1. Understanding epigenetic mechanisms of lactation failure

**Investigator:** Brian Cherrington

**Issue:** Across species, obesity negatively affects lactational performance. Understanding of the role of obesity in altering hormonal control of lactation is improving; yet, the downstream effects on changes in milk gene expression not due to alteration in DNA sequence (i.e., epigenetics) is unclear.

**Goal:** The goal is to study if an epigenetic enzyme family termed peptidylarginine deiminases is negatively affected by obesity resulting in changes in milk production. These enzymes convert the amino acid arginine in histone tails to the non-coded residue citrulline to regulate gene expression.

**Objectives:** The specific objectives for this project are to 1) determine how prolactin increases expression of peptidylarginine deiminases in mammary epithelial cells and 2) determine the role of peptidylarginine deiminases and histone citrullination in regulating mammary gland gene expression.

**Impact:** Given the growing obesity rate in Wyoming and nationwide, viable, cost-effective strategies are needed to combat the growing epidemic. Project results should determine how obesity influences lactational performance at the cellular level with the ultimate goal of promoting breastfeeding to combat obesity.

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**Key Words:** epigenetics, lactation, obesity

**PARP:** VII:1,2

2. Regulation of nuclear size in cancer cells

**Investigators:** Daniel Levy, Predrag Jevtić, and Karen White

**Issue:** The nucleus is a compartment within each cell that contains the genetic information directing the growth and identity of that cell. The size of the nucleus is often inappropriately enlarged in cancer cells, a change that pathologists use to diagnose and stage disease. Yet, little is known about the causes or effects of nuclear morphology changes in cancer.

**Goal:** The goal is to determine how nuclear size impacts cell function and contributes to cancer development and progression.

**Objectives:** Specific objectives are to 1) quantify nuclear size in normal and cancer tissue culture cell lines, 2) manipulate nuclear size in these cells by transfection, and 3) determine how altering nuclear size affects cell growth, death, and migration.

**Impact:** Results should identify novel approaches and targets for cancer diagnosis and treatment, and new cancer susceptibility factors could be identified to aid in prevention.

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**Key Words:** nuclear size, cancer cell biology, health

**PARP:** None applicable
3. Social and economic survey of public land ranchers

**Investigators:** Bree Lind, John Tanaka, and Kristie Maczko

**Issue:** There is a lack of information regarding the social and economic contributions public land ranchers have to their communities on a national scale. Understanding these relationships could lead to better decision-making strategies by public land policymakers.

**Goal:** The goal of this study is to determine how public land ranchers contribute to the economics and social structure of their local communities on a national scale.

**Objectives:** Specific objectives include collecting economic and social data through a national survey. This data can be used to create accurate socio-economic models, which in turn could be used for decision-making.

**Impact:** Results could assist public land agencies and policymakers in their decisions about public land management at the local to national scales. Accurate economic and social models could also assist public land agencies in social and economic impact analyses for required planning documents, e.g., environmental assessments and environmental impact statements.

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**Key Words:** impact analysis, ranching, public lands

**PARP:** VII:3, IX:1,3

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4. Mapping socio-economic and ecological impacts of development projects in Wyoming

**Investigators:** Leticia Varelas, John Tanaka, Ben Rashford, and John Ritten

**Issue:** Agencies such as the U.S. Bureau of Land Management (BLM) are required to estimate potential impacts of development projects on federal lands in a timely manner. These agencies, however, are often limited by available resources for data collection, expertise for thorough project analysis, and strict time requirements necessary to comply with National Environmental Policy Act guidelines, especially socio-economic impacts.

**Goal:** Goals are to 1) use spatial data and ArcGIS to map the human footprint of wind energy development in Wyoming by estimating impacts on ecological and socio-economic systems and 2) determine the optimal land use scenario given potential impacts and land management objectives.

**Objectives:** Specific objectives include modeling 1) spatial relationships between wind energy development and ecological factors such as wildlife, plant communities, and soil erosion and 2) relationships between wind energy development and socio-economic factors such as viewshed, current land uses, and local communities.

**Impact:** Project results should assist the BLM in conveying social and economic impacts of proposed development—including wind energy—to the public. The project should also help the BLM more efficiently assess future projects based on limited staff resources.

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**Key Words:** impact analysis, landscape analysis, human footprint

**PARP:** XII
5. Myxobacteria as biocontrol agents against crop pathogens

**Investigator:** Dan Wall

**Issue:** Crop pathogens have a significant detrimental impact on Wyoming and U.S. agriculture. Biocontrol agents can offer an environmentally friendly and cost-effective means to help suppress crop diseases.

**Goal:** The goal is to investigate the feasibility of using myxobacteria as a biocontrol agent to protect crops against pathogens. Since myxobacteria can produce spores that allow for long-term storage and because they prey on soil microbes, they hold promise as commercial biocontrol agents.

**Objectives:** Specific objectives include 1) assessing the ability of myxobacteria to live in the rhizosphere, the soil environment immediately surrounding plant roots, 2) identifying and characterizing myxobacteria gene products that block crop pathogen growth, and 3) testing whether myxobacteria can protect sugarbeet seedlings in the laboratory.

**Impact:** Results should provide both a theoretical and practical analysis of how myxobacteria might be used to suppress crop disease.

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**Key Words:** biocontrol, myxobacteria, pathogens

**PARP:** VIII:2

6. Variations of soil phosphorus chemical forms in a cold, semiarid climate

**Investigators:** Mengqiang Zhu, Larry Munn, David Williams, Jay Norton, Yongfeng Hu, and Teresa Lehmann

**Issue:** Phosphorus (P) deficiency in soils is prevalent in Wyoming, and increasing soil P availability for plant uptake is an important strategy to enhance productivity and sustainability of both farmland and rangeland ecosystems.

**Goal:** The goal is to determine P chemical forms in Wyoming soils that determine P short- and long-term availability for plant uptake.

**Objectives:** Specific objectives are to address 1) what the P chemical forms are in natural and disturbed Wyoming rangeland soils, 2) how the P forms depend on climate variables, and 3) how these forms developed to the current state as soil formed over thousands of years.

**Impact:** Results should help land managers, ranchers, and others evaluate sustainability of rangeland ecosystems in terms of nutrient availability. They could also benefit ranchers and farmers improve P use efficiency.

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**Key Words:** phosphorus, rangeland soils, chemical forms

**PARP:** I:1, X:1