--- Name of 501(c)(3) Organization ---

University of Minnesota Foundation

--- Today's Date ---

06/27/2022

--- Year Established ---

1965

--- Amount Requested ---

6610

--- Name of Executive Director ---

Mary Holtz-Clause, Chancellor

--- Mailing Address ---

2900 University Ave
Crookston, MN
56716

--- Contact Information - Name and Title ---

Dr. Morgan Pyles, Assistant Professor

--- Work Phone ---

+12182818103

--- Email ---

pyles024@crk.umn.edu

--- Website / URL ---

https://crk.umn.edu/academics/agriculture-and-natural-resources-department/equine-science

--- Farm/Facility Name ---

University of Minnesota Crookston Equine Program

--- Farm/Facility Physical Location (City, State) ---

Crookston, Minnesota

--- Farm/Facility Mailing Address ---

100G UTOC 2900 University Ave
Crookston, MN
56716

--- Brief Mission Statement ---

The University of Minnesota Crookston delivers educational programs that build upon a broad academic foundation and combine theory, practice, and experimentation in a technologically rich environment. We prepare students for career success, advanced study, and engaged citizenship in a diverse world. We integrate teaching and learning, research and scholarly work, and outreach and engagement to serve the public good.

--- In brief, what is your proposed use of the grant you are applying for? Please include 3 to 5 goals you expect to achieve with the funding. ---

The following project proposal aligns with two of TERF's goals: Goal A and Goal B, equine education and equine research. This research study will provide opportunities for undergraduate students in the equine program at the University of Minnesota Crookston to be involved in equine research that will have an impact on Thoroughbred management. Undergraduate research provides invaluable experience for students preparing for careers in the equine industry. Opportunities to learn about the scientific process, the importance of research, the impact of research on the equine industry and improving the overall wellness of the horse. Furthermore, undergraduate research projects provide opportunities for students to travel to scientific conferences to present results and be exposed to the field of equine research.

The University of Minnesota Crookston equine program supports the Thoroughbred industry in many ways. First in preparing students to enter into the industry after graduation. Our hands-on equine program provides excellent preparation for our undergraduate students for careers in the equine industry. Secondly, our equine program offers foaling services for broodmare owners. We have foaled out Thoroughbred mares for several years for owners in the surrounding states so that they are eligible for the Minnesota Breeders Fund. Lastly, we have supported Thoroughbreds through retraining off-the-tracks and incorporating these horses into our riding and training program. The proposed project is an additional avenue to support the Thoroughbred industry by investigating topics that will improve management strategies.

Summary of research project

Milk is a complex and incredibly adaptive substance that sustains early life in neonatal foals. Mare milk is highly variable and several factors have been identified that can influence milk composition. Some of these factors include the diet and stage of lactation. Feeding mares a diet high in either fat or nonstructural carbohydrates alters the fat and lactose content in milk (Hoffman et al., 1998). Over time, the concentration of lactose in milk increases while protein is the highest in colostrum and decreases over time (Markiewicz-Keszycka et al., 2015). Every successful equine athlete starts their life as a foal and the nutrition of the young foal can have lasting effects on their metabolism, microbiome, and

skeletal development (Quercia et al., 2019). Thus, investigating the factors influencing mare milk is important for optimizing growth and development of the foal to produce successful athletes.

Despite the general acceptance of the importance of milk to the young foal, there is a marked shortage of research investigating the short-term influence of maternal diet on mare milk composition. Previous studies evaluating the effect of maternal diet on mare milk have typically collected samples at a single time point during the day rather than taking a time-course approach (Hoffman et al., 1998; Bondo and Jensen, 2011; Kouba et al., 2019). Horses are typically meal fed, and when a meal high in nonstructural carbohydrates is fed, there is a surge in blood glucose following the meal. It is possible that this rise will be reflected in a change in milk composition.

