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EQUINE DISEASE QUARTERLY

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RESEARCH SPOTLIGHT

Advancing Equine Health through Targeted Musculoskeletal and Sports Medicine Research

At the Musculoskeletal Research Lab within the University of Kentucky Gluck Equine Research Center, we are committed to enhancing the welfare of horses and advancing the field of equine and translational sports medicine.

As elite athletes, horses rely on their musculoskeletal systems to perform at peak levels, and dysfunctions in this system will affect their performance. Osteoarthritis (OA) is the most common cause of lameness in horses and is characterized by chronic inflammation and progressive degeneration of all articular tissues. The management of OA is a significant challenge for equine veterinarians, as available treatments fail to fully restore joint function. Successful management of OA hinges on a comprehensive understanding of the mechanisms that drive inflammatory degeneration of joints.

Understanding the two sides of inflammation
Inflammatory events, including those involving joints, surge with the purpose of counteracting tissue damage, clearing tissue debris and driving tissue repair and recovery of joint health. The transition from acute inflammation towards recovery of joint health is called inflammation resolution. Such a process is not simply passive termination of inflammation, but one in which pro-inflammatory mediators are metabolized into those that resolve inflammation to recover joint health.

Traditional treatments for OA typically aim to alleviate symptoms by suppressing inflammation (using NSAIDs or intra-articular corticosteroids), as well as mechanisms involved in the housekeeping of joint tissues. While widely used due to the power to suddenly stop inflammation, these methods offer significant temporary relief, but the lack of disease-modifying properties can ultimately accelerate disease progression. While such effects were thought to result only from certain intra-articular corticosteroids, it is currently known that by suppressing inflammation, all anti-inflammatory drugs can prevent the synthesis of these specialized pro-resolving mediators (SPMs), paradoxically setting the stage for chronic inflammation.

Macrophages in Osteoarthritis
Macrophages are immune cells in the joint and critical players in joint health and resolution of inflammation. Studies from our lab and collaborators have shown that in osteoarthritic joints, macrophages become overwhelmed and are unable to properly resolve inflammation. This failure to resolve inflammation contributes to the chronic nature of OA, causing ongoing damage to the joint.

Interestingly, our team has also discovered that injecting autologous macrophages, derived from the horse's own bone marrow, into inflamed joints can significantly aid in resolving inflammation. This approach not only mimics the natural process of inflammation resolution but does so in a way that restores joint health providing a more durable solution than traditional anti-inflammatory treatments. This method has shown promising results that are both comparable to corticosteroid injections and more effective in the long term without the side effects commonly associated with conventional treatments.

Towards Pro-Resolving Therapies
Our recent research focuses on identifying the mechanisms by which macrophages drive inflammation resolution and how we can harness these processes for therapeutic development. This includes recently completed *in vitro* and *in vivo* studies on PPAR-γ agonism in synovial tissues. Our team's research utilizes point-of-care cell-based therapies and pro-resolving therapies that focus on enhancing the body's own healing mechanisms. By targeting key pro-resolving cells and mediators, we hope to effectively treat chronic inflammation, and improve long-term equine joint health.

Personal Reflection: A Journey in Research and Innovation
As an equine surgeon with over 19 years of experience, I am honored to contribute to this critical research alongside my colleagues and mentors at the Gluck Equine Research Center. Under the mentorship of Dr. James MacLeod and Dr. Bruno C. Menarim, I have gained invaluable insights into the complexities of osteoarthritis and the collaborative nature of scientific research. My postdoctoral program has strengthened both my clinical expertise and my ability to contribute meaningfully to the development of innovative treatments for equine OA. My career goals are to continually strive to push the boundaries of equine sports medicine. Our work is a testament to the power of teamwork and innovation in tackling some of the most pressing challenges in the field and I am humbled for being part of it.

