anterior pituitary are central regulators of reproductive function. Their activation requires the complex integration of multiple hormones and signaling pathways to initiate distinct gene programs that culminate in the synthesis and secretion of the gonadotropins, luteinizing hormone (LH) and follicle stimulating hormone (FSH). It is demonstrably clear that males and females require differential patterns of gonadotropin synthesis and secretion to maintain fertility; yet mechanistically, how male vs. female gonadotropes differentially regulate gonadotropin production at the molecular level is unclear. Previous studies in gonadotrope-derived cell lines suggest that c-Jun NH_2-terminal kinase (JNK) activation increases the expression of the gonadotropin releasing hormone receptor (*Gnrhr*), *Lhb*, and *Fshb* genes. While informative, this *in vitro* work does not accurately recapitulate the complex and differential hormonal regulation between the male and female hypothalamic-pituitary-gonadal axis. To specifically address this, we utilized Cre/*loxP* technology to selectively inactivate JNK 1 and JNK 2 (JNK 1/2) in gonadotrope cells of the anterior pituitary (DKO). Interestingly, our data demonstrates that compared to males who harbor the same deletion, JNK DKO females have *elevated* serum gonadotropins in diestrus. Consistent with elevated serum gonadotropins, JNK DKO females also have altered estrous cyclicity, enhanced folliculogenesis, and increased ovarian weights. Paradoxically, JNK DKO females skip proestrus and have increased time to first parturition. This intriguing data suggests that JNK regulation likely varies across the estrous cycle. Taken together, our results diverge from previous *in vitro* findings and define a sexually dimorphic role for JNK signaling in gonadotropin production.

9:40-10:00 am. Pilot Project 1: **Uncovering How a Disordered Linker in the Polycomb protein Polyhomeotic Shapes Self-Association and Nucleosome Array Folding**. Utkarsh Kapoor.

Department of Chemical and Biomedical Engineering, University of Wyoming, 1000 E. University Avenue, Laramie, WY 82071, USA
E-mail: utkarsh.kapoor@uwyo.edu

ABSTRACT. The mechanisms that govern the three-dimensional organization of chromatin remain incompletely understood, especially how chromatin-associated proteins influence compaction, flexibility, and higher-order folding. Polyhomeotic (PHC), a Polycomb group protein containing a C-terminal Sterile Alpha Motif (SAM), is known to form helical polymers and plays a critical role in spreading canonical Polycomb Repressive Complex 1 across chromatin domains. While this oligomerization activity contributes to chromatin compaction, how these different interaction modes are regulated and coordinated remains an open question in biology. In this talk, I will present our recent work using multiscale molecular dynamics simulations to investigate how a disordered linker adjacent to the SAM domain impacts PHC dimerization—an intermediate state that may precede both oligomerization and phase separation. I will show how specific linker–SAM interactions influence the structural stability and interaction landscape of PHC dimers and discuss the resulting consequences for chromatin folding. By simulating PHC monomers and dimers with tetra-nucleosome arrays, we assess how dimerization affects nucleosome bridging, compaction, and fiber flexibility. Together, these results provide new insights into how disordered and structured regions cooperate to tune the physical state of chromatin. Our findings contribute to a broader understanding of how Polycomb proteins, and potentially other modular chromatin regulators, encode genome organization through their intrinsic sequence features.

10:00-10:20 am. Thematic Project 1: **Efficacy of a PTSD Intervention for Autistic Adults on Biobehavioral Health.** Christina G. McDonnell, Alison U. Tassone, Kaitlyn E. Breitenfeldt, & Theresa M. Andrzejewski.

Department of Psychology, University of Wyoming, 1000 E. University Avenue, Department 3415, Laramie, WY 82071
E-mail: christina.mcdonnell@uwyo.edu

ABSTRACT. Posttraumatic stress disorder (PTSD) is characterized by a set of symptoms (intrusions, avoidance, hyperarousal, and negative mood and thoughts) that occur after a traumatic event. When untreated, chronic PTSD symptoms can lead to biomedical consequences, including reduced physical activity, disrupted sleep, cardiovascular health risk, chronic diseases, and early mortality. PTSD risk is particularly high among autistic adults. Autism is a neurodevelopmental diagnosis defined by social communication differences and restricted/repetitive behaviors, now diagnosed among 1 in 45 adults. Although autistic adults experience a high number of traumatic events and symptoms, little research has evaluated evidence-based PTSD interventions for autistic adults. The aims of this project were to (1) examine the initial feasibility and efficacy of a telehealth based, brief evidence-based intervention for PTSD among autistic adults (Written Exposure Therapy [WET]), (2) pilot the use of wearable technology (Fitbit) to evaluate whether the intervention is associated with changes in biobehavioral health metrics (activity, sleep, resting heart rate), and (3) obtain feedback from autistic adults on ways to modify and enhance the program, consistent with community engaged, participatory research methods. Out of 28 enrolled participants, 23 fully completed WET (average age = 38 years), and the majority were retained for a 1-month (n = 19) and 6-month (n = 18) follow-up assessment. PTSD symptoms significantly declined from pre-post WET, with effects maintained through the 6-month follow-up. Co-occurring self-reported mental and physical health outcomes also improved, with effects varying across time points. Fitbit compliance was low-moderate through the end of the program. Although Fitbit metrics did not

significantly change from the beginning to the end of the intervention, baseline Fitbit metrics related to some indicators of treatment response. Program satisfaction was high overall. Qualitative feedback identified strengths and suggested improvements for the program. Limitations and implications for future research will be discussed.

10:20-10:40 am. Break.

10:40-11:00 am. Pilot Project 2: **Anti-Citrullinated Protein Antibody Production in the Female Reproductive Tract.** Brian D. Cherrington.
Department of Zoology and Physiology, University of Wyoming, 1000 E. University Avenue, Laramie, WY 82071
E-mail: bcherrin@uwyo.edu
ABSTRACT. Rheumatoid arthritis (RA) is a chronic autoimmune disease that can be defined by the production of anti-citrullinated protein antibodies (ACPA). Despite the central role of ACPA in RA, there is a limited understanding of the initiating events including the mucosal site where and mechanisms by which autoimmunity to peptidylarginine deiminase (PAD) catalyzed citrullinated (cit)-proteins is initially triggered. This gap in knowledge is particularly adverse for women who have a 3 fold higher incidence of RA, face a delay in diagnosis and treatment, and have worse clinical outcomes compared to men. Our long-term goal is to determine whether RA-related autoimmunity initiates in the female reproductive tract (FRT) - a finding that could explain sex differences in RA. The objective of this proposal is to use mouse models to test if cit-proteins stimulate local FRT ACPA production and whether ACPA are elevated during pregnancy or postpartum in FRT fluid (FRTF). FRTF ACPA from women with RA are significantly elevated compared to samples from healthy women, and our mass spectrometry studies identified cit-proteins whose levels differ between FRTF samples from healthy women and those at risk for and with RA. We propose a model in which neutrophil extracellular traps (NETs), PADs, and cit-proteins are released in the FRTF during times of mucosal tissue inflammation; however, as this process repeats with each menstrual cycle, during pregnancy and postpartum, it increases the likelihood of RA in women genetically at risk for the disease. Our central hypothesis is that in genetically susceptible females cit-proteins in the FRT stimulate local ACPA production during reproductive cycles, pregnancy, and postpartum. The central hypothesis will be tested with the following specific aims: (1) Determine whether cit-proteins stimulate local inflammation and ACPA production in the FRT; (2) Determine whether ACPA in the FRT change during pregnancy and postpartum and if their production is altered by PAD inhibition. The work is significant because it is a critical step to characterize ACPA production in the FRT, which may underlie the increased incidence of RA in women. The proposed research is innovative because these studies will provide critical data to support clinical studies to target the FRT for diagnosis, treatment, or prevention of RA.

11:00-11:20 am. Administrative Supplement Project 2: **Diurnal Regulation of Urinary Behavior and Gene Expression in Aged Mice.** Danielle S. Taylor,[1,2] Albert A. Allotey,[2] Rachel E. Fanelli,[1,3] Sushumna B. Satyanarayana,[4] Sharanya S. Bettadapura,[5] Cole R. Wyatt,[6] Adam C. Nelson,[1] Emily E. Schmitt,[6,7] Danielle R. Bruns,[6] and Nicole L. Bedford.[1]
[1]Department of Zoology and Physiology, University of Wyoming, Laramie WY 82071
[2]Neuroscience Program, University of Wyoming, Laramie WY 82071
[3]Program in Ecology and Evolution, University of Wyoming, Laramie WY 82071
[4]Biomedical Sciences Program, University of Wyoming, Laramie WY 82071
[5]Molecular and Cellular Life Sciences Program, University of Wyoming, Laramie WY 82071
[6]Division of Kinesiology and Health, University of Wyoming, Laramie WY 82071
[7]WWAMI UW School of Medicine, University of Wyoming, Laramie WY 82071
E-mail: nbedford@uwyo.edu

ABSTRACT. Nocturia, defined as waking one or more times per night to urinate, is a prevalent and burdensome condition with few effective treatments. While the primary risk factor for nocturia is advanced age, few preclinical studies have addressed the pathophysiological mechanisms of nocturia in older subjects. Here, we develop a translational model of nocturia using aging mice and a behavioral paradigm that enables circadian assessment of voluntary urination in group-housed animals. We discovered dampened diurnal regulation of urinary behavior in aged mice compared to adult controls. Molecular analyses revealed disrupted diurnal expression of canonical circadian genes in aged mouse kidney and bladder tissues. Notably, we identified age-related loss of diurnal regulation of the bladder mechanosensory ion channel, *Piezo1*, suggesting a potential mechanism linking circadian disruption to altered bladder sensitivity. Our results reveal a role for circadian dysfunction in age-related nocturia and identify *Piezo1* as a promising therapeutic target for chronobiological intervention.

11:20-11:40 am. Pilot Project 3: **The Experience of Cancer for Rural and Frontier Wyoming Adult Oncology Patients: A Two-Phase Mixed Methods Study.** Jennifer M.L. Stephens, Chenoa K. Williams, and Sherrill J. Smith.

Fay W. Whitney School of Nursing, University of Wyoming, Laramie, 1000 E. University Avenue, WY 82071

E-mail: jsteph35@uwyo.edu

ABSTRACT. *Background.* There has been little research on the adult rural oncology patient journey, especially for Wyoming residents. Most research includes neighboring states and lumps Wyoming residents into an amorphous "rural" population. However, empirical information indicates that Wyomingians *are* unique, and their healthcare needs are complex due to being in a rural state. When a patient is diagnosed with cancer in Wyoming, their survival journey may include out-of-state referrals for diagnostics, treatments, and follow-up care. A lack of oncology specialists and palliative care in Wyoming, combined with challenges including transportation, small cancer-cohorts, weather, finances, and housing to name a few, can be daunting for those facing cancer. *Method.* The Wyoming INBRE 2-year pilot project grant (2023-2025) has supported a mixed method study exploring the first-hand experiences of adult oncology cancer patients who were Wyoming residents. The two-phased methodology included gathering both patient and oncology healthcare provider perspectives. Data collection included a demographic survey, along with extensive transcripts from digitally recorded, in-depth one-on-one interviews done either in-person or through a virtual platform (ZOOM). *Results***.** Recruitment into this study started in Fall 2023 and lasted for a year. 82 interviews were completed (patients, n=47; healthcare providers, n=35). Themes arising from thematic analysis include rural versus rurality**,** embracing complexities**,** patient-as-advocate, centrality of community, and "cowboy culture." *Conclusion*. Data collection in this study has resulted in an extensive number of transcripts which are being analyzed using NVIVO, EXCEL, and WORD utilizing a variety of thematic analysis techniques. The results of this study are incredibly useful in informing the adult oncology patient experience in Wyoming, revealing both successes and significant healthcare gaps. This presentation will touch on the most remarkable gaps, provide solutions, and detail the knowledge translation endeavors resulting from this research project.

11:40 am-1:20 pm. Lunch on your own.

1:20-1:40 pm. Administrative Supplement Project 3: **Granular Cell Scaffolds: Fundamental Studies Toward Translational Development**. John Oakey.

Department of Chemical and Biological Engineering, University of Wyoming, 1000 E. University Avenue, Laramie, WY 82071

E-mail: joakey@uwyo.edu

ABSTRACT. Hydrogels are widely used in tissue engineering and regenerative medicine due to their ability to mimic the physical properties of various tissues, host encapsulated cells, and serve as models for diseased and traumatized tissue. Despite these advantages, they face many limitations that hinder their utility and impede their adoption. A primary limitation is their inability to support cell motility and proliferation, the elaboration of extracellular matrix (ECM) components, and the development of *de novo* tissue. These limitations are primarily attributed to a lack of hierarchical structure bridging the macromolecular and tissue length scales. Conventional, homogeneous polymeric hydrogels, for instance, lack long range architectural features, such as micron-scale porosity. Recently, granular hydrogel scaffolds, a new class of materials composed of densely-packed hydrogel microparticles, has been introduced and rapidly adopted. These scaffolds offer many advantages over conventional hydrogels for tissue engineering. Leveraging advances in high-throughput microfluidic emulsion templating, hydrogel particles can be produced in sufficiently large quantities to enable the assembly of macroscale materials. These granular scaffolds offer significantly increased porosity, facilitating the infiltration of cells and the rapid diffusional exchange of nutrients and waste products. Moreover, particles can be designed independently of macroscale requirements, effectively decoupling material stiffness from porosity. Beyond these design advantages, granular scaffolds can be injected, 3D printed, or molded into arbitrary shapes. This work seeks to extend the known advantages of granular gels by incorporating newly developed microfabrication capabilities. We have used unique particle microfabrication capabilities to produce granular scaffolds as a medium to study fundamental and poorly understood questions of cell motility and proliferation within granular scaffolds. This knowledge is currently being applied to develop translational applications for granular scaffolds in cartilage regeneration and peripheral nerve allografts.

