[EXTERNAL]

--- Today's Date ---

07/09/2025

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

Cornell University

--- Federal Tax-Exempt ID# ---

150532082

--- Year Established ---

1865

--- Amount Requested ---

$8,518.00

--- Name of Executive Director ---

Janet Strait, Associate Director, Sponsored Financial Services

--- Mailing Address ---

Cornell University, Sponsored Financial Services, 373 Pine Tree Road Ithaca, NY

14850

US

--- Email address ---

cu\_awds@cornell.edu

--- Work Phone # ---

+16072555014

--- Organization's website ---

<https://www.cornell.edu/>

--- Copy and paste the link to your organization’s most recent filed IRS Financial Statements (#990): ---

<https://finance.cornell.edu/controller/reporting>

--- Upload all supporting documents required for your application and your organization’s most recent filed IRS Financial Statements (#990): ---

<https://www.terfusa.org/wp-content/uploads/wpforms/809-a07c4cb3463c1ac16da216b7fda5277e/CU-IRS-Form-990-2023-2332141797699a6b9fa53f5aa0001e8c.pdf>

--- Farm/Facility Name ---

Cornell University, College of Veterinary Medicine, Population Medicine and Diagnostic Sciences/Animal Health Diagnostic Center

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

Ithaca, New York, 14850

--- Farm/Facility Mailing Address ---

240 Farrier Rd

Ithaca, NY

14853

US

--- Contact Name and Title ---

Latasha Ludwig, Assistant Clinical Professor in Anatomic Pathology

--- Contact Work Phone ---

+16072533892

--- Contact Email ---

lal269@cornell.edu

--- 1. Brief mission statement and describe the distinguishing features of your organization that supports the mission of TERF and the relevance to this proposal. ---

The Department of Population Medicine and Diagnostic Sciences (PMDS) and the Animal Health Diagnostic Center (AHDC) within Cornell University both seek to promote the health of various animals and prevent and/or identify animal disease by providing diverse veterinary diagnostic services and expertise. Specifically, the Section of Anatomic Pathology, which Drs. Ludwig and Chambers are part of, provides expert services via board-certified veterinary pathologists, like Dr. Ludwig, in gross and histopathologic examination of a variety of species, including equids, to aid in the diagnosis of diseases. The service receives over 150 equine necropsies per year, including cases through the New York Racing Association. These services and expertise directly support TERF’s mission to improve equine health. The extensive caseload results in a unique case archive for which materials can be accessed for further investigation, such as for this proposal. As a board-certified veterinary pathologist, Dr. Ludwig also has the appropriate expertise, along with collaborative partners, to undertake this proposal. In addition, the Anatomic Pathology service directly trains residents, such as Dr. Chambers, seeking to achieve board-certification in veterinary pathology. Education of future experts in the veterinary field also supports TERF’s mission. As veterinary pathology is a relatively small specialty, there is an extensive interest in collaborating with others and working together to improve animal health, as in this multi-institutional project. The mission of PMDS and the AHDC are in alignment with that of TERF to improve equine health, along with educating future experts and provides unique access to extensive expertise and case materials which allows for success of this proposal.

--- 2. Briefly outline 3-5 goals for the requested funds and how these goals support your mission. ---

- Identify cases of fungal abortion and stillbirth in horses from multiple institutions in the United States and Canada over 15 years

- Document the histologic lesions associated with fungal abortion and stillbirth in the placenta and fetal tissues

- Characterize the fungal pathogens present in these cases

o Retrospectively from historic culture data available in reports using fresh tissues

o Using pan-fungal polymerase chain reaction (PCR) on archived formalin-fixed paraffin-embedded (FFPE) materials

- Evaluate using retrospectively obtained ancillary testing any associations between the presence of fungal pathogens and other common causes of abortion and stillbirth (e.g. bacteria, Equid herpesvirus-1)

These goals support our mission to improve animal health by better understanding the distribution of and antigens involved in fungal causes of equine abortion.