To the best of our knowledge, there are no studies that have evaluated the acute influence of maternal diet on mare milk by collecting multiple samples within one day. This gap in the knowledge base is important for the management of broodmares regarding their diet and to optimize foal developmental outcomes. Additionaly studies investigating dietary effects on mare milk composition are greatly needed, but first we need to know if multiple samples over the course of the day are needed or if one single sample is adequate. The objective of this study is to determine the effect of a concentrate meal high in nonstructural carbohydrates on the macronutrient composition of mare milk over the subsequent 12 h period.

Briefly, the study will be conducted at the University of Minnesota Crookston. This project will use 6 Thoroughbred mares between 5 to 7 days after parturition. The mares will be fed two concentrate meals at 7 am and 4 pm. A milk sample will be collected from each mare before the first concentrate meal. Then milk will be collected hourly for 12 hours (7 am – 7 pm). To aid in milk collection, the foals will be muzzled for 20 min prior to each milk collection. Milk samples will be analyzed using Fourier Transform Infrared Spectroscopy to measure the macronutrient composition (protein, fat, total carbohydrates, and total solids). Blood will be collected from the mares via jugular venipuncture and will be analyzed for glucose concentration using a glucometer. The data will be analyzed using an ANOVA with repeated measures to evaluate the changes in nutrient concentration over time.

Outcomes

The results of this study will be presented at a scientific conference, presented as a manuscript for publication in a peer-reviewed journal, and as a lay article for horse owners and breeders . The undergraduate equine students helping with this study will gain experience with close observation of mares and foals, proper sampling techniques, recording and managing data, and communicating results. Additionally, the students' personal experience with these Thoroughbred mares and foals in their early life create more exposure to the industry and the students' interest in the horse's subsequent careers in the Thoroughbred industry.

Goals

1. Conduct a research study investigating the acute impact of maternal diet on mare milk composition
2. Provide opportunity for students to participate in undergraduate research
3. Provide students with experience presenting at scientific meetings
4. Create a lay article for horse owners and breeders on mare milk composition and its effects on neonatal foals
5. Aid in optimizing broodmare management strategies with the ultimate goal of improving the health of the Thoroughbred horse

Dr. Morgan Pyles will serve as the contact for any communication needed or for follow up information regarding this application.

Timeline

This study will be conducted during the foaling season of 2023 at the University of Minnesota Crookston Equine Barn. Samples will be analyzed during the spring 2023 semester. Results will be presented on campus by students at a college-wide research day, exposing others on campus to the Thoroughbred industry. The results will also be presented at a scientific conference such as the American Society of Animal Science Annual Meeting or Equine Science Society Symposium. A manuscript will be prepared for submission in 2024.

Detailed Budget

Supplies	
Collection cup	$ 10.00
Conical tubes	$ 40.00
Labels	$ 15.00
Racks	$ 25.00
Milk analysis	$ 200.00
Foal muzzles	$ 50.00
Blood tubes	$ 100.00
Needles	$ 25.00
Glucose strips	$ 150.00
Glucometer	$ 50.00
Lab consumables	$ 100.00
Gloves	$ 30.00
Cheese cloth	$ 25.00
Feed/hay analysis	$ 40.00
Personnel	
Undergraduate student	
$10/h	$ 750.00
Dissemination	
Publication costs	$ 3,500.00
Conference travel	$ 1,500.00
Total requested	$ 6,610.00

Literature Cited

Bondo, T., and S. K. Jensen. 2011. Administration of RRR-alpha-tocopherol to pregnant mares stimulates

maternal IgG and IgM production in colostrum and enhances vitamin E and IgM status in foals. J. Anim. Physiol. Anim. Nutr. 95(2):214-222. doi: 10.1111/j.1439-0396.2010.01043.x

Hoffman, R. M., D. S. Kronfeld, J. H. Herbein, W. S. Swecker, W. L. Cooper, and P. A. Harris. 1998. Dietary carbohydrates and fat influence milk composition and fatty acid profile of mare's milk. J. Nutr. 128(12 Suppl):2708s-2711s. doi: 10.1093/jn/128.12.2708S