1:40-2:00 pm. Collaborative Project 1: **"Soil on a Chip" Platform to Directly Study Inter-Organismal Interactions.** Simon Rachou,[1] Chris Wenzel,[2] Ryan Black,[2] and John Oakey.[1]

[1]Department of Chemical and Biological Engineering, University of Wyoming, 1000 E. University Avenue, Laramie, WY 82071

[2]Department of Science and Mathematics, Eastern Wyoming College, 3200 West C Street, Torrington, WY, 82240

E-mail: joakey@uwyo.edu

ABSTRACT. Soil is a complex, multiscale system of solid, aqueous, and gaseous phases that contain an enormous diversity of prokaryote and eukaryote life. Its importance to agriculture, carbon cycling, and food chains make it one of the most critical components of the terrestrial ecosystem, yet also one of the most challenging to study. Aside from the extreme physical, chemical and biological diversity found in soil, soil is optically opaque, which presents intractable barriers to imaging and directly studying long-term events such as root development and interactions between the myriad of species present. To overcome these difficulties, we have developed a "soil on a chip" – a structured, controlled soil-like milieu that can be used to structure and directly observe interactions between soil organisms and growing plant roots. This platform will be applied to the study of symbiotic root-fungal interactions in osmotically challenged soil conditions. Understanding how dynamic conditions affect these interactions in real time will provide a framework to study and understand implications for fertilizer use and drought tolerance. We focus upon understanding the function of arbuscular mycorrhizae (AM), obligate fungal symbionts that interact with the root systems of more than 80% of land plant species and provide water and inorganic nutrients such as phosphate and nitrogen in return for more than 20% of plant fixed carbon. AM acts as an extension of the root system and greatly increases plants' ability to access nutrients and moisture. In this project, we have developed a microfluidic soil on a chip platform to visualize co-cultures of fluorescently encoded *N. benthanmiana* roots with *Rhizophagus irregularis* mycelium. The device provides temporal

control over the soluble environment within its chambers, therefore we can dynamically change and perturb the roots chemical environment without significantly altering the development of the rhizosphere. This talk will focus upon technological developments that improve root integration and the control of the artificial soil milieu.

2:00-2:20 pm. Pilot Project 4: **Characterizing Cell Cycle-Dependent Changes in the Dynein Interactome.** Zainab Almazaydeh[*+] and Jesse C. Gatlin.[*+]
[1]Department of Molecular Biology, University of Wyoming, 1000 E. University Avenue, Laramie Wyoming 82071
[+]Molecular and Cellular Life Sciences Interdisciplinary Graduate Program, University of Wyoming, 1000 E. University Avenue, Laramie, Wyoming 82071
E-mail: jgatlin@uwyo.edu
ABSTRACT. To maintain the fidelity of genetic material from one cell division to the next, a cell must form a properly assembled mitotic spindle of characteristic size and shape. This structure is composed mainly by long filamentous polymers called microtubules which are organized spatially, at least in part, by molecular motors that can move cargo along microtubule tracks. One such motor is cytoplasmic dynein (dynein). It is well established that dynein-mediated microtubule sliding is critical for proper spindle morphogenesis in normal and transformed cells, but at a mechanistic level this function of the motor is poorly understood. Here we attempt to elucidate cell cycle dependent changes in the molecular composition of the dynein motor complex responsible for crosslinking and sliding microtubules. Our strategy relies on an approach that combines multiplexed quantitative proteomics with APEX peroxidase-catalyzed proximity labeling (PLA) of the motor. We have expressed the requisite components required to conduct these experiments, and preliminary comparisons between mitosis-arrested and interphase arrested cells suggest some change in the dynein interactome. However, we are currently optimizing bait protein expression levels and sample preparation to ensure reproducibility.

2:20-2:40 pm. Break.

2:40-3:00 pm. Collaborative Project 2: **Effects of Higher Protein or Western Style Diets on Metabolic Health Indicators in a Biomedical Swine Model.** Cody L. Gifford,[1] Jeremy L. Burkett,[2] and Hannah C. Cunningham-Hollinger.[1]
[1]Department of Animal Science, 1000 E. University Avenue, Laramie, WY 82071
[2]Agricultural Department, Casper College, Casper, WY 82601
Email: cody.gifford@uwyo.edu
ABSTRACT. The association between poor dietary quality and chronic disease risk continues to impact the U.S. and global human population. The Western Style Diet (WSD) is characterized by energy-dense, nutrient poor foods that are often high in added sodium, added sugar, saturated fat and produced in a highly processed food matrix. In contrast, the Healthy Style Diet (HSD) described by the Dietary Guidelines for Americans limits added sugar, saturated fat, and sodium, while consuming rich nutrient dense foods. Numerous epidemiology studies have reported positive associations between WSD and chronic disease risk. The current collaborative project uses modification of diet ingredients to assess the macronutrient impact (carbohydrate and protein content) of feeding a WSD or higher protein (HP) over the rapid postnatal growing phases of a swine biomedical model while maintaining fat constant in both diets. Swine were assigned to the WSD or HP in a parallel (only received one dietary treatment for 8 or 16 weeks) or crossover arrangement (switched to the other diet after 8 weeks) spanning pre-pubertal and post-pubertal phases of growth. The overall aim of this project was to evaluate the impact of diet duration on key growth phases in a biomedical swine model. This talk will focus on major findings due to diet on animal growth changes, systemic markers of inflammation, fecal

microbiome, muscle chemistry and tissue composition changes from this Casper College-University of Wyoming collaborative study.

3:00-3:20pm. Collaborative Project 3: **Ongoing Evaluation of Growth and Viability of *Pseudogymnoascus destructans*, the Causal Agent of White Nose Syndrome in Bats.**
Braden D. Mays,[1,2] Riley F. Bernard,[3] Steven L. Miller,[2] and Ami L. Wangeline.[1]
[1]Department of Biology, Laramie County Community College, 1400 E. College Drive, Cheyenne, WY 82007
[2]Department of Botany, University of Wyoming, 1000 E. University Avenue, Laramie, WY 82071
[3]Department of Zoology & Physiology, University of Wyoming, 1000 E. University Avenue, Laramie, WY 82071
E-mail: rbernar5@uwyo.edu
ABSTRACT. One of the primary conservation concerns for bats in the Great Plains, Inter- and Rocky Mountain West, is the emergence white-nose syndrome (WNS). The causative agent of WNS is *Pseudogymnoascus destructans* (Pd), a psychrophilic filamentous opportunistic pathogen. This non-native fungal pathogen continues to decimate populations of bats, including recently moving through populations in Wyoming. This update will describe the completed method development for Pd isolation from environmental samples and current progress on viability of the pathogen at roost sites, particularly those used by bats during the summer months. We will also discuss progress on paired nucleic acid testing and future plans for protocol development to evaluate bat susceptibility through intentional inoculation of harvested wing tissues and fur. All together these protocols and the information gained will allow us to better understand the disease etiology in our region, and potentially throughout the Intermountain West thereby aiding in management decisions and hopefully slowing the spread of disease.

3:20-3:40pm. Pilot Project 5: **Theft of Host Iron Machinery to Acquire Iron by *Toxoplasma gondii.*** Stephen L. Denton,[1] Alexa Mejia,[1] Lindsay L. Nevarez,[1] Miguel P. Soares,[2] Barbara A. Fox,[3] David J. Bzik,[3] and Jason P. Gigley.[1]
[1]Department of Molecular Biology, University of Wyoming, 1000 E. University Avenue, Laramie, WY 82071
[2]Instituto Gulbenkian de Ciência, Rua da Quinta Grande 6 2780-156, Oeiras, Portugal
[3]Department of Microbiology and Immunology, Geisel School of Medicine at Dartmouth, 1 Rope Ferry Rd, Hanover, NH 03755
E-mail: jgigley@uwyo.edu
ABSTRACT. Host nutrient acquisition is essential for apicomplexan parasite infection, yet mechanisms underpinning this acquisition are not defined. We discovered the genome of *Toxoplasma gondii* lacks conserved genes for iron transport and storage and show these host cell proteins including the transferrin receptor 1 (Tfr1) and transferrin (Tf) are robustly taken up by tachyzoites. Acquisition of these host cell proteins was conserved across host cell species and parasite virulence type. Knocking out Tfr1 (Tfr1KO) inhibited parasite growth and replication. Complementing Tfr1KO cells with murine Tfr1or human Tfr1 fully restored *T. gondii* infection *in vitro*. Complementing Tfr1KO cells with a murine Tfr1 containing a point mutation that prevents Tf from binding inhibited *T. gondii* infection *in vitro*. Our study uncovers a novel pathogen-host interaction essential for successful parasitism. Our results provide insight into essential functions associated with parasite theft of host iron acquisition proteins.

3:40-4:30pm. Break.

4:30- 6:00 pm. Graduate Poster Presentations/Reception (UW Conference Center Salon C/D)

(12:00-4:00 pm: **Graduate Poster set-up**)

FRIDAY, APRIL 25TH, 2025
UWCC Salon E

9:00-9:20 am. Welcome and Introductions by R. Scott Seville (Wyoming INBRE program Director/PI).

9:20-9:40 am. Collaborative Project 4: **Analysis of Protein Connectivity in a Membraneless Microcompartment.** Joshua A. Holmes,[1] Dagmara Motriuk-Smith,[2] and Grant R. Bowman.[3]
[1]Western Wyoming Community College, 2500 College Dr., Rock Springs, WY 82901
[2]University of Wyoming at Casper, 125 College Drive, Casper, WY 82601
[3]Department of Molecular Biology, University of Wyoming, 1000 E. University Avenue, Laramie, WY 82071
E-mail: Grant.Bowman@uwyo.edu
ABSTRACT. Many cells use membraneless microcompartments as a tool for organizing the cytoplasm into discrete zones with different biological activities. Some microcompartments are formed through the activity of one or more scaffolding hub proteins, which self-associate into phase-separated structures and also interact with multiple other proteins, drawing them from surrounding cytoplasm. This project seeks to identify the structural features that dictate protein binding specificity for a bacterial scaffolding hub protein, called PopZ, which is conserved in *Alphaproteobacteria* and is critical for cell organization in these species. For PopZ and all other "one-to-many" type hub proteins, where a single hub domain makes direct connection to multiple clients, the rules that determine binding connectivity are poorly understood. This project is providing high-resolution genetic and structural information data on precisely which amino acid positions in a hub domain are critical for binding and which amino acid substitutions are non-permissive at each location. Comparing the results for several different clients will show how a single hub domain uses multiple structural conformations to engage structurally diverse targets.

9:40-10:00 am. Collaborative Project 5: **Efforts Towards Building a Protein Crystallography Lab**. Elliott B. Hulley,[1] and Eric C. Atkinson.[2]
[1]Department of Chemistry, University of Wyoming, 1000 E. University Avenue, Laramie, WY 82071
[2]Department of Biology, Northwest College, 231 W. 6th Street, Powell, WY 82435
E-mail: ehulley@uwyo.edu
ABSTRACT. Modern structural biology depends on molecular-level understanding of the tertiary structures that nucleic acids, proteins, and other biological molecules attain in vivo. Of the techniques available, single-crystal X-Ray Diffraction (sc-XRD) is one of the most successful and least ambiguous technologies, and hundreds of thousands of structures have been determined using sc-XRD. The Department of Chemistry at the University of Wyoming, with funding from Wyoming INBRE, recently acquired a new sc-XRD instrument that has the capability to solve structures of small-to-medium sized proteins. Although the new instrumentation is rated for studies of small-to-medium sized proteins, formally adding that capability to its operation requires (1) assessing the instrument's capabilities for protein work using experimental protein crystals, (2) developing a knowledge base of protein crystallization conditions and requirements, (3) building the infrastructure for shipping and handling of crystalline protein samples, and (4) training students and faculty in the use of crystallographic solution software designed specifically for biomolecules. This talk will be an introduction to the challenges involved and an update on the progress made towards building this capability.