--- 3. Provide a detailed description of the proposed project, how it is related to the mission of TERF and how it will impact the health and welfare of the horse. (Note: research applications should be understandable to a non-scientific audience and include sufficient detail and rigor for the scientific reviewers.) ---

Infectious agents are considered the cause of abortion in 19-53% of mares depending on geographic location [1]. Fungal causes of abortion and stillbirth are considered uncommon, representing less than 10% of infectious etiologies, and therefore are less well-documented and understood [1]. While multiple retrospective studies on equine abortions exist, they either lack large numbers of cases caused by fungal organisms or generally fail to adequately describe the pathologic features of these cases [2-10]. Few studies have described in depth the histopathologic changes and morphologic features of fungal causes of abortion [10, 11]. Consequently, the features, specifically histopathologic, of fungal abortions and stillbirths remain inadequately documented on a large scale in mares. Additionally, fungal culture is not always performed at the time of necropsy on fresh tissues which limits the understanding of the responsible organisms in these cases and any distinguishing morphologic features beyond the commonly known Aspergillus spp. At its core, the equine industry is heavily dependent on its continued success in the breeding industry. The stochastic reproductive efficiency and loss of foals due to abortion and stillbirth cause large economic losses and jeopardize a mare’s health [12]. A thorough histopathologic and etiologic investigation and characterization of these cases is the first step in prevention and improving equid health in relation to fungal abortions and stillbirths.

This project aims to collect cases of fungal abortion and stillbirth in mares from multiple institutions across the United States and Canada to characterize histologic and etiologic features.

Nine academic institutions with associated pathology laboratories (3 in Canada and 6 in the United States) have been contacted to retrospectively search their case archives. Cases of equine fungal abortion (including those born alive and died shortly after or were euthanized) and stillbirth have been found in the case archives of 5 of these institutions, thus far (one institution is pending). Cases were required to have placenta and fetal tissues (at least liver and lung) available for histopathologic examination. Cases with only placenta available were excluded. Retrospective clinical information has been collected, including breed, mare’s age, and gestational length. Histopathologic findings from the initial reports and ancillary testing performed (e.g. bacterial culture, fungal culture) have been recorded. Case materials (block or glass slides) have been or will be collected by Cornell University from collaborators. Glass slides from at least 84 cases are to be reviewed by two board-certified veterinary pathologists and a Cornell University Anatomic Pathology resident.

The clinical information, histopathology findings, and ancillary testing from the cases’ initial investigation have been summarized based on the information provided by each institution, including breed (predominantly Thoroughbreds at this time), age of the mare, gestation length, etc. This information has been submitted as an abstract to the American Association of Veterinary Laboratory Diagnosticians for its Annual Meeting. During slide review all lesions within the placenta and other available tissues will be recorded based on a consensus of the reviewers. The morphology of any fungal agents present will be described using the hematoxylin and eosin-stained slide. These methods have already been completed or are in progress and we are not seeking funding for these components of the project.

We seek funding from TERF to achieve the objective of using pan-fungal PCR to uniformly characterize the etiologic agents of these cases. This testing will be requested in collaboration with Dr. Aline Hoffman at the University of Florida (<https://cdpm.vetmed.ufl.edu/services/diagnostic-labs/molecular-fungal-id-laboratory/>). Morphologic features to characterize fungal agents by histopathology alone is poor and so ancillary testing is recommended [13]. Unlike conventional fungal culture, FFPE tissues can be used for PCR [13]. This allows archived cases to be investigated. In our cohort of cases, 27 cases for which fungal elements were noted on histopathology, no fungi were cultured. Utilizing samples for which there is direct evidence of fungal elements present (i.e. the FFPE blocks from which the reviewed histopathology slides are derived) with pan-fungal PCR provides a greater opportunity to identify the etiologic agent compared to fresh tissue which does not have necessarily have confirmed fungi in the sample submitted for testing. Fifty-four cases had found fungi on culture. Including these cases will allow the comparison of results between the novel pan-fungal PCR technique and the traditional gold-standard of culture. Pan-fungal PCR offers a safer method for investigation of potentially zoonotic organisms but there is limited documentation on agreement between these two methods in equine fetal tissues [13].