CONTACT:
Guilherme M. M. van de Graaf, DVM, MSc, PhD
Postdoctoral Scholar, Musculoskeletal Research Lab
Gluck Equine Research Center
Martin-Gatton College of Agriculture, Food and Environment
University of Kentucky
gui.graaf@uky.edu

New World Screwworm Threat

The New World Screwworm (NWS) fly, *Cochliomyia homnivorax* was eradicated from the United States in 1966. Prior to eradication, it cost the U.S. livestock industry more than $100 million annually.

In 2023, increased cases of Screwworm infestation were noted in Central America and began advancing north. In February 2025, the first cases were identified in southern Mexico and more cases have been identified further north, creating a concern to the U.S., especially with border states such as Texas and New Mexico. Unfortunately, with the increase in international travel, this pest can hitch a ride and travel into the U.S. and become established before it can be stopped.

Different NWS Instars: First through third instar with first being the smallest. Notice the mouth hooks at the head of the third instar larvae.

On May 13, 2025, Secretary of Agriculture Brooke Rollins announced that the border was closed for cattle, bison and horses coming out of Mexico due to the NWS threat. Sheep and goat imports into the U.S. were already restricted due to Scrapie disease. Unfortunately, this fly has no boundaries, and it is hard to control wildlife movement across countries. Therefore, we must be diligent in our efforts to educate producers and pet owners as to what an NWS fly looks like and the signs of an NWS infestation by its larvae, i.e. myiasis.

Cochliomyia homnivorax: An adult fly is up to 10mm long, body is metallic blue, bluish purple to blue-green, eyes are reddish in color and large. The fly does not bite; however, the harm comes when the female lays eggs near an open wound and the larvae infest the wound. An adult fly only survives for about two weeks but she is sexually mature within two to three days after developing into an adult. Once fertilized by a male, she is capable of laying an egg mass several times during her lifetime near open wounds. These egg masses contain 100 to 300 eggs, which develop into larvae within 10 to 12 hours, which then feed on live tissue.

The female NWS fly only mates once in her lifetime. One of the methods of control is to release sterilized male NWS which breed the females, which are then unable to lay viable eggs. This is the method which has been used in the U.S. and other countries to eradicate NWS flies.

The larvae go through three stages and grow larger with each stage. The larvae can survive and eat live tissue for up to seven days. The head of the third stage (instar) larvae has hooks on it, which enables the larvae to tear at the host tissues during feeding. They also have barbs on their sides which allow them to secure their position within a wound. "Myiasis" describes a wound that is infested with fly larvae. When these larvae develop into the third stage larvae, they exit the wound, burrow into the soil and develop into pupa. Pupa can develop into adults or they can hibernate within the soil until conditions are more conducive for development into an adult fly.

Horses can become infected with the larvae through any break in the skin (trauma, horse fly or tick bite, etc.) or at their mucous membranes (eyes, vulva, prepuce, etc.). Therefore, it is essential that the horse owner is diligent in fly protection and observation. If they observe any suspicious lesions, they should contact their veterinarian, State Animal Health Official or USDA Area Veterinarian in Charge immediately.

Legions on leg.

Identification/Notification
Once an animal becomes infected by NWS and left untreated, the animal may die within one week due to secondary infections. Animals identified with myiasis should receive veterinary medical assistance along with collection of larvae within the wound submitted for identification.

If you observe an animal with myiasis, collect the larvae from the lesion and place in a sterile container with 70% ethanol or alcohol and send to the nearest National Animal Health Labatory Network (NAHLN) lab for diagnosis. Do not place the larvae in formalin.

The link for the parasite submission form if larvae are found can be found here.

Treatment:
Clean and debride the wound and apply permethrin spray. Ivomec injectable can be given to livestock as a treatment. Also, topical permethrins could be used in horeses and other livestock to assist with fly control.

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EDITORS
Ernie Bailey
Lynne Cassone
Lutz Goehring
Brett Sponseller

STAFF
Holly Wiemers

EDQ@uky.edu

Eradication Techniques
The only proven technique which worked back in the '60s was releasing sterilized male screwworm flies which mated to the females and rendered their eggs infertile.