Kouba, J. M., T. A. Burns, and S. K. Webel. 2019. Effect of dietary supplementation with long-chain n-3 fatty acids during late gestation and early lactation on mare and foal plasma fatty acid composition, milk fatty acid composition, and mare reproductive variables. Anim. Reprod. Sci. 203:33-44. doi: 10.1016/j.anireprosci.2019.02.005

Markiewicz-Keszycka, M., G. Czyzak-Runowska, J. Wojtowski, A. Jozwik, R. Pankiewicz, B. Leska, J. Krzyzewski, N. Strzalkowska, J. Marchewka, and E. Bagnicka. 2015. Influence of stage of lactation and year season on composition of mares' colostrum and milk and method and time of storage on vitamin C content in mares' milk. J. Sci. Food Agric. 95(11):2279-2286. doi: 10.1002/jsfa.6947

Quercia, S., F. Freccero, C. Castagnetti, M. Soverini, S. Turroni, E. Biagi, S. Rampelli, A. Lanci, J. Mariella, E. Chinellato, P. Brigidi, and M. Candela. 2019. Early colonisation and temporal dynamics of the gut microbial ecosystem in Standardbred foals. Equine Vet. J. 51(2):231-237. doi: 10.1111/evj.12983

--- If you received a grant from TERF (Thoroughbred Education and Research Foundation) previously, please describe how those funds were used. ---

A grant was awarded from TERF in 2021 for educational purposes. The $4,000 grant was used to award four students scholarships of $1,000 each during the 2021-2022 academic year. The students are working towards Bachelor's degrees in either Equine Science or Equine Business Management and pursuing careers in the equine industry.

--- Please list the other organizations or major contributors that have provided funding to your organization within the last calendar year. ---

A $20,000 gift was made to the University of Minnesota Crookston equine program by Roy Johnson, Minnesota Racing Commission and Cargill Animal Nutrition. The purpose of the gift is to support construction of a lean-to at the UMC Equine Facility. The lean-to will be used to house off-the-track-Thoroughbreds for retraining in the fall and to house foaling mares for the Minnesota Breeding Fund program in the spring.

https://crk.umn.edu/news/lean-equestrian

--- Please describe your charity’s public education/research efforts. ---

As a Land Grant University, the University of Minnesota focuses on addressing the needs of community across the state. Furthermore, our equine program provides educational opportunities for the public through course work, workshops, and clinics to improve the management practices of horse owners with the overall goal of improving the health and welfare of horses in the state of Minnesota

The racing industry has a significant impact on the economy in Minnesota. Overall, the racing industry

contributes over 2,000 jobs and $123 million value added to the economy. The equine program at UMN Crookston directly contributes to the racing industry in Minnesota by preparing professionals not only to simply contribute to the industry, but to improve upon the health and welfare of the horses within the industry by using their equine knowledge acquired at UMN Crookston.

There are many opportunities for students to gain experience and knowledge of the horse, including undergraduate research projects. Previous and ongoing equine research has focused on behavior, suitability of bedding types, and the effects of hay steaming on the horse. Understanding more about the horse will better prepare the students as they graduate and make an impact on the equine industry.

--- Please describe any publicity your charity has earned within the last calendar year. Copies of news articles or a brief summary of news coverage are acceptable. ---

The following news releases and articles have been published in the last year about the equine program at UMN Crookston. The links and details about the articles are listed below.