10:00-10:20 am. University of Wyoming at Casper and Casper College INBRE Activity Report: **Undergraduate research at Casper College and the University of Wyoming at Casper supported by INBRE.** Dagmara Motriuk-Smith (Project Lead)

University of Wyoming at Casper, 125 College Drive, Casper, WY 82601
Email: motriuk@uwyo.edu

ABSTRACT. The objective of the INBRE-supported research is to enhance the research and learning experience for students interested in pursuing careers in biomedical and allied health fields. This goal is achieved by implementing hands-on laboratory skill development and interdisciplinary collaboration. Since January 2024, sixteen students have received INBRE Internships and were mentored by six faculty members. These students participated in a variety of research projects including topics such as: environmental impact of microplastics, spadefoots in Natrona County, cardiac aging and PAD-mediated protein citrullination, amino acid sequence features of a disordered polar organizing protein, the effects of the white nose syndrome on wing damage. Additionally, four faculty members received support from the Collaborative Research Program. Two of them received Wyoming INBRE STEM seed grants. Two equipment grants provided funding for the purchase and installation of the Nanalysis high-performance benchtop NMR spectrometer and the Olympus BX53 fluorescence microscope.

10:20-10:40 am. Break.

10:40-11:00 am. Northwest College INBRE Activity Report: **Bioinformatics and Basic Research in the Big Horn Basin: Opportunities for Project-Based Inquiry while Building Laboratory Skills and Knowledge of Theory: Building Momentum.** Eric C. Atkinson[1] (Project Lead), Allan Childs,[2] Uko Udodong,[2] and Austin Conklin.[1]

[1]Biology Department, Northwest College, 231 W. 6th Street, Powell, WY 82435
[2]Chemistry Department, Northwest College, 231 W. 6th Street, Powell, WY 82435
Email: eric.atkinson@nwc.edu

ABSTRACT. NWC INBRE supports undergraduate research, exploration, and mentoring spanning topics from a) novel antibiotic research especially via investigating aromatic native plants, b) characterization and modification (glycosylation) of bactericidal compounds in spices, c) metabarcoding hymenopterans, d) avian disease ecology and immunology, e) environmental microplastics and organisms that inhabit this refuse, f) “All of Us” Human Genetics Program, to g) curriculum development (e.g., protein crystallization via CURE) all meeting the following program goals: 1) enhance opportunities for WY community college undergraduates to better understand (and ultimately participate in) the field of biomedical research; and 2) develop a pipeline of students with an interest in biomedical science who would then go on to complete their baccalaureate degrees and/or graduate degrees at UW. Collaborated with Drs. Merkle and Hulley addressing disease transmission in migrating cervids and haemoglobin description in Wyoming wildlife, respectively, with WGF with whom we collaborate on CWD surveillance. A weekly journal club “SPARK” continues to grow. We concentrate on our major research projects where we emphasize exposure to basic laboratory, research, and professional skills over this year, as was done last year. With pre- and post-Knowledge Surveys via COI barcoding and Kirby-Bauer Methods we substantially increased the skill level of students while maintaining intellectual growth in the fields of genomics, bioinformatics, evolution, disease ecology, scientific professional development, and ethics. Since 2020, 95 students participated in our program (36 in the past 2-years): 40 students graduating with AS degrees; two have entered nursing school, 18 transferring to UW (11 awarded INBRE Transition support). Two REUs were gained. Two peer-reviewed papers were published by INBRE faculty, 2 faculty accompanied 3 students to WRIC, and 1 faculty was awarded an UArizona/Banner Health *All of Us* Data Fellows opportunity. Collaboration with an INBRE alumna teaching science at Frank Bratten Middle School (Colstrip, MT) continues.

11:00-11:20 am. Western Wyoming Community College INBRE Activity Report: **INBRE Research at Western Wyoming College.** David A. Tanner (Project Lead) and Joshua Holmes
Western Wyoming Community College, 2500 College Drive, Rock Springs, WY 82901
E-mail: datanner@westernwyoming.edu
ABSTRACT. The purpose of INBRE research at Western Wyoming Community College is intended to introduce freshman and sophomore students to research, provide them the opportunity to apply the scientific method, encourage students to pursue consider careers in the sciences, and to expand our current understanding of the natural world through presentation and publication of research work. Six students at WWCC participated in INBRE funded research. Topics of research included microbiology, protein-protein interactions, evolution, and bioinformatics. We currently have two faculty participating in INBRE research programs. Three students from WWCC were awarded a UW Transfer Award. Research as currently practiced at WWCC would not be possible without INBRE funding, which has allowed us to retain quality faculty and facilitated the development of our students into capable and responsible scientists.

11:20-11:40 am. Northern Wyoming Community College District-Sheridan and Gillette Colleges INBRE Activity Report: **Northern Wyoming Community College INBRE-Supported Research Activities.** Ami Erickson[1,2] (Project Lead), Scott Newbold,[2] Rob Milne,[2] Eva M. Harlan,[2] and Stephanie Servetas.[2,3]

[1]Department of Agriculture, Sheridan College, Sheridan, WY 82801
[2]Department of Natural Sciences, Sheridan College, Sheridan, WY 82801
[3]Biosystems and Biomaterials Division, National Institute of Standards and Technology, Gaithersburg, MD 20899
Email: amie@sheridan.edu
ABSTRACT. Faculty and students at Sheridan College, Northern Wyoming Community College District, have been actively engaged in research and educational endeavors associated with biomedical and scientific inquiry and supported by Wyoming INBRE. A team of students, supervised by Stephanie Servetas, Eva Harlan, and Ami Erickson, continue to investigate the microbiome of the Hot Springs State Park in Thermopolis, WY. We are also developing projects to identify and characterize microorganisms associated with Controlled Environment Plant Growth Systems using the Innovaprep Concentrating Pipette purchased through the INBRE STEM seed grant. Scott Newbold is supervising students who are evaluating the performance of wild-caught versus captive-bred ornamental fish. Rob Milne's student is using HPLC to quantify Vitamin C content in different beverages. Meanwhile, Sheridan College students taking Natural Science and Agricultural Science classes are exposed to research techniques important to the biomedical fields, and the students have the opportunity to develop laboratory and field research skills. Many science classes incorporate independent, inquiry-based research projects, during which students develop a scientific hypothesis. Students use equipment and materials associated with biomedical research to test their hypotheses. Detailed examples will be shared during our presentation.

12:00 -1:30 pm. Statewide Steering Committee Meeting (Marian H. Rochelle Gateway Center/MHRGC, Boyd Room, Level 2): SSC members, EAC members, and Wyoming INBRE Executive Committee members only (lunch provided).

***11:40am -1:30 pm**. Lunch on your own for other attendees.*

1:30-1:50 pm. Laramie County Community College INBRE Activity Report: **Focus on Students and Improved Education through Opportunities in the Face of Change – LCCC Annual**

Research Report. Gavin J. Martin, Zachary P. Roehrs (Co-Project Lead), Heather A. Talbott, and Ami L. Wangeline (Co-Project Lead).

Laramie County Community College, 1400 E. College Drive, Cheyenne, WY 82007
E-mail: AWangeli@lccc.wy.edu

ABSTRACT. With the completion of Wyoming INBRE-4 and a focus on the future, the Laramie County Community College (LCCC) IDeA Network for Biomedical Research Excellence (INBRE) research group has had a productive year. The mission of the LCCC INBRE research group is to improve access to authentic research experiences for our students. Along these lines, we will report on improvements made in inquiry-based education at LCCC, including implementation of a CURE for all in-person BIOL1010 sections this year, as well as continuing work on lab and lab kit redesigns to implement this CURE for distance sections in Fall 2025. CUREs are beginning development in other areas as well including geosciences and chemistry. This year the scientific research classes have seen increasing demand (highest since before COVID) with a continued focus on data science projects using the Anchored Hybrid Enrichment dataset and morphological analysis using advanced imaging techniques. A STEM-Seed grant award to Dr. Talbott has given students opportunities to do molecular biology and cell biology in collaboration with The Cherrington Lab. Our collaborative grant with The Bernard Lab was awarded another year of funding to complete work on white nose syndrome in bats. We feel confident we will be able to continue to provide our students with growing opportunities to engage in research and develop as professionals within the Wyoming INBRE program and beyond within the changes happening on our campus, in the state, and country.

1:50-2:10 pm. Central Wyoming College INBRE Activity Report: **Spring 2025 Central Wyoming College INBRE Report.** William F. Finney (Project Lead), Mara Gans, Lucy Graham, Matt Herr, Kirsten Kapp, Jacki Klancher, Charles Palmer, Claudia Troxel, and Tara Womack-Shultz.

Science, Health, and Education Division, Central Wyoming College, 2660 Peck Ave., Riverton, WY 82501
Email: bill@cwc.edu

ABSTRACT. INBRE-supported faculty at Central Wyoming College continue to engage undergraduate students in research and develop broadly applicable skills in wide-ranging projects. **Professors Charles Palmer and Matt Herr** are working with CWC GIS program faculty to develop an open platform for mobile environmental sensor data collection. **Professor Lucy Graham** and **Dr. Claudia Troxel** collaborate to investigate the effects of wildfire smoke on oncogenic changes to protein and RNA expression in cell culture and the effects on compounds in plants used in traditional Native medicine on these cultures. **Professor Kirsten Kapp** continues her work investigating the sources of microplastic pollution in natural waters. Through a variety of high elevation monitoring and research projects **Professors Mara Gans and Jacki Klancher** literally take students to the highest peaks to understand the connections between the health of our environment and human health. **Professor Tara Womack-Shultz** has and continues to be open to participate in collaborative projects with faculty at the University of Wyoming and throughout the INBRE network.

2:10-2:30 pm. Eastern Wyoming College INBRE Activity Report: **Eastern Wyoming College (EWC) INBRE Progress Report: Microbial Ecology.** Christopher R. Wenzel (Project Lead).

Department of Science and Mathematics, Eastern Wyoming College, 3200 West C Street, Torrington, WY 82240
Email: cwenzel@ewc.wy.edu

ABSTRACT. The INBRE program at Eastern Wyoming College (EWC) has involved 30 undergraduate students since it began in 2009. At least 16 students have gone on to pursue or are planning to pursue higher degrees in Biology or Biomedical related fields. Research at the

EWC-INBRE Laboratory focuses on three major areas including 1) the role of microbes in biogeochemical cycles; 2) environmental tolerances of soil microbes; and 3) collaborative development of a microfluidic platform for observing fungal-plant interactions. Student tasks have included 1) microbial DNA extraction and quantification; 2) polymerase chain reaction (PCR) to determine the presence or absence of microbial genes; and 3) determination of variation in microbial environments. Additional support has been provided by supplemental equipment purchases using INBRE funds including 1) Nano-Drop UV-vis for DNA quantification; 2) Bio-Rad T100 Thermal Cycler for gene detection; 3) So Low -40 freezer for nucleic acid preservation; 4) Stirling Ultra-cold -86 freezer; and 5) Chai-Bio quantitative PCR (qPCR) unit, and 6) GelDoc Go Gel Imaging System with Image Lab Touch Software. EWC has provided over 400 square feet of laboratory space dedicated to faculty-student research; computer and laboratory resources; transportation support to and from faculty-student statewide and regional meetings and conferences, graduate-level courses for faculty, and laboratory training sessions for both students and faculty. The INBRE program has been an invaluable addition to the Pre-Health Science and Biology-based programs on our campus. It has provided state-of-the-art equipment for biomedical research, hands-on experiences and scholarship opportunities for students, and enhanced the caliber of our science faculty, thereby attracting better-prepared students to our campus.

2:30-3:00 pm. Closing Remarks (Dr. Scott Seville)

3:00-4:30 pm. Break.

4:30-6:00 pm. Undergraduate Poster Presentations/Reception (UW Conference Center Salon C/D)

6:00 pm. Conference adjourns.

UW GRADUATE STUDENT POSTER PRESENTATION ABSTRACTS

The Effect of Choice on Placebo Effects for Prescription Stimulants. Katherine A. Berry and Alison Looby.
Department of Psychology, University of Wyoming, Laramie, WY 82071
E-mail: kberry11@uwyo.edu
ABSTRACT. Nonmedical prescription stimulant use is prevalent among college students for cognitive, academic, and mood enhancement purposes. While prior research demonstrates placebo effects for subjective mood and drug effects, objective cognitive enhancement placebo effects have been less reliably produced in the laboratory, perhaps because lack of ability to choose to use a drug decreases ecological validity. This study examined whether prescription stimulant placebo effects are modulated by ability to choose whether to use a drug. College students (N=183; M_{age}=19.48, 92.9% white non-Hispanic, 77.0% female) were randomized into choice (n=95; ability to choose to ingest 10mg Adderall [actually placebo]) or no-choice (n=88; randomly assigned to receive drug or no drug) conditions prior to completing subjective effect measures and cognitive tasks. Nearly all choice participants (95%) decided to ingest drug, resulting in 130 participants who ingested "drug" and 53 who did not, across choice conditions. Replicating prior research, participants who ingested the drug (actually placebo) indicated subjectively enhanced mood and drug effects (e.g., feeling high, feeling good, amphetamine effects). With one exception on a specific reaction time index, there were no placebo effects on objective cognitive tasks. We examined if choice moderated these effects such that placebo effects were stronger among students who chose to ingest drug; there were no significant interactions with choice. Study results confirm medium-large effect sizes for prescription stimulant placebo effects related to subjective mood. Having the ability to choose whether to take a stimulant did not impact placebo effects for subjective or objective measures. Given the observed placebo effects for enhanced mood and drug effects, intervention efforts aimed at reducing nonmedical prescription stimulant use should focus on challenging and modifying these expectancies.