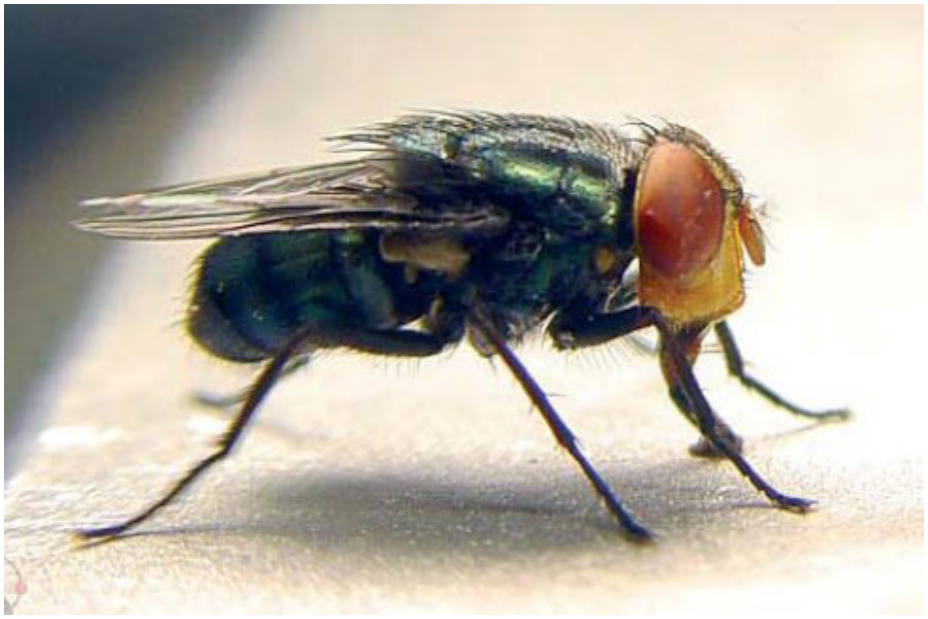
For more information about NWS:

- https://www.aphis.usda.gov/sites/default/files/aphis-sop-detection-nws-in-animals.pdf
- https://www.aphis.usda.gov/sites/default/files/factsheet-nws-private-veterinarians.pdf
- https://www.kyagr.com/statevet/disease-prevention.html

Scan the QR code to learn more about NWS.

CONTACT:

Beth Johnson, DVM
Director of Regulatory Field Services
Kentucky Department of Agriculture, Office of State Veterinarian
109 Corporate Drive
Frankfort, KY 40601
BethC.Johnson@ky.gov



Screwworm (*Cochliomyia homnivorax*).

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Maxwell H. Gluck
Equine Research Center
Lexington, Kentucky USA, 40546-0099
Telephone (859) 257-4757
Fax (859) 257-8542
gluck.ca.uky.edu

Iatrogenic Transmission of Equine Infectious Anemia Virus

Introduction

Equine infectious anemia virus (EIAV) is an RNA virus in the Retroviridae family, genus Lentivirus. It shares structural and genomic features with other lentiviruses, including human immunodeficiency virus (HIV). Like HIV, EIAV uses reverse transcriptase to convert its RNA genome into DNA, which is then integrated into the host genome via the virally encoded enzyme, integrase. Once integrated, EIAV establishes a lifelong infection by hijacking the host cell's machinery to replicate and produce new virions. The virus causes equine infectious anemia (EIA), a disease first recognized in 1843 and identified as viral in origin in 1904.

Identification of EIAV-Positive Equids

EIA is a federally regulated disease in the United States. The U.S. Department of Agriculture oversees nationwide serosurveillance through mandated testing protocols. In 2023, 1,364,247 tests were conducted, identifying 61 seropositive horses across 45 sites, up from 29 seropositive horses in 2020.

The Coggins test, developed in 1970, remains a USDA-approved diagnostic tool. Additionally, licensed ELISA tests detect antibodies to viral antigens such as gp45 and p26. Equids must test seronegative before crossing state lines or participating in events. However, many infected horses are inapparent carriers, displaying no clinical signs yet capable of transmitting the virus—either via blood transfer or mechanical transmission by biting flies like tabanids. These inapparent carriers pose a serious risk, especially to naïve horses, for whom the infection can be fatal.

