College of Agricultural Sciences Undergraduate Research Fellowship

Project Application

The College of Agricultural Sciences has developed an Undergraduate Research Fellowship for up to ten students per year from across the College. We aim to provide opportunities for undergraduates to find purpose, mentorship and community within their academic discipline and we aspire to facilitate self-discovery through research engagement and increase access for all undergraduates to impactful science.

Student are encouraged to compete for the Fellowship by identifying a project of interest from the list available online. Each fellowship will last for one semester (Fall, Spring, or Summer) and will pay the Fellow $2,000/semester for the hours worked. At approximately $13/hour, students will be allotted 10 hours per week over a 15-week semester to complete their unique project. Project leaders will be given $300 to assist with purchasing project supplies. All Fellows are encouraged to present their final project at the Multicultural Undergraduate Research Art and Leadership Symposium (MURALS) or the Celebrate Undergraduate Research and Creativity (CURC) Showcase in spring of each year.

INSTRUCTIONS FOR SUBMITTING A FELLOWSHIP PROJECT

STEP 1) Faculty, lab staff and other qualified leaders are encouraged to outline a one-semester project below. Please include the following to allow students a broad understanding of how this project may align with their interests and skill development:

   a) Fellowship Mentor name and Project title
      Terry Engle and Octavio Guimaraes
      Project Title – “Molybdenum water concentration and beef cattle performance”

   b) Justification or broad impact of project on the field of science it resides within.
      Previous research (Kistner et al., 2017; J. Anim. Sci. 95:2758-2766) in our laboratory has indicated that molybdenum (Mo) supplied in drinking is not effective in reducing copper (Cu) status in feedlot cattle. The intent of the proposed experiment is to investigate the influence of dose of Mo in drinking water on Cu metabolism and apparent digestion and retention of molybdenum and copper in lactating and pregnant beef cattle fed a forage-based diet.

   c) Tasks to be completed during approximately 150-hour fellowship
      Animals will be housed in their appropriate feedlot pens. On day 28 of the experiment, one cow will be selected from each pen (n=18) and transported to the metabolism barn. While in the metabolism barn, all animals will remain on their appropriate treatments. Treatments will consist of: 1) Negative control (no supplemental dietary Cu and no Mo added to the drinking water; = 14:1 Cu: Mo); 2) Positive control (additional Cu supplementation; =3.0 mg Cu/kg diet DM to supply a total dietary Cu concentration of 10 mg Cu/kg DM; and no Mo
added to the drinking water; ≈20.0:1 Cu: Mo); 3) 500 µg of Mo/L added to the drinking water (no supplemental dietary Cu; ≈ 3.5:1 Cu: Mo); 4) 1,000 µg of Mo/L added to the drinking water (no supplemental dietary Cu; ≈ 2.0:1 Cu: Mo); 5) 1,000 µg of Mo/L added to the drinking water with additional Cu supplementation (≈3.0 mg Cu/kg diet DM to supply a total dietary Cu concentration of 10 mg Cu/kg DM; ≈ 2.8:1 Cu: Mo); and 6) 3 mg Mo/kg DM added to the feed and no Mo added to the drinking water (≈ 2.0:1 Cu: Mo). Each animal will be housed in metabolism pens (3m x 3m equipped with individual waters, individual feeders, rubber matted floors, and a drain. Animals will be allowed to acclimate to their new environment for 3 days. At the end of the 3-day acclimation phase, animals with the closest DMI across treatments will be paired. Once animals are appropriately paired, each individual pair will be fed the same amount of feed. Feed delivered to each pair will be 90.0% of the animal within the pair with the lowest average DMI during the acclimation period. This will ensure equal amounts of feed intake within each pair of animals during the 5d total collection phase. The next 5 d will serve as the sample collection period used to determine apparent absorption and retention of Cu and Mo. After the 5d fecal and urine collection phase all animals will be returned to their appropriate feedlot pens. This process will be repeated on the same animals at approximately day 150 and 350 of the experiment.

Pens will be checked daily to monitor animals for health and locomotion problems. Animals exhibiting symptoms of respiratory disease will be assigned scores of 0 or 1 for each of the following respiratory symptoms: eye discharge, nasal discharge, coughing, rapid breathing, and depressed appearance. Rectal body temperatures will also be recorded for suspect animals that are removed from the pen. Two additional points will be assigned to animals exhibiting body temperatures greater than 39.4° C. Animals with a total of four or more points will be considered morbid. All morbid animals will be treated according to the appropriate treatment schedule as communicated from the Attending Veterinarian to feedlot personnel, immediately returned to the pen, and allowed a chance to recover. All animals being treated get red ear tags and are treated and observed according to the treatment protocol. If problems persist concerning the health status of specific animals, they will be removed from the experiment. The Attending Veterinarian will be consulted, and appropriate humane intervention taken upon their recommendation.

d) Major skills and competencies that will be developed during the project execution

- This independent study will allow the student to gain valuable experience in conducting nutritional research using beef cattle as a model. It is the intent of this independent study to expose Savannah to proper experimental design, animal handling techniques, sample preparation, laboratory analysis, and interpretation and presentation of her research findings. The interpretation and application of the experimental data will require Savannah to collectively utilize the knowledge that she has gained from the courses that she has taken as an undergraduate.
- Traditional courses offer a basic background pertaining to specific subject matter. This independent study will allow Savannah to utilize the scientific method to systematically answer specific research questions about mineral metabolism in beef cattle. She will also learn many laboratory techniques and will be challenged with interpreting the data that she collects.
STEP 2) Please share the following to best describe how the Fellowship Mentor plans to support the Fellow throughout the Fellowship:

a) What training will the new Fellow receive to on-board them to community practices? The student will be training in every activity that surrounds the project itself. The idea is to enhance the students’ knowledge in ruminant nutrition, experimental design, and laboratory techniques.

b) Who will the Fellow be working with directly? Terry Engle, Octavio Guimaraes and graduate students that will also be involved on this trial.

c) Are there weekly/monthly group meetings that may provide additional training and/or connection for the Fellow with the other student employees working on related projects? The students will be invited to the Nutrition Seminar which happens on a weekly basis.

d) What specific mentorship is the Fellowship Mentor willing to provide the Fellow (for example, an introduction meeting and two additional meetings throughout the Fellowship)? Introduction meeting followed by weekly meeting to adjust details throughout the project and for report purposes.

e) Are you interested in receiving a copy of Critical Mentoring: A Practical Guide by Torie Weiston-Serdan from the CAS Student Success Team to access current best practices for mentoring undergraduates? YES

Please send your completed project application to Adelle.Thompson@colostate by Nov. 15.

All available projects will be posted on the CAS Undergraduate Research Fellowship webpage and advertised to our undergraduates. Undergraduate applications will be due by December 10 and Spring 2020 Fellows will be announces before the end of the Fall 2019 semester.

If you have any questions, please contact Addy Elliott, Assistant Dean of Academic Advising and Student Success at Adriane.Elliott@colostate.edu or 970-491-6984.