There are of course limitations to this work. First, blocks may not be available for all cases. Given the search is only for the past 15 years we anticipate there being few cases missing from archives. All cases have either histopathologic or previous culture supporting a fungal agent and so provide the best samples for success with pan-fungal PCR. The pan-fungal PCR technique used at the University of Florida reports obtaining fungal identification from 60-70% of FFPE cases. They also recommend cases that have been fixed for no more than 2-3 days. Due to the nature of the retrospective study, we do not have control over the fixation time. However, given our large cohort and projected 90 cases for submission, we anticipate receiving adequate results for at least 50 samples. This remains a large dataset for this disease and type of testing.

>From this work we plan to provide knowledge dissemination via attendance and presentation of the work at the American College of Veterinary Pathologists Annual Meeting in the fall of 2026. As well as publication of a manuscript of the results in a journal such as Veterinary Pathology. Dissemination of findings via laboratory newsletters and/or trade journals will also be pursued.

--- 4. Provide a timeline detailing the expected progress of the project and specific milestones. ---

Previous work completed/in progress:

- Case database searches: Feb.-July 2025

- Clinical information analyses – June-Sept. 2025

- Slide acquisition and review: May-Oct. 2025

Timeline for project proposal:

- Request of formalin-fixed paraffin-embedded scrolls – Oct.-Dec. 2025

- Pan-fungal PCR performed by University of Florida – Jan.-Apr. 2026

- Detailed characterization of fungal morphology and lesion characteristics – Oct. 2025-Jan. 2026

- Summarizing of histologic characteristics with etiologic agents – Apr.-June 2026

- Submission of abstract to the American College of Veterinary Pathologists Annual General Meeting – July 2026 (conference in Oct. 2026)

- Preparation and submission of manuscript – July-Sept. 2026

--- 5. Provide a detailed budget for the projected use of the funds. (Note: no funds will be provided for administrative overhead or capital spending; TERF reserves the right to modify funding based on Foundation requirements). Attach budget to submitted proposal as needed. ---

Items

Formalin-fixed paraffin-embedded scrolls

- Cornell University (16 cases) - $6.00/item = $96.00

- UC Davis (7 cases) - $10.00/item = $70.00

- Animal Health Laboratory (2 cases) - $18.00/item = $36.00

- University of Kentucky (58 cases) - $7.00/item = $406.00

Shipping of scrolls

- Cornell University to University of Florida - $25.00/item = $25.00

- UC Davis to Cornell University - $25.00/item = $25.00

- Animal Health Laboratory to Cornell University - $80.00/item = $80.00

- University of Kentucky to University of Florida - $40.00/item = $40.00

Pan-fungal PCR (90 cases) - $86.00/item = $7,740.00 Total budget: $8,518.00

--- 6. Provide a list of all other sources of funding and the amount(s) received. ---

Co-investigator (Dr. Ludwig): Cornell Richard P. Riney Canine Health Center Research Grant; Amount: $74,093

--- 7. Briefly summarize your charity's past public education and research efforts. ---

The PMDS/AHDC within Cornell University is committed to not only diagnostic service but also outreach efforts in the local community. Please see department website for details. Dr. Ludwig has directly actively participated in pathology outreach with secondary school students. She has also presented her research at multiple international conferences.

--- 8. If you received funding from TERF previously, describe how these funds were used and outcomes achieved. Include any relevant publicity your charity received relating to the funding. (i.e.: media coverage, such as news articles, scientific publications, provide links to copies, as appropriate). ---

N/A to Principal Investigator

--- 9. List other organizations or major contributors that have provided funding to your organization in the last calendar/fiscal year. For research grant applications, provide a list of all current funding relating to your current proposal. ---

None for the current proposal or directly to Dr. Ludwig. See sources of funding above.