Single-Cell Chromatin Accessibility Reveals Epigenetic Effects of Maternal Choline Supplementation in a Down Syndrome Mouse Model. Naomi Boldon,[1] Bo Shui,[2] Jen Grenier,[3] Brian D. Cherrington,[4] Jill Keith,[5] Barbara Strupp,[6] and Paul Soloway.[7]
[1]Biomedical Sciences, University of Wyoming, Laramie, WY 82071
[2]Department of Molecular Genetics, Cornell University, Ithaca, NY 14853
[3]Genomics Innovation Hub, Cornell University, Ithaca, NY 14853
[4]Department of Zoology and Physiology, University of Wyoming, Laramie, WY 82071
[5]Department of Family and Consumer Sciences, University of Wyoming, Laramie, WY 82071
[6]Department of Nutritional Sciences, Cornell University, Ithaca, NY 14853
[7]Department of Molecular Genetics, Cornell University, Ithaca, NY 14853
E-mail: nboldon@uwyo.edu
ABSTRACT. Choline, an essential nutrient vital for neurocognitive development, influences neuronal signaling, cellular membrane integrity, and gene methylation. Despite increased needs during pregnancy, more than 90% of women don't meet Adequate Intake recommendations, and prenatal vitamins often lack choline. Previous research shows maternal choline supplementation (MCS) improves neurocognitive outcomes in the Ts65Dn Down syndrome mouse model, but the underlying molecular mechanisms remain unclear. We hypothesized that MCS during pregnancy and lactation drives epigenetic programming through DNA and histone methylation, altering chromatin accessibility and gene expression to improve neurocognitive function. Using single-cell ATAC-seq on frontal cortex tissue from behaviorally tested wild-type and Ts65Dn mice (n=56), we identifyied genotype-and diet-specific changes in chromatin accessibility at

marker genes, genomic peaks, transcription factor motifs. After filtering for high-quality nuclei, we obtained chromatin accessibility profiles from 104,455 frontal cortex cells across diverse neuronal and non-neuronal single-cell populations. Trisomy produced distinct cell type-specific epigenetic signatures, and MCS normalized chromatin accessibility patterns in neuronal populations. Notably, GABAergic (inhibitory) neurons showed enrichment in neuronal growth and development processes. Glutamatergic (excitatory) neurons displayed functional enrichment linked to memory, learning, and cognition. Transcription factor motif analysis revealed coordinated regulatory networks potentially mediating the MCS effects, including genomic imprinting and epigenetic regulation of gene expression pathways. This study provides genome-wide characterization of how MCS shapes the epigenetic landscape in Down syndrome, offering mechanistic insights into its neurocognitive benefits. By identifying chromatin accessibility alterations rescued by MCS, we established connections between specific genes, regulatory elements, and cognitive deficits. Additionally, we detected gene accessibility changes in wild-type mice, revealing broader impacts of maternal nutrition on neurocognitive development. These datasets serve as a valuable resource for understanding maternal nutrition's role in neurocognitive development and exploring potential therapeutic interventions for Down syndrome.

Acute Effects of Physical Exercise on Mood in College Students with and without ADHD.

M. M. Khaireddin,[1] E. A. Miller,[1] J. M. Vasko,[1] J. W. Serrano,[1] D. K. Smith,[2] and C.M. Hartung.[1]
[1]Department of Psychology, University of Wyoming, Laramie, WY 82071
[2]Department of Kinesiology & Health, University of Wyoming, Laramie, WY 82071
E-mail: mkhaired@uwyo.edu

ABSTRACT. Individuals with ADHD are at a higher risk for depression and anxiety. Physical exercise (PE) has been shown to have effects beyond improving physical health (e.g., improved mood in youth with ADHD). The goal of this study was to examine whether PE has a greater impact on mood in college students with, versus those without, ADHD. Participants were 70 students (57% female) who completed a mood survey after PE or no PE.

We hypothesized that mood would improve after PE regardless of ADHD status and improve more for those with, versus those without, ADHD. We conducted repeated-measures 2 (ADHD vs. non-ADHD) x 2 (PE vs. no PE) ANOVAs. For depression, there were main effects of PE (p = .008; medium effect) and ADHD (p < .001; large effect). The group x PE interaction was not statistically significant, but the effect was small (ηp^2 = .03). For anxiety, there was a main effect of ADHD (p < .001) but no main effect of PE and no interaction.

Regardless of PE, college students with, versus those without, ADHD reported more depression and anxiety. Furthermore, students, regardless of ADHD, reported less depression, but not anxiety, following PE. However, our hypothesis regarding PE having a greater impact on mood for students with, versus those without, ADHD was not supported although there was evidence of a small interaction for depression.

These finding suggest that PE has a positive impact on depression in college students regardless of ADHD. Our hypothesis might be supported for depression with a larger sample. The sample size needed to detect a small interaction effect would be 200 participants. Thus, a larger sample may demonstrate that PE has a greater impact on depression for students with, versus those without, ADHD.

Inhibition of the Cysteine Protease Cathepsin K Attenuates Diabetic Neuropathic Pain.

Vitoria Mattos Pereira,[1, 2] Cameron James Campbell,[1,2] and Sreejayan Nair.[1,2]
[1]School of Pharmacy and [2]Biomedical Sciences Graduate Program, College of Health Sciences, University of Wyoming, Laramie, WY 82071
E-mail: vmattosp@uwyo.edu

ABSTRACT. *Background and Aim*. Diabetic peripheral neuropathy (DPN) is a painful and debilitating complication of diabetes that develops in 30-50% of diabetic patients. The drugs currently available to treat DPN lack specificity and only transiently relieve neuropathic pain. Recent studies demonstrated that the cysteine protease cathepsin K plays a critical role in the development of nociceptive pain. The present study was undertaken to assess the efficacy of cathepsin K inhibition in alleviating DPN. *Methods.* Five-week-old C57BL/6J mice were rendered diabetic through a single intraperitoneal injection of streptozotocin (STZ, 150 mg/kg), while the control animals received the buffer (n=10 per group). DPN was confirmed in diabetic mice using tactile allodynia test with von Frey filaments. Then, diabetic animals were challenged with a single intraperitoneal injection of Cathepsin K inhibitor II (0.01 mg/kg, EMD Millipore # 21937). Data were expressed as mean ± S.E.M and statistically evaluated using the paired Student t-test. *Results.* STZ injections induced diabetes in the mice as evidenced by elevated blood glucose levels (459.22 ± 35.8 mg/dL). Diabetic mice exhibited mechanical hyposensitivity as indicated by a twofold increase in the von Frey filament threshold (4.75 ± 0.54 g) relative to controls (2.76 ± 0.55 g, $p \geq 0.05$, n=10). Treatment with cathepsin inhibitor II resulted in a complete reversal of the diabetes-induced mechanical hyposensitivity (2.42 ± 0.60 g, $p \geq 0.05$). *Conclusion.* Inhibition of cathepsin K may represent a viable strategy to treat DPN. *Funding Source:* Institutional Development Awards (IDeA) from the NIGMS of the NIH under grant number P20GM121310.

Determining viability of the causative agent of white-nose syndrome, *Pseudogymnoascus destructans*, at seasonal bridge roosts across Wyoming.
Braden Mays,[1,2] Riley Bernard,[2] Steven Miller,[3] and Ami Wangeline.[1]
[1]Department of Biology, Laramie County Community College, Cheyenne, WY 82007
[2]Department of Botany, University of Wyoming, Laramie, WY 82071
[3]Department of Zoology and Physiology, University of Wyoming, Laramie, WY 82071
Email: Bmays@uwyo.edu
ABSTRACT. *Pseudogymnoascus destructans* (*Pd*) is a psychrophilic fungus whose genus is commonly found in soils in colder environments, including caves and mines. *Pd* causes the epizootic disease white-nose syndrome, which is responsible for the deaths of millions of bats in North America by disruption of the hibernation cycle and gas/water exchange processes that takes place across wing membranes. Previous research on the fungus has mainly been focused on nucleic acid-based detection methods which can be used to identify presence, but not viability, of the fungus. To improve our understanding of *Pd*, we first tested a pure culture from the American Type Culture Collection on a wide array of media types at different concentrations, selecting media that results in efficient and fast fungal growth with conidia development. Further, we also discovered what leads to inefficient and/or stressed growth. These methods have now been applied to the evaluation of viability of *Pd* during different seasons and locations *via* swab collections from roost and hibernaculum sites from around Wyoming. To date the fungi have been isolated from 6 bridges resulting in 927 total fungal cultures, 6 of which are potentially *Pd*. Over the spring the remaining 219 bridge swabs will be processed and paired with nucleic acid presence as well as identification of the isolates. Through the development of these methods, our goal is to provide information for regional study and improved management of the fungus. We also hope to identify any Wyoming *Pd* variants for further molecular evaluation. Overall, we hope to use the gained information and procedures to move to a more encompassing understanding of *Pd* than previous studies; including the ecology, transmission, and impact on bat species in North America.

The Binding Specificity of a Hub Protein.
Samantha Patterson,[3] Abigail Straight,[3] Cody McClaron,[3] Rachel Kaiser,[3] Kayla Clymore,[3] Ainsley Hokanson,[3] Ray Heffley,[3] Tess Palen,[3]

Maddie Sites,[3] Nathan Johnson,[3] Jonathan Thornton,[3] Josh Holmes,[1] Dagmara Motriuk-Smith,[2] and Grant Bowman.[3]
[1]Western Wyoming Community College, Rock Springs, WY 82901
[2]University of Wyoming Casper, Casper, WY 82601
[3]Department of Molecular Biology, University of Wyoming, Laramie, WY 82071
E-mail: spatte14@uwyo.edu
ABSTRACT. Bacteria, often considered to be simple organisms that lack complex subcellular organization, can produce membrane-less organelles known as bacterial microcompartments (BMCs). These BMCs are complex and can be formed in certain organisms as a way to replicate asymmetrically. One important protein known to form a BMC is the *Caulobacter crescentus* hub protein Polar Organizing Protein Z, or PopZ. PopZ localizes to the cell pole during replication and self-assembles to form a phase separated domain, or condensate, where it can facilitate interactions with 12 known client proteins. Of these 12 binding partners, 10 interact with a relatively small portion of PopZ, a 28AA molecular recognition feature (MoRF), that is highly conserved in other alphaproteobacterial PopZs. While this MoRF has been shown to be necessary and sufficient for binding, individual interaction sites have not been identified for any of the binding partners. In this work we use a high-resolution genetic approach to identify the amino acids essential for the binding of these different proteins. Insight into the amino acids involved in these interactions will allow us to identify what structural conformations of PopZ are essential for the client interaction. By observing multiple client proteins we show how PopZ uses different components of its structure to bind proteins that are unrelated in sequence and in structure.

Robust Inducible Gene Expression in Intracellular *Listeria monocytogenes in vivo*. Huong Giang Pham, Kiet N. Tran, Larissa Gomelsky, Tathagato Roy, Jason P. Gigley, and Mark Gomelsky.
Department of Molecular Biology, University of Wyoming, Laramie, WY 82071
Email: gpham@uwyo.edu
ABSTRACT. Attenuated strains of the intracellular pathogen *Listeria monocytogenes* have shown promise in delivering genetically-encoded payloads inside tumor cells. *L. monocytogenes* preferentially accumulates and propagates inside immune-suppressed tumor microenvironments. However, it is important to note that even attenuated strains, when they colonize healthy tissues following systemic *Lm* delivery, may cause significant damage if they constitutively produce cell-toxic agents. To maximize the payload impact in tumors and minimize damage to healthy tissues, it is desirable to induce payload synthesis when bacteria are eliminated from the healthy tissues but are grown to high numbers intratumorally. Here, we have engineered a tightly controlled gene expression system for intracellular *L. monocytogenes* that is inducible with a cumin derivative, cumate. Upon cumate addition, expression of a reporter gene is increased in *L. monocytogenes* growing *in vitro* by 80-fold, and in intracellular *L. monocytogenes* in murine tumors by 10-fold. Furthermore, when employing this system to deliver the killing agent (pro-apoptotic agent, Noxa and pro-necrotic agent, MTD) intratumorally, we significantly reduced 40% to 60% in the 4T1 cancer cell population. Using an edible inducer, this study demonstrates the feasibility of activating gene expression in intracellular bacteria in live animals. The system is expected to enhance the efficacy and safety of the attenuated *L. monocytogenes* strains as antitumor payload delivery bacterial drones.