Clinical Disease

EIA progresses through three stages: acute, chronic and inapparent. The acute phase is marked by high fever, thrombocytopenia (lower than normal number of platlets in the blood) – which may cause hemorrhaging, and malaise. Clinical signs may include petechiae (tiny dots on the skin, caused by the leakage of blood from tiny capillaries under the skin) and ecchymoses (bruising). In the chronic phase, clinical signs recur intermittently with decreasing intensity. The inapparent phase is asymptomatic, though the horse remains infected and capable of transmitting the virus. Regardless, fever accompanied by recurrent or unexplained thrombocytopenia should prompt suspicion for EIA.

Stress or immunosuppressive treatments such as corticosteroids can trigger disease recrudescence, or reoccurance. Other potential clinical signs include edema, weight loss, anemia, and—less commonly—leukoencephalitis (inflammation of the white matter of the brain) or enterocolitis (inflammation of the intestines). The expression of disease varies based on factors such as viral dose, strain, virulence, host immune competence and environmental stressors. Notably, high-titered viremia during the acute phase significantly increases transmission risk.

Like other lentiviruses, EIAV mutates rapidly due to error-prone reverse transcription. These genetic changes in the viral genome (genetic variation) result in antigenic variation and escape from acquired immune responses. Antigenic variation complicates vaccine development and contributes to recurring clinical episodes in chronic infections.

Pathogenesis

EIAV infects monocytes, macrophages, dendritic cells and endothelial cells. Infection of the endothelium is implicated in vascular damage, which may trigger disseminated intravascular coagulation (DIC), promote platelet aggregation and contribute to tissue edema.

Pathology and Clinical Pathology

Common necropsy findings in EIA cases include splenomegaly, lymphadenopathy, hepatomegaly, mucosal and visceral hemorrhages, subcutaneous edema and thrombi. Histopathologic examination often reveals mononuclear cell infiltration and hemosiderophages within lymphoid tissues. Immune complex-mediated glomerulonephritis is also frequently observed.

Thrombocytopenia typically coincides with febrile episodes and may be compounded by platelet dysfunction, further exacerbating hemorrhagic risk and contributing to DIC. Anemia arises from both hemolysis and reduced erythropoiesis. In inapparent carriers, mild anemia, hyperglobulinemia and hypoalbuminemia are common. Persistent polyclonal B cell activation reflects ongoing immune stimulation.

Prevention, Control and Regulations

EIA risk varies geographically. High-risk regions include Texas and Louisiana, while areas like New England and Alaska are considered low risk. Nevertheless, sporadic outbreaks can occur anywhere, underscoring the need for continued vigilance.

Veterinarians should promote annual EIAV testing, particularly for new arrivals, and advocate for robust tabanid fly control measures. Organizers of equine events should require documented proof of EIAV seronegativity.

When a horse tests positive, all potentially exposed horses must be quarantined and retested until two negative results, taken 30 to 60 days apart, are confirmed. EIAV-positive horses must either be euthanized or permanently isolated at least 200 yards from other equids—sufficient distance to prevent mechanical transmission by insect vectors. Positive horses must also be permanently identified with a USDA-issued brand or tattoo.

With no nationwide eradication program in place, reservoirs of EIAV persist. Of the estimated 6.65 million horses in the U.S., fewer than 20% are tested annually, allowing inapparent carriers to remain undetected. Identifying and managing these carriers is essential for effective disease control. Veterinarians play a critical role in educating owners about the economic, emotional and epidemiologic consequences of EIA and the importance of proactive prevention.

Iatrogenic and Emerging Modes of Transmission

Veterinarians, horse owners and farm and venue managers must recognize that EIAV transmission remains a serious threat to the equine population, especially via iatrogenic routes—a frequent, yet preventable, mode of spread. Iatrogenic transmission occurs through mechanical transfer of EIAV via contaminated needles, surgical instruments, blood products or contamination of multi-dose vials. It should be a constant concern in veterinary biosafety protocols.