UMC News release about the impact of the equine program on the racing industry https://crk.umn.edu/news/racehorse. This article was also picked up by the Crookston Times

Article in the Crookston Times about the TERF scholarships in 2021-2022 academic year https://www.crookstontimes.com/2022/03/14/terf-scholarships-awarded-four-umn-crookston-students-get-1000-each/

Article by the Farm Forum that discusses the equine and animal science programs as UMC. https://www.farmforum.net/story/news/agriculture/2021/04/15/minnesota-university-makes-case-for-its-animal-equine-science-programs/43702975/

UMC News release detailing the use of the gift for construction of a lean-to https://crk.umn.edu/news/lean-equestrian

--- List 2-3 things that distinguishes your organization and why TERF should fund this proposal. ---

The UMN Crookston Equine Program has fostered several ties with the Thoroughbred racing industry including Racehorse Minnesota, the Minnesota Racing Commission, Canterbury Park, and Running Aces Casino, Hotel & Racetrack. Students and alumni have had employment and educational opportunities with connections not only in Minnesota, but also in Kentucky, Louisiana, and Oklahoma.

The UMN Crookston equine program provides industry ties and hands on opportunities for students by foaling out mares from out of state in support of the Minnesota Breeders Fund racehorse eligibility. In 2021, we foaled out 9 Thoroughbred and Quarter Horse mares and 7 mares in 2022.

Dr. Morgan Pyles has been involved with the Thoroughbred industry in Kentucky for 8 years before coming to Minnesota in 2020. She has conducted several mare and foal studies through her doctorate work at the University of Kentucky. This project would provide an opportunity to continue in her field of mare and foal nutrition by investigating factors influencing mare milk composition.

--- Space for Additional Information and Notes ---

The UMN Crookston equine program has worked with off-track Thoroughbreds that have been admitted into our training course from outside horseman. We continue to develop relationships with Minnesota Thoroughbred and Standardbred owners who are retiring sound racehorses to create new careers for those horses.

--- Please list your Officers with their Titles ---

Dr. Mary Holtz-Claus - Chancellor
Dr. Tony Kern - Vice Chancellor
Tricia Sanders, Director of Finance
Dr. Kristina Walker - Unit Head, Agriculture and Natural Resources
Dr. Morgan Pyles, Assistant Professor, Equine Program
Nicky Overgaard - Equine Instructor
Amanda Clary - Equine Lab Service Coordinator
Christy Doyea - Equine Barn Manager

--- How many Directors/Trustees does your organization have? ---

7

--- Director Name (1) ---

Kendall J Powell -Board of Regents, Chair of the Board

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--- Director Name (2) ---

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--- 1. Name - Job Title ---

Morgan Pyles, PhD, Assistant Professor

--- 1. Duties ---

Primary duties include teaching and research. Courses taught: Equine Reproduction Techniques, Horse Production, Equine Nutrition, Riding Instructor Training, and Equine Exercise Physiology. Oversee internship program. Additional responsibilities include leading equine research projects involving undergraduate students, analyzing data, and publishing the results in peer-reviewed journal articles and at scientific meetings.
Other responsibilities: advising undergraduate students, leading independent study, honors students, advising clubs, and working with other faculty and staff in the care and management of the UMN Crookston horse herd.

--- 2. Name - Job Title ---

Nicky Overgaard, Instructor

--- 2. Duties ---

Primary duties include teaching and overseeing the equine barn. Courses taught: Equine Evaluation, Advanced Western, Training & Showing, Hunt Seat Equitation, Dressage Equitation
Additional responsibilities: Advise students, program development and marketing, horse procurement, club adviser, clinic and camp organization.

--- 3. Name - Job Title ---

Christy Doyea, Farm Animal Attendant

--- 3. Duties ---

Primary duties including managing herd of 45-50 horses. Manage farrier, nutrition, health, veterinary work, intake of lease horses, billing, feed procurement, pasture management, & oversee student workers. Work closely with faculty and staff to ensure horse health, use, research, etc.

--- 4. Name - Job Title ---

Amanda Clary, Lab Services Coordinator

--- 4. Duties ---

Primary duties include providing support for the instructors in the equine program and barn manager including teaching, research, and horse care. Aid in preparing labs for equine courses such as vaccination, deworming, leg wrapping, first aid, and arena maintenance.