Chrono-Exercise Consolidates Sleep. Karla Pitha,[1], Haifa Chargui,[2] Bryn Bruch,[1] Sherry Negaard,[1] Macei Engelke,[1] Brandon Roberts,[2] and Emily Schmitt.[1]
[1]Division of Kinesiology & Health, University of Wyoming, Laramie, WY 82071
[2]Department of Zoology & Physiology, University of Wyoming, Laramie, WY 82071
E-mail: kpitha@uwyo.edu

ABSTRACT. Circadian rhythms are the biological process that helps to regulate the sleep-wake cycle. These rhythms are regulated by the suprachiasmatic nucleus (SCN) located in the anterior hypothalamus. Disrupted circadian rhythms can lead to sleep disturbances and poor sleep habits over time. PURPOSE: The purpose of this study is to use exercise as a method of re-entraining circadian rhythms in mice through forced treadmill running and sleep analysis. METHODS: This work was approved by the University of Wyoming IACUC. In this study we took male (n=8) and female mice (n=4) and studied their sleep rhythm during exercise entrainment. The sleep system was non-invasive and continuously monitored the mice for seven days pre-exercise and seven days during exercise. The exercise training protocol mimicked ACSM guidelines for moderate intensity and was as follows: Days 1 – 7 warm –up at 8m/min for 5 minutes then 13 m/min for 35 minutes. Exercise occurred 30 minutes after lights off for males and females. RESULTS: Male mice had more consolidated sleep with early active period exercise as shown through increased bout length, total sleep, dark period sleep, and the decreased number of bouts. Late active period exercise was also done with male mice and results showed that the total bout length and day sleep decreased suggesting that exercise at this time does not carry the same benefits as early exercise. Females respond differently than males in most instances but responded similarly to early chrono-exercise with an increase in sleep and sleep duration. CONCLUSION: Exercise is a viable and cost-effective method to help with sleep. It is a natural way to regulate the circadian rhythm, promoting deeper and more restful sleep. Continuation of this work will shed light to the neural mechanisms underlying how sleep is consolidated in exercised entrained mice. *This work was supported by NIH Grant 2P20GM12131006.*

Microbial Stem Cells: Using Asymmetric Division to Enhance Bioreactor Productivity.
Steven Poyer, and Grant Bowman.
Department of Molecular Biology, University of Wyoming, Laramie, WY 82071
E-mail: spoyer@uwyo.edu
ABSTRACT. Bioreactors have become an increasingly attractive method for the production of renewable fuels, pharmaceuticals, food additives, and the management of agricultural waste. While the underlying technology continues to improve efficiency and yield, a significant hurdle to the use of bioreactors remains that product synthesis and cell proliferation are often mutually antagonistic activities, leading production to be self-limiting. An elegant solution to this problem is to control cell differentiation within a culture, allowing the roles of cell growth and product synthesis to be assigned to two different cell types. The first cell population, factory cells, would sustain constant production, utilizing all cell machinery to that end. While a second population, stem cells, would focus solely on asymmetric cell division, leading to constant replenishment of the factory cells. As many diverse organisms are used in bioreactors, our research focuses on disparate methods of leveraging asymmetric differentiation to achieve these goals.

Investigating the Role of Peptidylarginine Deiminases (PADs) in Female Reproduction.
Elizabeth B. Quigley,[1] Joseph W. Flock,[1] Ari O. Sequoia,[1] Kelly L. Sams,[2] Scott A. Coonrod,[2] Amy M. Navratil,[1] and Brian D. Cherrington.[1]
[1]Department of Zoology and Physiology, University of Wyoming, Laramie, WY 82071
[2]Baker Institute for Animal Health, Cornell University College of Veterinary Medicine, Ithaca, NY 14850
E-mail: equigle2@uwyo.edu
ABSTRACT. Peptidylarginine deiminases (PADs) are a family of enzymes that post-translationally convert positively charged arginine residues in target proteins to the neutral, non-coded residue citrulline, through a reaction termed citrullination. Citrullination, a novel post-translational modification, can alter target protein structure and function. Our previous work discovered that PADs are expressed in anterior pituitary gonadotrope cells, which are

responsible for the production of the gonadotropins luteinizing hormone (LH) and follicle-stimulating hormone (FSH). While this work is informative, these cell line-based studies do not address the contribution of PADs in gonadotrope cell function *in vivo*. To address this, we are using a global PAD2/4 double knockout (DKO) mouse. A recently published study suggests that PAD2/4 isoforms are important regulators of reproductive function in males, highlighting that PAD2/4 DKO males have delayed puberty, decreased testis size, and are subfertile as compared to wild-type (WT) controls. Male PAD2/4 DKO mice also have reduced serum LH and FSH at 12 weeks of age compared to controls. However, these prior studies did not examine if reproduction is also compromised in PAD2/4 DKO female mice, which we hypothesize is reduced similar to males. To test this hypothesis, we first measured pubertal onset in female PAD2/4 DKO mice and found that it takes approximately 5 days longer to initiate puberty. Our preliminary data also demonstrates that PAD2/4 DKO females have lower fertility rates and have altered estrous cyclicity, spending a significantly longer time in the diestrus phase of the estrous cycle compared to WT female controls. In pituitaries from female PAD2/4 DKO mice, LHβ mRNA and serum LH are decreased compared to controls during estrus, precisely when LH should be elevated. Taken together, these data suggest that PAD2/4 isozymes are critical regulators of female gonadotrope function, and their ablation may contribute to the reproductive phenotype of female PAD2/4 DKO mice and the downstream effects on the female reproductive tract. In the future, we seek to investigate the transcriptomic changes in the PAD2/4 DKO female pituitaries by utilizing sn-RNA Seq.

Investigating the Role of a Tardigrade Protein during Protective Biostasis in Human Cells. Jarrod Reister and Thomas Boothby.
Department of Molecular Biology, University of Wyoming, Laramie, WY 82071
E-mail: jreister@uwyo.edu
ABSTRACT. Organisms capable of surviving extreme environmental stresses are found in every kingdom of life. One organism known as the tardigrade, or water bear, can withstand losing up to 99% of its intracellular water through a process known as anhydrobiosis. This occurs when during drying, the tardigrade suspends its metabolism and enters a state of biostasis. Anhydrobiosis is mediated in part by a class of protective proteins specific to tardigrades. Expression of one of these proteins, Cytoplasmic Abundant Heat Soluble Protein D (CAHS D), in human cells increased their tolerance to water loss through a reduction in metabolic activity, similar to anhydrobiosis in tardigrades. What remains unclear is how CAHS D is reducing metabolism and why that is beneficial for tolerating water loss. Here we show that CAHS D reduces the area of mitochondria in response to the loss of water, which correlates with increased cellular survival. Transmission electron microscopy revealed that expression of CAHS D during water loss reduced the mitochondrial area from 0.25μm2 to 0.14μm2, which correlated with increased tolerance to hyperosmotic shock. Interestingly, decreased mitochondrial area did not correlate with reduced metabolic activity, indicating the need for further study. This result shows that in response to the loss of water in a living system, the protective tardigrade protein CAHS D causes the mitochondria to shrink, which results in increased stress tolerance. This illustrates a novel protective mechanism for this protein that has not previously been characterized in cells. Tardigrade proteins are targeted as potential protectants for the dry storage of sensitive biologics. Therefore, understanding their function could be the key to developing these technologies further. Additionally, insights into the function of this protein could highlight cellular processes essential for tolerating the loss of water.

CD4 Co-Receptor Regulates Sex-Specific NK Cell Responses to Acute *Toxoplasma gondii* Infection. Tathagato Roy, Leah Bernstein, Hunter K. Keplinger, Kaatje Fisk, Sai K. Ng, Stephen L. Denton, and Jason P. Gigley.
Department of Molecular Biology, University of Wyoming, Laramie, WY 82071

E-mail: troy4@uwyo.edu
ABSTRACT. Immunity to Toxoplasma gondii (T. gondii) is sexually dimorphic in humans and mice, with females having higher morbidity and mortality during immune dysfunction and HIV-AIDS. The mechanisms underlying these sex differences are unclear. We investigated how a lack of CD4+ T cells (CD4 co-receptor KO) impacted T. gondii survival in mice. Female CD4 co-receptor KO mice succumbed to T. gondii much faster than males. To dissect why female CD4 co-receptor KO mice died faster, we tested their NK cell responses to acute T. gondii infection compared to males. Although in wild-type (WT) animals, both sexes had similar increases in total NK cells and IFNγ + NK cells, infected CD4 co-receptor KO female mice had 50% fewer IFNγ+ NK cells than infected WT female mice. Infected male CD4 co-receptor KO had a similar increase in IFNγ+ NK cells as WT male mice. Since CD4 co-receptor deficient mice still have functional helper T cells that are CD4-, we next tested survival and NK cell responses in female and male MHCII deficient (MHCIIKO) animals, which completely lack helper CD4+T cells. Surprisingly, survival, NK cell numbers, and IFNγ+ NK cells were not significantly different between WT or MHCIIKO female and male mice. These results suggest CD4 co-receptor expression is required for survival via optimal NK cell responses during acute T. gondii infection only in female mice and not in male mice. Our findings reveal an unappreciated sexual dimorphic role of CD4 co-receptor expression in regulating NK cell responses to acute T. gondii infection.

Prospective Memory and Dementia Risk: Examining Associations with Blood-Based Neurodegenerative Biomarkers. Conner K. Ryan and Erin E. Harrington.
Department of Psychology, University of Wyoming, Laramie, WY 82071
E-mail: cryan19@uwyo.edu
ABSTRACT. *Background:* Prospective memory (PM; i.e., memory for future actions or events) lapses, such as forgetting to attend an appointment or take medication on time, may be one of the earliest indicators of mild cognitive impairment (MCI) and Alzheimer's Disease and related dementias (ADRD). Yet, limited work has examined links between PM and biomarkers of ADRD such as neurodegenerative biomarkers. Determining such associations may be crucial in early identification of MCI and ADRD risk. The present work addressed this gap by examining self-reported PM lapses and blood-based levels of β-amyloid and tau biomarkers among older adults. *Method:* Older adults (N=275, Mage=77.02, 68% female, 48% non-Hispanic White; 40% non-Hispanic Black) enrolled in the Einstein Aging Study completed a two-week protocol, that included blood draws for biomarker assays of β-amyloid (Aβ40, Aβ42, Aβ42:Aβ40) and phosphorylated tau (pTau181). Participants reported PM lapses at the end of each day of the two-week period via study-provided smartphones. Independent regression analyses examined links between neurodegenerative biomarkers and PM lapses (daily reports averaged across the two weeks) within the full sample and stratified by gender. Covariates included age and educational attainment. *Results:* Higher levels of pTau181 were associated with reporting more PM lapses on average across the two weeks (b=0.01, p = .005). When examined within gender, this effect appeared to be driven by women: higher levels of pTau181 were associated with reporting more PM lapses among women (n=186, b=0.02, p < .001) but not men (n=89, b=0.00, p=.678). No significant relationships emerged with β-amyloid (ps>.123). *Conclusion:* The present findings indicate that in older adults, PM lapses are related to elevated levels of pTau181 in women by not men. This finding is noteworthy, as markers of pTau181 are detectable in blood in preclinical Alzheimer's disease and increases correlate with risk of disease progression.

Mapping the Metabolic Landscape in Biological Samples Using MALDI/MALDESI Imaging Mass Spectrometry with On-Tissue Derivatization. Nilay Saha,[1] Andrew Goodenough[1], Megan Dillon[2], Michael Dillon[2], and Franco Basile.[1]

[1]Department of Chemistry, University of Wyoming, Laramie, WY 82071
[2]Department of Zoology and Physiology University of Wyoming, Laramie, WY 82071
E-mail: nsaha@uwyo.edu
ABSTRACT. The utilization of mass imaging techniques, such as MALDI-MS imaging, has proven to be an invaluable tool in obtaining spatiotemporal dynamics of various compounds. Through this method, the distribution of a wide range of compounds can be obtained. However, certain molecules, such as sterols and carbohydrates, present a significant challenge in terms of ionization, rendering it difficult to attain spatial information through MALDI-MS imaging alone. To overcome this limitation, on-tissue derivatization of sterols and carbohydrates can be a powerful technique for identifying the spatial distribution of these molecules. In the first step of method development, bee sections were extracted with MTBE/MeOH/H2O solvent, and the aqueous layer taken for carbohydrate derivatization and mixed with Girard P reagent. For sterol derivatization, the organic layer was treated with cholesterol oxidase followed by Girard P at a 1:1:1 ratio. MALDI-MS analysis was performed using DHB matrix and a MALDI-ToF/ToF-MS system (5800; Sciex). Similarly, On tissue derivatization was performed by spraying cholesterol oxidase and Girard P reagent by HTX-TM sprayer. Enhanced signals of carbohydrates in bee aqueous extracts (from head, thorax, and abdomen sections) were achieved upon derivatization. Strikingly different spectra of the bee extract were obtained when derivatized with the GP as compared to underivatized samples. A strong signal was detected corresponding to a monosaccharide of the form [M + GP]+ ion at m/z 314.1, where M corresponds to a carbohydrate with the molecular formula $C^6H^{12}O^6$. In the case of sterol detection, successful derivatization was achieved in bee and rat brain. The two-step reaction, oxidation of the hydroxyl group to a carbonyl group by cholesterol oxidase followed by reaction with GP reagent, yielded a strong signal at m/z 530.4 in bee, likely corresponding to 24-methylenecholesterol and at m/z 518.4 likely corresponding to 5-CHOLESTEN-3β-OL.