Other transmission routes—such as via infected secretions or mechanical vectors like biting flies—can be mitigated through careful management practices.

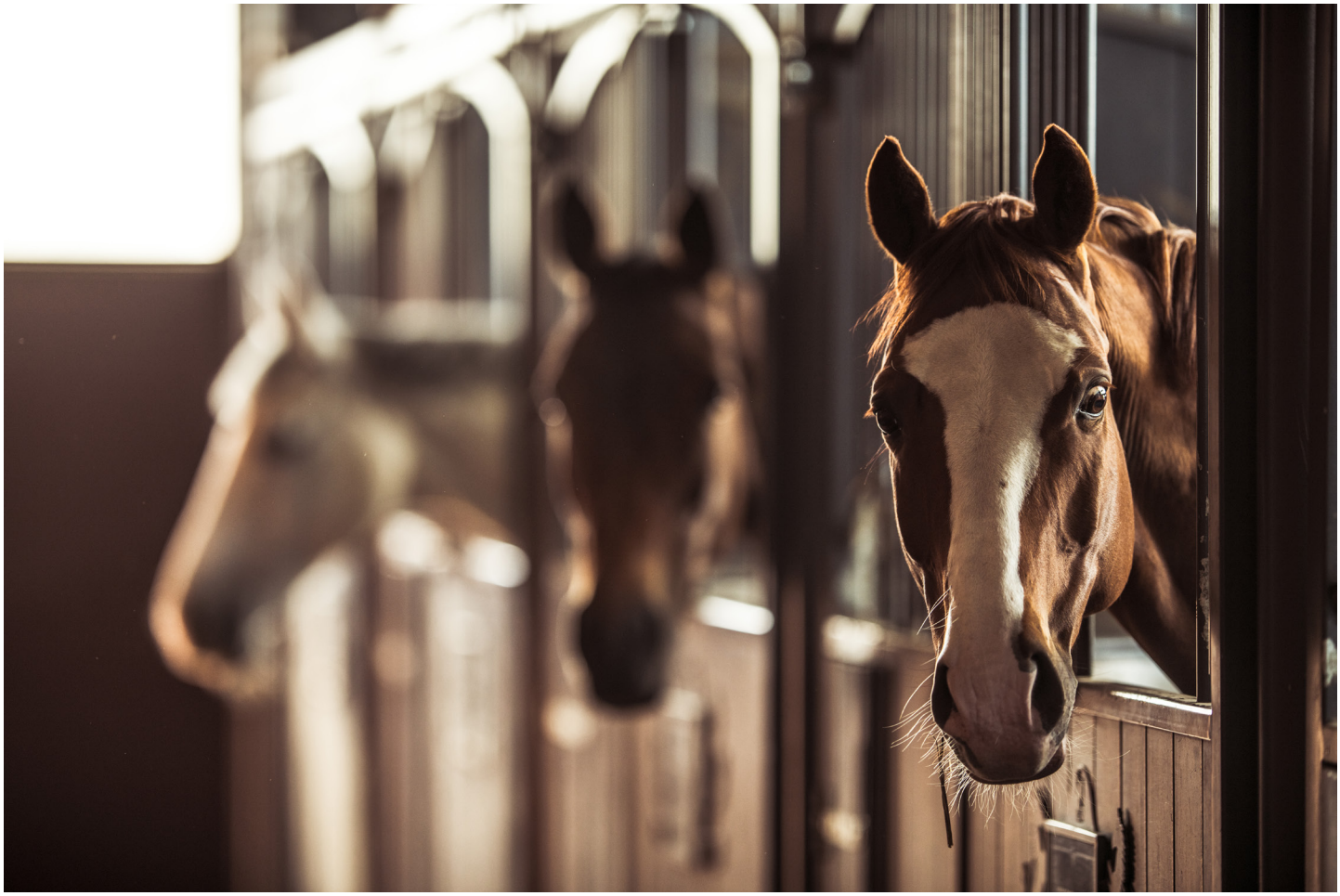
Recently, a cluster of EIAV cases originating at a Texas equine clinic was linked to iatrogenic transmission via catheter flushes using multi-dose vials of heparinized saline. As of the end of May 2025, the USDA Animal and Plant Health Inspection Service (USDA-APHIS) has confirmed 21 seropositive horses across four states: Texas, California, Colorado and Oklahoma. According to USDA-APHIS epidemiologist Angela Pelzel-McCluskey, DVM, additional cases are anticipated.