--- 10. Name a responsible person with whom TERF may communicate regarding specific questions and who will be responsible for follow-up information regarding the project. ---

Latasha Ludwig

--- 11. Provide appropriate references to support the proposed research. ---

1. Leon, A., Pillon, C., Tebourski, I., Bruyas, J. & Lupo, C. Overview of the causes of abortion in horses, their follow‐up and management. Reprod. Domest. Anim. 58, 93–101 (2023).

2. Laugier, C., Foucher, N., Sevin, C., Leon, A. & Tapprest, J. A 24-Year Retrospective Study of Equine Abortion in Normandy (France). J. Equine Vet. Sci. 31, 116–123 (2011).

3. Smith, K. C., Blunden, A. S., Whitwell, K. E., Dunn, K. A. & Wales, A. D. A survey of equine abortion, stillbirth and neonatal death in the UK from 1988 to 1997. Equine Vet. J. 35, 496–501 (2003).

4. Giles, R. C. et al. Causes of abortion, stillbirth, and perinatal death in horses: 3,527 cases (1986–1991). J Am Vet Med Assoc. 203(8), 1170-5 (1993).

5. Tengelsen, L. A. et al. A 12-Year Retrospective Study of Equine Abortion in Michigan. J. Vet. Diagn. Invest. 9, 303–306 (1997).

6. Szeredi, L. et al. A survey of equine abortion and perinatal foal losses in Hungary during a three-year period (1998–2000). Acta Vet. Hung. 56, 353–367 (2008).

7. Marenzoni, M. L. et al. Causes of equine abortion, stillbirth and neonatal death in central Italy. Vet. Rec. 170, 262–262 (2012).

8. Agerholm, J. S. et al. A Diagnostic Survey of Aborted Equine Fetuses and Stillborn Premature Foals in Denmark. Front. Vet. Sci. 8, 740621 (2021).

9. Ricard, R. M., St-Jean, G., Duizer, G., Atwal, H. & Wobeser, B. K. A 13-year retrospective study of equine abortions in Canada. Can. Vet. J. 63, 715–721 (2022).

10. Cantón, G. J. et al. Equine abortion and stillbirth in California: a review of 1,774 cases received at a diagnostic laboratory, 1990–2022. J. Vet. Diagn. Invest. 35, 153–162 (2023).

11. Orellana-Guerrero, D. et al. Fungal Placentitis Caused by Aspergillus terreus in a Mare: Case Report. J. Equine Vet. Sci. 83, 102799 (2019).

12. Bosh, K. A., Powell, D., Neibergs, J. S., Shelton, B. & Zent, W. Impact of reproductive efficiency over time and mare financial value on economic returns among Thoroughbred mares in central Kentucky. Equine Vet. J. 41, 889–894 (2009).

13. Meason-Smith C, Edwards EE, Older CE, Branco M, Bryan LK, Lawhon SD, Suchodolski JS, Gomez G, Mansell J, Hoffmann AR. Panfungal Polymerase Chain Reaction for Identification of Fungal Pathogens in Formalin-Fixed Animal Tissues. Vet Pathol. 54(4), 640-648 (2017).

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

Latasha Ludwig - Assistant Clinical Professor, Anatomic Pathology

--- 1. Salary ---

$134,000

--- 1. Duties ---

Appointment is composed of approximately 65% diagnostic service (biopsy and necropsy anatomic pathology service), 20% teaching, 10% research, and 5% general service.

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

Brian Chambers - Resident, Anatomic Pathology

--- 2. Salary ---

$52,000

--- 2. Duties ---

Appointment is composed of 50% clinical service (biopsy and necropsy anatomic pathology service) and 50% other, including research, teaching, general service, and study, determined based on personal interest/need.

--- 14. Add additional Information and Notes: ---

Question 12 - organization's executive staff and Board of Directors:

Executive staff (50 Senior Administration Officials): <https://www.leadership.cornell.edu/senior-leadership/>

Board of directors (60 Board of Trustees): <https://trustees.cornell.edu/members/>

Question 13 - additional paid employee information:

Paid employee information: <https://finance.cornell.edu/sites/default/files/cornell-financial-report-FY2024.pdf>

Information on employee directly involved in the project listed above.