Caught in a NET: Is the Female Reproductive Tract a Sex Specific Site for Anti-Citrullinated Protein Antibodies? Ari O. Sequoia, Rachael A. Horne, Kali Franckowiak, Heather M. Rothfuss, and Brian D. Cherrington.
Department of Zoology and Physiology, University of Wyoming, Laramie, WY 82071
E-mail: atourtel@uwyo.edu
ABSTRACT. Women have a three-fold higher rate of rheumatoid arthritis (RA) as compared with men, and several reproductive factors are correlated with the increased risk of RA in women. RA autoimmunity can develop when citrullinated (cit) proteins are generated at a mucosal surface by peptidylarginine deiminase (PAD) enzymes, which post-translationally covert arginine to a non-coded citrulline residue in target proteins. Auto-antibodies to cit-proteins, termed anti-citrullinated protein antibodies (ACPAs), are produced in the mucosa, but can become systemic and trigger joint inflammation. Prior studies have established the association between PAD4 mediated neutrophil extracellular traps (NETs) which generate cit-proteins and ACPA in the sera of RA patients, while other work has localized NETs to mucosal surfaces, including in the female reproductive tract (FRT). Shared mucosal sites (ie. lung, gingiva, and gastrointestinal tract) have yet to explain the sex disparity in RA, leading us to hypothesize that the FRT mucosa is a sex specific site of NET generation and ACPA production. To begin to test our hypothesis, we first examined whether PAD enzymes and cit-fibrinogen are present in FRT fluid (FRT-F) during the mouse estrous cycle. Our results demonstrate that PAD enzymes and cit-fibrinogen levels fluctuate in wild type mouse FRT-F during the estrous cycle in parallel with PAD enzymatic activity. These results are similar to our previous work showing that in FRTF from women, ACPA levels and PAD activity peak at day 5 of the menstrual cycle, just post-menses. The FRT can locally produce antibodies, prompting us to next test whether ACPA to cit-fibrinogen and NET associated proteins are present in FRT-F across the estrous cycle. Our results show that not only are ACPA and NET associated proteins highest during metestrus,

but NETs are also visible via confocal microscopy in FRT-F. We are currently using mass spectrometry to identify the mouse FRT citrullinome during the different stages of the estrous cycle. Ultimately, our objective is to identify the mechanism by which ACPA are produced in the FRT and to identify possible targets for sex-specific diagnostic tests or treatments to improve clinical outcomes for women suffering from RA.

Uterine PGRMC1 Overexpression Causes Disrupted Embryonic, Fetal and Placental Development. Nikhil Srivastava,[1,3] Sandeep Paudel[1], Jack A. Govaerts[2], Jacob McDaniel[2], Cindy A. Pru[1], Todd A. Schoborg[2], and James K. Pru.[1]

[1]Program in Reproductive Biology, Department of Animal Science, University of Wyoming, Laramie, WY 82071

[2]Department of Molecular Biology, University of Wyoming, Laramie, WY 82071

[3]Molecular and Cellular Life Sciences Program, University of Wyoming, Laramie, WY 82071

E-mail: nsrivast@uwyo.edu

ABSTRACT. *Introduction***.** Conditional mutagenesis and overexpression studies in mice, *progesterone receptor membrane component* (*Pgrmc*) *1* and *Pgrmc2* are essential for normal fertility in the female and male. The objectives of this study were to: 1) evaluate the impact of uterine PGRMC1 overexpression on embryonic, fetal and placental growth; and 2) determine the utility of micro-CT for imaging murine prenatal development. *Methods.* **A** *Cag-loxP-STOP-loxP-Pgrmc1 (Pgrmc1-OE)* mouse line was developed to assess the impact of uterine PGRMC1 overexpression on fertility and embryonic, fetal and placental development. $Pgr^{+/+}$*;Pgrmc1-OE* (CTL) and $Pgr^{cre/+}$*;Pgrmc1-OE* (OE) animals (N=7) were used in a 6-month fertility trial. Implantation sites from **CD1, CTL, and OE dams were collected for micro-CT imaging on day of pregnancy (DOP) 7, 8, 10 and 14. Sites were formalin fixed, embedded in acrylamide hydrogel, and incubated in potassium iodide contrasting agent. Micro-CT images taken at 2-5 µm/voxel resolution were analyzed with Dragonfly software. Linear and volumetric measurements were taken for implantation sites, embryo/fetus and placentae at various DOPs throughout early gestation in CD1, CTL, and OE dams.** *Results.* Conditional overexpression of PGRMC1 in the female reproductive tract resulted in a significant decrease in the number of pups/litter and total litters. Conventional histology and micro-CT imaging established that embryonic, fetal, placental, and postnatal growth trajectories were dramatically reduced in offspring from OE dams regardless of offspring genotype. Quantified and analyzed imaging data will be discussed for embryonic/fetal measurements. *Conclusion.* Uterine overexpression of PGRMC1 impaired overall fecundity and fertility. This outcome coincides with reduced embryonic, fetal and placental fetal growth in a uterine environment. Micro-CT and AI-based segmentation of images served as a valuable approach for generating quality linear, 3D and volumetric growth measurements throughout gestation.
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Listerial Drones for Targeted Cancer Immunotherapy. Kiet N Tran, Huong Giang Pham, Larissa Gomelsky, Jason P. Gigley, and Mark Gomelsky.

Department of Molecular Biology, University of Wyoming, Laramie, WY 82071

E-mail: ktran3@uwyo.edu

ABSTRACT. Cancer immunotherapy, along with chemotherapy and radiotherapy, has become essential in cancer treatment. One promising approach involves using bacteria to stimulate the immune system to target tumors and deliver anti-cancer agents. Attenuated strains of the bacterium *Listeria monocytogenes* (*Lm*) are particularly effective because they can colonize and spread within tumors, triggering immune responses. While *Lm* has been engineered to deliver tumor antigens and has demonstrated remarkable safety in clinical trials, current *Lm* therapies face challenges, including off-target delivery and limitations on the types of anti-cancer payloads

that can be effectively used. To further improve the safety and efficacy of *Lm*-based cancer therapy, we have developed “Listerial drones" (bactodrones) equipped with a remote-control system. This system uses anhydrotetracycline to precisely control the bacteria's release of their anti-cancer payloads within tumors, minimizing damage to healthy tissues. We are also enhancing our bactodrones by exploring novel methods for delivering payloads, including DNA, RNA, and protein-based deliveries. Our results show that *Lm* can successfully deliver diverse payloads into tumors and release them in response to a remote signal. Notably, RNA-based delivery, specifically of STING (stimulator of interferon genes) agonists, proved most effective in suppressing murine breast tumor growth and improving survival in tumor-bearing mice.

Small Molecules Vary in their Ability to Protect Labile Biomolecules during Desiccation.

Chaitra Shree U S Udugere Shivakumnara Swamy, Kenny Nguyen, Tyler Gonzalez, Vincent Nicholson, and Thomas C. Boothby.

Department of Molecular Biology, University of Wyoming, Laramie, WY 82071

E-mail: cudugere@uwyo.edu

ABSTRACT. Desiccation, the loss of intracellular water, is extremely detrimental to living cells, damaging the cell’s labile components like proteins, nucleic acids, and membranes. Despite this, there are desiccation-tolerant organisms, such as tardigrades, which have evolved to survive the loss of nearly 95% of their intracellular water. A major strategy through which desiccation-tolerant organisms mitigate damage is the enrichment of small molecules. However, there are hundreds of different metabolites implicated in desiccation tolerance, and their exact functions are poorly understood. Here, we screen several small molecules spanning various categories, including excipients, osmolytes, sugars, polymers, and polyamines, to assess their ability to prevent four different types of desiccation-induced damage: protein unfolding, protein aggregation, membrane leakage, and RNA degradation. Our results demonstrate that small molecules vary significantly in their protective capacity. Known desiccation tolerance mediators such as trehalose, sucrose, maltose, and polyamines exhibited notable efficacy in preventing various types of damage. Several small molecules were only able to prevent one type of desiccation-induced damage, highlighting the specificity of their mechanisms. Overall, this research underscores the multifaceted nature of desiccation stress, as well as the need for organisms to enrich themselves with multiple diverse protectants. Ultimately, understanding the mechanisms of these protectant molecules could offer potential avenues for developing novel strategies for the transportation and long-term storage of pharmaceuticals in arid conditions, eliminating the need for reliance on the cold chain. These advancements hold promise for addressing challenges within the pharmaceutical industry while promoting sustainability and efficiency.

Deciphering Molecular Interactions that Shapes Polycomb Protein Polyhomeotic Paralogs Oligomerization and Phase Behavior Using Multiscale Computer Simulations.

Vithurshan Varenthirarajah and Utkarsh Kapoor.

[1]Department of Chemical and Biomedical Engineering, University of Wyoming, Laramie, WY 82071

E-mail: utkarsh.kapoor@uwyo.edu

ABSTRACT. The organization of DNA into chromatin is an important process that defines cell identity and key cellular processes. Spatial organization of chromatin is a crucial aspect of genome regulation that influences gene activity in different regions of the genome. Chromatin architecture is regulated by various proteins, and Polycomb group (PcG) proteins play an important role. PcG proteins has two main complexes, Polycomb Repressive Complex 1 (PRC1) and PRC2. PRC1 is responsible for adding the H2AK119ub histone modification, while PRC2 catalyzes the H3K27me3 modification. These modifications are not only responsible for transcriptional repression but also for the recruitment of additional regulatory proteins. In

humans, while canonical PRC1 consists of four core subunits, PHC1/2/3 (collectively known as Polyhomeotic paralogs) proteins are responsible for mediating long range interactions with chromatin. PHC paralogs have a conserved Sterile Alpha Motif (SAM) (similar amino acid composition and length) and less conserved disordered domains classified as linker, HD1, and FCS zinc finger (different amino acid composition and length). Recent studies have shown that SAM oligomerization activity is crucial for phase separation and regulation of chromatin architecture by PHC proteins. However, information regarding the interplay between the disordered domains and SAM on its dimerization, the influence of SAM dimerization on phase separation behavior, and the distinct contribution of the PHC paralogs in chromatin architecture regulation is rudimentary and remains an open question. To answer these quandaries, in this study we employ atomistic and coarse-grained molecular dynamics simulations in conjunction with enhanced sampling techniques and elucidate how the disordered domain (linker) affects the SAM dimerization across different PHC paralogs. We also identify sequence features in both conserved and disordered domains responsible for SAM dimerization and phase separation among PHC paralogs. Our findings provide insights on how gene duplication and divergence have shaped roles of PHC proteins in chromatin organization.

Even Bacteria Use Libraries. Sheila Walsh,[1] Dan Wall[1], and Cole Stevens.[2]
[1]Department of Molecular Biology, University of Wyoming, Laramie, WY 82071
[2]School of Pharmacy, University of Mississippi, University, MS 38677
E-mail: swalsh13@uwyo.edu
ABSTRACT. Recently, novel symbiotic bacteria were isolated from the soil beneath a spruce tree in White Lake, Michigan. These bacteria require each other to grow apparently due to missing key components in their genomes. One partner, *Archangium* sp., has a 12 Mbp genome but, for example, lacks several enzymes necessary for synthesizing branched-chain amino acids such as leucine and valine. The other partner, *Microvirga* sp., has a 4 Mbp genome and cannot synthesize nicotinamide adenine dinucleotide (NAD^+). We believe these two symbionts cross-feed each other to provide the missing compounds. It has been shown that many species of bacteria can share metabolites through diffusion or exchange processes (Kost, 2015). However, cross-feeding is just one facet of their interaction.

Archangium sp. is a myxobacterium, which means it is predatory and has demonstrated the ability to kill *E. coli*. Our first strategy to determine whether *Microvirga* sp. produces a diffusible protectant was unsuccessful. Here, after growing *E. coli* in the media used to culture the symbionts, we challenged *E. coli* with the symbionts. *E. coli* was still predated upon by *Archangium* sp.

Our second hypothesis is that *Microvirga* sp. produces a cell surface receptor recognized by *Archangium* sp. that confers protection. The goal of this project is to create a DNA expression library to identify interesting genes from these two novel symbiotic bacteria, with a focus on genes that help to protect *E. coli* from predation.