In clinical medicine, previously unrecognized transmission routes may initially seem unlikely until they are fully understood. For example, during a 2006 outbreak in Ireland involving two clusters in County Meath and County Kildare, the possibility of aerosol transmission was raised. It was speculated that aerosolization occurred during cleanup of infectious bloody secretions—suggesting a previously unidentified transmission mode in a clinical setting (Equine Veterinary Journal, 2008, 40(7):709–711).

Together with the recent Texas outbreak, these events underscore the evolving landscape of infectious disease transmission and biosecurity, and highlight the need for ongoing research, vigilance and adaptation of veterinary protocols.

CONTACT:

Brett Sponseller, DVM, PhD, DACVIM
Professor and Chair, Department of Veterinary Science
Gluck Equine Research Center
University of Kentucky
Lexington, KY 40546
Brett.Sponseller@uky.edu



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Equine Associated Sudden Death

Exercise-associated sudden death (EASD) is defined as the spontaneous death of a closely observed, apparently clinically normal horse that occurs during or within one hour of exercise.
This timeline includes active exertion, returning to the barn from racing or training and while the horse is being cooled out or bathed after the activity. These dramatic events occur in the presence of any number of people, including racetrack workers, media professionals and the public.

When high profile deaths or clusters of these events occur, scrutiny becomes closer, more directed and sharper. The death of the disqualified Kentucky Derby winner, Medina Spirit, during a morning workout at Santa Anita in 2021 generated a media firestorm. Likewise, during a spate of 12 racehorse deaths at Churchill Downs in the spring of 2023, the exercise-associated sudden deaths of two horses generated controversy, as well as wild speculation.

In Kentucky, as in many other racing jurisdictions, horses that succumb to EASD are subject to a rigorous and detailed postmortem examination protocol. In addition to a standard postmortem examination, an extensive visual and microscopic examination of the heart is performed, the spinal column is examined and toxicology testing is performed as indicated by the individual horse history. Despite this extensive testing, a clear diagnosis is reached by the pathologist in fewer than 50% of cases.

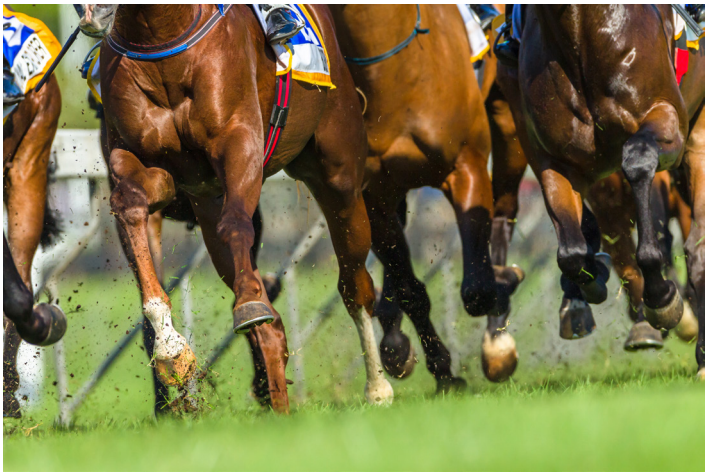
EASD is divided into two broad categories: those with significant postmortem examination findings and those without, termed autopsy-negative. From March 2017 through December 2024, 55 EASD examinations were performed at the University of Kentucky Veterinary Diagnostic Laboratory (UKVDL). A diagnosis was reached in 45% of cases, while 55% were considered autopsy-negative. Autopsy-negative cases are presumed to be of cardiac origin and are termed sudden cardiac deaths (SCD).