Doppelgängers and Self-Similar Avatars for Spanish Language Learning in Virtual Reality. Milan Wolff,[1] Jennifer LaVanchy[2], and Amy Banić.[1]
[1]Electrical Engineering and Computer Science, University of Wyoming, Laramie, WY 82071
[2]Modern and Classical Languages, University of Wyoming, Laramie, WY 82071
E-mail: mwolff3@uwyo.edu
ABSTRACT. While virtual instructors have long been used in learning applications, the ideal visual appearance of these pedagogical agents to facilitate learning and promote positive psychological effects in virtual reality has not been established. Prior research suggests that the use of self-similar virtual humans, also known as doppelgängers, promotes feedforward learning in kinesthetic tasks such as dance, but the use of doppelgängers in foreign language learning remains an underexplored area in VR research. Furthermore, greater similarity between the

user and their avatar is known to enhance embodiment, yet recent studies suggest that dissimilarity has positive impacts on foreign language learning. In this 2x2 within-subjects study, we investigate the interacting effects of self-similarity in virtual instructor and user avatar design to promote introductory level Spanish language learning. Participants (n = 21) completed four introductory level Spanish language lessons. Self-similar virtual humans had a positive effect on enjoyment, engagement, and sense of presence, while self-similar avatars promoted greater avatar embodiment, wishful identification with the avatar, and a higher subjective sense of similarity. In addition, liking one's avatar had a moderate effect on learning outcomes. Our findings suggest that the use of both self-similar virtual humans and avatars may enhance positive psychological effects and learning outcomes in virtual reality environments intended for foreign language learning.

Exploring the Combined Effect of Aerobics and Resistance Exercise for Intervention of Alzheimer's Disease in Mouse Models. Mingming Yang,[1] Qin Zhu,[1] Sishir Gautam,[2] Malique Singleton,[2] Shuvo Saha,[2] Derek Austin Smith,[2] and Yun Li.[2]

[1]Department of Kinesiology and Health, University of Wyoming, Laramie, WY 82071

[2]Department of Zoology and Physiology, University of Wyoming, Laramie, WY 82071

E-mail: myang5@uwyo.edu

ABSTRACT. Alzheimer's disease (AD) comprising around 80% of dementia cases, predominantly affects individuals aged 65 and above. AD patients encounter difficulties in memory retention and severe cognitive decline, significantly diminishing their quality of life. Physical exercise has emerged as an effective non-pharmacological intervention for AD. Studies in human and mouse models support that various physical activity boosts hippocampal neurogenesis, reduces the neuropathological hallmarks of AD, and protects against cognitive decline. Aerobics exercise (AE), such as treadmill running, has been shown to attenuate spatial memory impairment through improving the clearance of Aβ plaque. Resistance exercise (RE) represents an alternative strategy for enhancing muscle mass, strength, and balance, given the fact that compromised life quality in the elderly population is largely due to loss of muscle strength and endurance. Previous studies suggest that RE may also be neuroprotective via promoting the release of neurotrophic factors and eliciting immunomodulatory responses. Here we aim to use mouse models to explore the combined effect of AE and RE for intervention of AD. 13-14 month-old male and female 3xTG mice were randomly assigned to either an AE/RE combined exercise group or a sedentary control group. During the 6-weeks exercise period, AE was achieved by treadmill running 3 times per week; and RE by climbing an inclined ladder with increased weights carrying for 2 times per week. Various cognitive tasks including Y-maze test for spontaneous alternation, novel object recognition and novel place recognition tests, were performed before and after the 6-weeks physical activity, and compared to that of the sedentary controls. We expect that AE and RE combined exercise could effectively restore cognitive function, reduce Aβ plaque and tauopathy, and reduce neuroinflammation in the 3xTG mice brains.

Direction Selective Tectal and Midbrain Tegmental Neurons in the Xenopus Tadpole. Kaiyuan Zheng,[1] Uwemedimo G. Udoh,[1,2] and Kara Pratt.[1]

[1]Department of Zoology and Physiology, University of Wyoming, Laramie, WY 82071

[2]St. Jude Research, St. Jude Children Research Hospital, Memphis, TN 38105

E-mail: kzheng1@uwyo.edu

ABSTRACT. There are two direct projections from the tadpole retina to the midbrain: the retinotectal projection and the retinotegmental projection. The well-studied retinotectal projection is considered homologous to the mammalian superior colliculus (SC). The retinotegmental projection is most likely the accessory optic system (AOS), a highly conserved retinofugal projection which has been described across a wide range of vertebrates, from adult frogs to

humans. The tegmental neurons of the AOS are known to be direction selective. They are activated optimally by slow velocity motion and, in turn, elicit compensatory optokinetic and optomotor reflexes - eye and head/body movements, respectively, that stabilize the visual world as the organism moves through space. If the tegmental neurons of the tadpole midbrain are part of the AOS, they should be direction selective. Hence, in this study, we measured direction selectivity expressed by tadpole tegmental neurons and, for comparison, tectal neurons. For this, slow-moving bars of light moving in four directions (up, down, left, right) were projected onto one eye of the tadpole, and resulting synaptic responses (whole-cell voltage-clamp) and action potential spikes (loose cell attached current-clamp) recorded from individual neurons in the contralateral tectum and tegmentum. Recordings were carried out between developmental stage 42 (approximately 5 days postfertilization, when the retinal ganglion cell axons have just begun to innervate their midbrain targets), to developmental stage 48/49 (10-18 days postfertilization). A direction selectivity index (DSI) for each orientation was calculated for each neuron. A DSI > 0.2 was considered direction selective. The finding of direction selective tegmental neurons is consistent with them being part of the AOS. We also identified direction selective neurons in the optic tectum, which may be homologous to the direction selective neurons of the mammalian SC that are known to be associated with saccades.

Casein Kinase 1 Delta and Epsilon Regulate Expression of the Long Non-Coding RNA Rhabdomyosarcoma 2-Associated Transcript during Postnatal Development of the Female Reproductive Tract. Ashley E. Zielinski-Schloegel,[1] Dania-Belen Sinzu-Prieto,[2] Cindy A. Pru,[2] Nikhil Srivastava,[1] Emily E. Schmitt,[3] and James K. Pru.[2]

[1]Molecular and Cellular Life Sciences Program, University of Wyoming, Laramie, WY 82071
[2]Program in Reproductive Biology, Department of Animal Science, University of Wyoming, Laramie, WY 82071
[3]Division of Kinesiology and Health, University of Wyoming, Laramie, WY 82071

E-mail: azielin1@uwyo.edu

ABSTRACT. *Introduction.* The long noncoding RNA (lncRNA) rhabdomyosarcoma 2-associated transcript (*Rrmst*) functions as a transcriptional regulator by binding to SOX2, which recruits the WNT effector TCF/β-catenin to start the transcription of *Wnt/β-catenin* genes. *Rmst* also harbors at least three different microRNAs, that when processed, regulate the expression of select classes of genes, including those within the WNT signaling pathway. Previous studies from our lab demonstrated that double conditional knockout of *casein kinase 1 δ* and *1ε* (*Csnk1δ/ε*$^{d/d}$) prevents development of the endometrial glandular epithelium (GE) during postnatal development. RNA sequencing revealed that *Rmst* and several *Wnts*, *Wnt receptors*, and *Wnt regulatory molecules* were downregulated in the uteri of *Csnk1δ/ε*$^{d/d}$ mice on postnatal day (pnd) 8, a time when the GE first appears. The objectives of this study were to: 1) evaluate *Rmst* expression throughout early postnatal uterine development; and 2) validate uterine downregulation of *Rmst* in the *Csnk1δ/ε*$^{d/d}$ female on pnd 8. *Methods.* The reproductive tracts from CD-1 female mice on pnd 5, 7, 9, 11, 15 and 21, as well as from control and *Csnk1δ/ε*$^{d/d}$ mice on pnd 8 were collected and evaluated for *Rmst* expression by qPCR and *in situ* hybridization (ISH). *Results.* *Rmst* was abundantly expressed in the endometrial luminal epithelium (LE) and GE along with some light punctate expression in the stroma from pnd 5-11. By pnd 15 expression in the stroma was lost and epithelial *Rmst* expression gradually decreases through pnd 21. *Conclusion.* The observed pattern of *Rrmst* expression in the postnatal uterus suggests that it plays a role in regulating early postnatal development of the endometrium, particularly in establishing the fate of epithelial tissues. Future studies will evaluate the expression of *Rmst* during additional WNT signaling-dependent events in the adult female reproductive tract, such as during embryo implantation and endometrial decidualization, and the requirement of this unique lncRNA for WNT signaling events in the uterus and pregnancy through *Rmst* mutagenesis studies. *Support.* MCLS Graduate Program, NIH

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UNDERGRADUATE POSTER PRESENTATIONS

Abigayl G. **Arnold**, Jack A. Govaerts, Jacob McDaniel, Shalini Chakraborty, Steven J. Florez, and Todd A. Schoborg. **Designating the Critical Functions of Abnormal Spindle and Protein Phosphatase 2A in Drosophila Brain Development.** Department of Molecular Biology, University of Wyoming (Laramie, WY); **E-mail:** aarnol14@uwyo.edu

Tara **Baer**, Rosa Virginia Melinda, Jinto Miao, Tasnim Ara, Nishan Paudyal, and Jing Zhou. **Can We Turn CO_2 from a Problem into a Solution?** Department of Chemistry**,** University of Wyoming (Laramie, WY); **E-mail:** Tbaer@uwyo.edu

Sharanya S. **Bettadapura**,[1,2] Sushumna B. Satyanarayana,[1] Vaishnavi Bhavsar,[1] Jaden Campbell,[1] Danielle S. Taylor,[3] Evan C. Johnson,[1] Nicole L. Bedford,[3] and Danielle R. Bruns.[1] **Atrial Natriuretic Peptide as a Circadian Modulator of Age-Related Nocturia.** Division of Kinesiology & Health, University of Wyoming (Laramie, WY); [2]Molecular and Cellular Life Sciences, University of Wyoming (Laramie, WY); [3]Department of Zoology and Physiology, University of Wyoming (Laramie, WY); **E-mail:** jcampb63@uwyo.edu

Vaishnavi **Bhavsar**, Sharanya S. Bettadapura, Julian Matthews, Mushu Yusifova, and Danielle Bruns. **Mechanisms of Circadian Control by the Cardiac Molecular Clock.** Department of Kinesiology and Health, University of Wyoming (Laramie, WY); **E-mail:** vbhavsar@uwyo.edu

Solana **Burbul**. **Quantifying Human Impact and Land Vulnerability in the Cirque of the Towers.** Central Wyoming College (Riverton, WY); **E-mail:** srb0215@cwc.edu

Solana **Burbul**. **The Eastward Movement of Tornado Alley Since 1951.** Central Wyoming College (Riverton, WY); **E-mail:** srb0215@cwc.edu

Addilyn **Burton,** Taige Lee, Easton Haskell, Julia Tofane Maia Vilasboas, Lazar Jimerson, Amelia Tate, Lucy Graham, Claudia Troxel. **Development of Inhalation Chamber for Smoke Exposure of Cells in Culture.** Department of Biology, Central Wyoming College (Riverton, WY) **E-Mail:** taigelee3@gmail.com

Addilyn **Burton,** Taige Lee, Easton Haskell, Julia Tofane Maia Vilasboas, Lazar Jimerson, Amelia Tate, Lucy Graham, and Claudia Troxel. **Impact of Wood Fire and Artemisia Tridentata Smoke on Human Bronchial Epithelial Cells.** Department of Biology, Central Wyoming College (Riverton, WY). **E-mail:** taigelee3@gmail.com

Bryn M. **Catlin**[1] and Jim Mildenberger.[2] **Characterizing Antimicrobial Resistance in Staphylococcus aureus from Human and Animal Isolates.** [1]University of Wyoming (Laramie, WY); [2]Wyoming Public Health Lab (Cheyenne, WY); **E-mail:** bcatlin@uwyo.edu

Penelope N. **Charles**, Hunter I. Copp, Eva M. Harlan, Stephanie L. Servetas, and Ami N. Erikson. **Characterization of the Microbiota from Thermopolis, WY Hot Springs.** Department of Natural Sciences, Sheridan College (Sheridan, WY); **E-mail:** penelopecharles@sheridan.edu

Kayla **Clymore,**[1] Rachel Heffley,[1] Ainsley Hokanson,[1] Nathan Johnson,[1] Rachel Kaiser,[1] Cody McClarnon,[1] Tess Palen,[1] Maddie Sites,[1] Jonathan Thornton,[1] Sammy Patterson,[1] Dagmara Motriuk-Smith,[2] Joshua Holmes,[3] and Grant Bowman.[1] **High-Resolution Genetic Analysis of Protein Interaction Specificity**. [1]Department of Molecular Biology, University of Wyoming

(Laramie, WY); [2]University of Wyoming at Casper (Casper, Wyoming); [3]Department of Biology, Western Wyoming Community College (Rock Springs, Wyoming); **E-mail:** kclymore@uwyo.edu

Hannah **Coffman**,[1] Kassidy Dunagan,[1] Brian Cherrington,[2] and Heather Talbott.[1] **Estrogen Regulation of Pregnancy-Induced Pituitary Changes in PAD2 Expression.** [1]Department of Zoology Physiology, University of Wyoming (Laramie, WY); [2]Department of Biology, Laramie County Community College (Cheyenne, WY); **E-mail:** htalbott@lccc.wy.edu