In 2008, the Jockey Club and industry stakeholders, including racetrack management, trainers, private and regulatory veterinarians and Thoroughbred breeders initiated a coordinated effort to address musculoskeletal injuries in racehorses. Through these and other efforts, the rate of catastrophic musculoskeletal injuries (breakdowns) has decreased by 34%. With the decreased rate of catastrophic musculoskeletal injuries, EASD has gained more prominence as a cause of exercise-associated mortality. As occurred in 2008, a focused approach to EASD and associated risk factors is being undertaken through multi-institutional research groups and regulatory bodies.

In October 2023, the Horseracing Integrity and Safety Authority (HISA) founded an EASD working group that includes veterinary professionals from a wide range of disciplines, including regulatory veterinarians, clinicians, diagnosticians and researchers. Current members of the working group represent the University of California-Davis, University of Kentucky, University of Minnesota, University of Pennsylvania, the Virginia Racing Commission and the Minnesota Racing Commission.

The goals of this working group include the development of monitoring tools to prospectively identify horses at risk, on-track emergency management plans, analysis of variations in genetics and biomarkers of horses that suffer EASD and the development of standardized postmortem examination protocols.

The successful development and implementation of risk mitigation strategies for the prevention of catastrophic musculoskeletal injuries



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provides a roadmap for the development of mitigation strategies to decrease the prevalence of exercise-associated sudden death. With a concerted effort among owners, trainers, private veterinarians, regulatory bodies, diagnosticians and researchers, and a dedication to the welfare and safety of racehorses, this goal can be achieved. We can do this.

CONTACT:

Laura Kennedy, DVM, DACVP
Veterinary Pathologist, University of Kentucky Veterinary Diagnostic Laboratory
Associate Professor, Veterinary Science Department
University of Kentucky
Lexington, KY
drlaurakennedy@uky.edu

Second Quarter 2025

International Report on Equine Infectious Diseases

Lexington and Kentucky:
For the second quarter of 2025, nearly 50 aborted fetuses or stillbirths were examined by the UK-VDL with four EHV-1 abortions reported. As expected for this time of the year, Rotavirus (Rota A) and (Rota B) antigen detection in submitted fecal samples from foals has increased.

North America:
Across the continent there have been incidental Equine Influenza reports with clusters in the Pacific Northwest and Ontario, Canada. *Strep. equi spp. equi* (Strangles) is reported from across the continent.

Several Equine Infectious Anemia cases have been detected in the Western United States, with some cases linked to a nosocomial spread in Texas. (S*ee article on EIA on page 4 of this issue.*)

Arboviruses West Nile virus (WNV) and Eastern Equine Encephalitis virus (EEEV) cases are still low because of low vector (mosquitos) activity. Several outbreaks of Equine Herpesvirus-associated Myeloencephalopathy – EHM have been reported mainly from Western United States and from Ontario, Canada. There is one report of New World Screwworm from Mexico. (*See article on page 2 of this issue.*)

South America:
Quarantines that were established as a response to an EHM outbreak in Chile have been lifted. Chile further reports two cases of EIA.

Europe and British Isles:
Rare cases of EIA were reported from Belgium, France, Italy and Bulgaria, and a few cases of Equine Influenza were reported from the British Isles and Germany. Very similar to North America, *Strep. equi spp. equi* (Strangles) dominates the statistics with reporting from across Europe.

EHV-1 abortions and EHM outbreaks have been reported mainly from central Europe.

Asia:
Japan reports Equine Influenza.

African Horse Sickness was reported from Namibia, Africa. There are currently no reports from Australia.