Viyaleta **Davydzenka** and Zoe Kriegel. **The More You Listen, The More You Understand: Perception and Progression in PPAOS.** Division of Communication Disorders, University of Wyoming (Laramie, WY); **E-mail:** vdavydze@uwyo.edu

Isabella K. **DeBoer**, Krista M. Gorrell, Liz Martinez Tzompa, Rubi Sosa-Carlos and Kirsten Kapp. **The Tearing of the Wear: Microplastic Pollution in Flat Creek, Jackson, WY.** Department of Mathematics and Science, Central Wyoming College (Jackson, WY); **E-mail:** kkapp@cwc.edu

Adriana **Deming,**[1] Zoey Woods,[1] Gavin Martin,[1] Kyle Schnepp,[2] and Garreth Powell.[2] **Antennal Sexual Dimorphism in Rhipiceridae.** [1]Department of Biology, Laramie County Community College (Cheyenne, WY); [2]Department of Entomology and Plant Pathology, North Carolina State University (Raleigh, NC); **E-mail:** zoeywoods@student.lccc.wy.edu

Roger **DesRosier,**[1] Sydney Legler,1 Melly Udodong,1 and Uko Udodong.[1] **Spiced Glycophospholipids in Membrane Transport and Signal Transduction.** Department of Chemistry, Northwest College (Powell, WY); **E-mail:** sydney.legler@nwc.edu

John **Dickinson**, Alex Watts and Petru Baraghin. **Bluetooth-Enabled Temperature Data Collection System for GIS Applications.** Computer Technology, Central Wyoming College (Riverton, WY); **E-mail:** jed0809@cwc.edu

Taylor **Erickson**, Jongchan Woo, Tathagato Roy, Jason Gigley, and Eunsook Park. **Autophagy Inhibition In *Toxoplasma gondii* Infection.** Department of Molecular Biology, University of Wyoming (Laramie, WY); **E-mail:** taylorgrace307@gmail.com

Tatiana **Farrington**, Roger DesRosier, Russel Baer, Sydney Legler, Kallie Stucki, Kayla Horsen, Katie Dandridge, KateLynne Herren, Cole Young, Ashley Rosales, Shir Shamedov, Joey Andrade, Koiki Hasegawa, Allan Childs, and Eric C. Atkinson. **Scent of Science: The Antimicrobial Properties of Wyoming's Native Plant Species.** Northwest College (Powell, WY); **E-mail:** tatiana.farrington@nwc.edu

Abigail **Flesvig**[1], Nikhil Srivastava,[1,2] Cindy A. Pru,[1] Dania Belen-Sinzu Prieto,[1] and James K. Pru.[1] **A Novel Pgrmc1H165R-HA Missense Mutant Mouse Line to Study PGRMC1 Functions in Physiology and Disease.** [1]Program in Reproductive Biology, Department of Animal Science, University of Wyoming (Laramie, WY); [2]Molecular and Cellular Life Sciences Program, University of Wyoming (Laramie, WY); **E-mail:** aflesvig@uwyo.edu

Willow **Goeglein**,[1] Ilana Neuberger,[2,3] Krystle Barhaghi,[4] and Katelyn J. Kotlarek.[1] **Morphology of the Tensor Veli Palatini Muscle in Children With and Without PE Tubes**. [1]Division of Communication Disorders, University of Wyoming (Laramie, WY); [2]University of Colorado, School of Medicine (Aurora, CO); [3]Children's Hospital Colorado (Aurora, CO); **E-mail:** wlarson4@uwyo.edu

Marlenne **Gracia**,[1] Gavin Martin,[1] Daira Ruiz,[1] Nathanael Poch,[1] Amanda Sinott,[1] and Gareth Powell.[2] **Exploring the Origins and Morphological Evolutionary History of Pyrophorini.** [1]Department of Biology, Laramie County Community College (Cheyenne, WY); [2]Department of Entomology and Plant Pathology, North Carolina State University (Raleigh, NC); **E-mail:** marlennegracia@student.lccc.wy.edu

Riley **Graham**,[1] Erica Pasley,[1] Chelby Frandsen,[1] Lizeth Hernandez-Tafoya,[1] Dagmara Motriuk-Smith[1], Joshua Holmes,[2] and Grant Bowman.[3] **Intrinsically disordered protein interactions: PopZ and its binding partners.** [1]University of Wyoming at Casper (Casper, WY); [2]Western Wyoming Community College (Rock Springs, WY); [3]Department of Molecular Biology, University of Wyoming (Laramie, WY); **E-mail:** rgraha12@uwyo.edu

Caroline **Hansen,**[1] Julia Yearout,[2] and Riley F. Bernard.[2] **Feasting in the Night: A Dietary Investigation of Bats in Wyoming.** [1]Department of Botany, University of Wyoming (Laramie, WY); [2]Department of Zoology and Physiology, University of Wyoming (Laramie, WY); **E-mail:** chanse34@uwyo.edu

Ava **Herceg**, Emi Story, Cagney O'Hara, and Gavin Martin. **Eyeing the Ladies**. Department of Biology, Laramie County Community College (Cheyenne, WY); **E-mail:** cagneyohara@student.lccc.wy.edu

Gustavo A. **Hernandez**, W. Cole, Z. Zhaojie, T. Trey, and Emily Schmitt. **Tick-Tock, Exercise O'Clock: Investigating the Role of Exercise in Restoring SCN Function and Circadian Health.** Department of Kinesiology and Health, University of Wyoming (Laramie, WY); **E-mail:** ghernan7@uwyo.edu

Dylan **Hicks,**[1,2] and Charlotte Snoberger.[2] **Exploring Spatial Distribution and Habitat of Spadefoots near Casper, Wyoming.** [1]University of Wyoming at Casper (Casper, WY); [2]Department of Biology, Casper College (Casper, WY); **E-mail:** dhicks6@uwyo.edu

Rachael **Horne**, Ari Sequoia, and Brian Cherrington. **Hormonal Control of Peptidylarginine Enzymes in the Development of Neutrophil Extracellular Traps in the Female Reproductive Tract.** Department of Zoology and Physiology, University of Wyoming (Laramie, WY); **E-mail:** rhorne1@uwyo.edu

Baily **Isaak**,[1] Elizabeth B. Quigley,[1] Alexandra Verosky,[2] Brian S. Edwards,[3] Shaihla A. Khan,[4] Ulrich Boehm,[5] Roger J. Davis,[6,7] Amy M. Navratil.[1] **Dumping the JNK; Exploring the Impact of c-Jun NH2-terminal Kinase on the Female Reproductive System.** [1]Department of Zoology and Physiology, University of Wyoming (Laramie, WY); [2]School of Medicine, University of Colorado (Denver, CO); [3]Department of Physiology and Biomedical Engineering, Mayo Clinic (Rochester, MN); [4]Genus PLC (DeForest, WI); [5]Experimental Pharmacology, Center for Molecular Signaling, Saarland University School of Medicine (Homburg, Germany); [6]Program in Molecular Medicine, University of Massachusetts Medical School (Worcester, MA); [7]Howard Hughes Medical Institute (Worcester, MA); **E-mail:** bisaak1@uwyo.edu

Tanner **Jaworski**, Britton Bluter, and Luis Alza. **Edible and Medicinal Wyoming Plants Held in the Casper College Herbarium.** Department of Biology, Casper College (Casper, WY); **E-mail:** eris.jaworski@mycc.caspercollege.edu

Logan R. **Jensen**, Pravas Roy, and Dan Wall. **Controlled Expression: Gene Activation in a Bacterial Predator.** Department of Molecular Biology, University of Wyoming (Laramie, WY); **E-mail:** ljense17@uwyo.edu

Lachlan C. **Johnson**, Seungmee Jung, Jongchan Woo, and Eunsook Park. **Building a Structure-Based Database of Fungal Pathogens for Food/Medical Security.** Department of Molecular Biology, University of Wyoming (Laramie, WY); **E-mail:** ljohn130@uwyo.edu

Danielle J. **Kosmicki** and Yun Li. **Preliminary Data on Using the Vicarious Chronic Social Defeat Stress Model to Study Depression in Male Mice.** Department of Zoology and Physiology, University of Wyoming (Laramie, WY); **E-mail:** jkosmick@uwyo.edu

Lillian **Laird** and Jared Bushman. **Isolation and Purification of Schwann Cell Cultures.** School of Pharmacy, University of Wyoming (Laramie, WY); **E-mail:** llaird2@uwyo.edu

Sydney **Legler**, Tatiana Farrington, Cole Young, and Austin Conklin. **Exploring Risk Alleles for Coronary Artery Disease.** Department of Biology, Northwest College (Powell, WY); **E-mail:** sydney.legler@nwc.edu

Selena A. **Melendez** and Sheba N. David. **Bioactive Wound Healing Hydrogel Membrane by Casting Method for Chronic Infected Wounds.** Department of Pharmacy, University of Wyoming (Laramie, WY); **E-mail:** smelend2@uwyo.edu

Madison **Olson**,[1] William Weader,[1] RaghuRam Prasad,[1] Chavely Cruz Cárdenas,[1] Mason Agor,[1,2] Brian Cherrington,[2] Danielle Bruns,[3] and Florence Teulé-Finley.[1] **Myocardial Citrullination and Cardiac Health: Investigating Age and Gender Effects through Mice Models.** [1]University of Wyoming at Casper (Casper, WY); [2]Department of Zoology and Physiology University of Wyoming (Laramie, WY); [3]Division of Kinesiology and Health, University of Wyoming (Laramie, WY); **E-mail:** molson31@uwyo.edu

Samantha **Patterson**,[1] Abigail Straight, [1] Cody McClaron,[1] Rachel Kaiser,[1] Kayla Clymore,[1] Ainsley Hokanson,[1] Ray Heffley,[1] Tess Palen,[1] Maddie Sites,[1] Nathan Johnson,[1] Jonathan Thornton,[1] Josh Holmes,[2] Dagmara Motriuk-Smith,[3] and Grant Bowman.[1] **Understanding the Binding Specificity of a Hub Protein Through a Mutational Screen.** [1]Department of Molecular Biology, University of Wyoming (Laramie, WY); [2]Department of Microbiology, Western Wyoming Community College (Rock Springs, WY); [3]University of Wyoming Casper (Casper, WY); **E-mail:** rkaiser1@uwyo.edu

Fatima **Perin**,[1,2] Sara Leach,[1,2] and Luis Alza Leon.[2] **Microplastic in Terrestrial Environments: A Study on Great Horned Owls (Bubo virginianus) Pellets.** [1]University of Wyoming at Casper (Casper, WY); [2]Department of Biology, Casper College (Casper, WY); **E-mail:** fatimabujosa16@gmail.com

Rishab M. **Ranjitkar**,[1] Kate Bunton,[2] Brad H. Story,[2] and Katelyn J. Kotlarek.[1] **Using 2-Year-Old Synthesized Speech to Identify Velopharyngeal Coupling Area for Oral Stop Versus Nasal Consonants.** [1]Division of Communication Disorders, University of Wyoming (Laramie, WY); [2]Department of Speech, Language, and Hearing Sciences, University of Arizona (Tucson, AZ); **E-mail:** rranjit1@uwyo.edu

Trevor **Rasmuson**, Morgane Vandendoren, Danielle Taylor, and Nicole Bedford. **Social Rank-Dependent Micturition: Investigating the Molecular Basis of Changes in Neural Circuit**

Function. Department of Zoology and Physiology, University of Wyoming (Laramie, WY); **E-mail:** trasmuso@uwyo.edu

Grace D. **Ritchie**, John Oakey and Katie D. Li-Oakey. **Electrospun Nanofibers for Composite Granular Hydrogel Tissue Scaffolds.** Department of Chemical and Biomedical Engineering, University of Wyoming (Laramie, WY); **E-mail:** graceritchie19@gmail.com

Abagail A. **Straight**,[1] Samantha Patterson,[1] Dagmara Motriuk-Smith,[2] Joshua Holmes,[3] and Grant Bowman.[1] **Genetic Analysis of Protein Binding Specificity for a Bacterial Hub Protein**. [1]Department of Molecular Biology, University of Wyoming (Laramie, WY); [2]University of Wyoming at Casper (Casper, WY); [3]Western Wyoming Community College (Rock Springs, WY); **E-mail:** astraigh@uwyo.edu

Merry **Teague**, Tathagato Roy, and Jason Gigley. **Effects of 2-Aryl-2-(3-indolyl) acetohydroximates (AKS7) on *T. gondii.*** Department of Molecular Biology, University of Wyoming (Laramie WY); **E-mail:** mteague2@uwyo.edu

Matthew T. **Werbelow**, and Todd Schoborg. **Investigating the Rold of Abnormal Spindle Protein in Microcephaly.** Department of Molecular Biology, University of Wyoming (Laramie, WY); **E-mail:** mwerbel2@uwyo.edu

Wolfgang **Wuerker**, Katherine A. Berry, McKenna Guzman, and Alison Looby. **Ruminative Thinking Facets Moderate the Relation Between Social Anxiety and Cannabis Consequences.** Department of Psychology, University of Wyoming (Laramie, WY); **E-mail:** wwuerker@uwyo.edu