CONTACT:

Edward Olajide, DVM
PhD Graduate Student
Gluck Equine Research Center
Department of Veterinary Science
University of Kentucky
Lexington, KY
Edward.olajide@uky.edu

Maria Polo, DVM
MS Graduate Student
Gluck Equine Research Center
Department of Veterinary Science
University of Kentucky
m.c.polo@uky.edu

Lutz S. Goehring, DVM, MS, PhD, DACVIM
Warren Wright, Sr. – Lucille Wright Markey Endowed Chair in Equine Infectious Diseases
Gluck Equine Research Center
Department of Veterinary Science
University of Kentucky
Lexington, KY
l.goehring@uky.edu

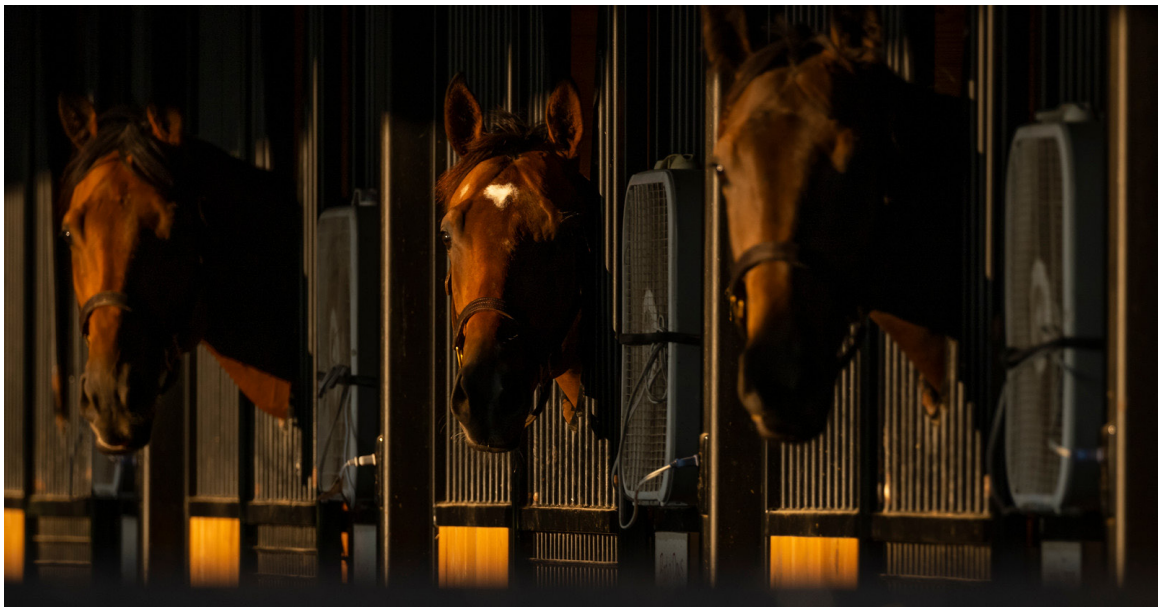

Photo Courtesy Mark Pearson Photography

Caring for the Horse's Liver: What to Know About Hepatitis Viruses

Equine hepatitis viruses are a group of viruses that can affect the liver health of horses. While some infections may go unnoticed, others can lead to significant health concerns. The two viruses currently identified as liver-specific pathogens are Equine Hepacivirus (EqHV) and Equine Parvovirus-Hepatitis (EqPV-H).

What Are EqHV and EqPV-H?
Horses can contract these viruses through contaminated biologics, such as plasma or stem cells, as well as through natural horizontal transmission, for example the parvovirus can pass through nose-on-nose contact. Natural transmission routes still have to be explained further.

EqHV is a virus that primarily causes chronic hepatitis in horses. Most horses infected with EqHV clear the virus within 20 weeks without showing any clinical signs. However, about 20% of cases may develop chronic hepatitis, which can persist for more than six months. This chronic condition may present as subclinical or with signs of liver disease, such as jaundice, lethargy or poor appetite.

EqPV-H, on the other hand, is associated with acute hepatitis, a more sudden form of liver inflammation that can frequently present with severe clinical signs. This virus has been linked to Theiler's Disease, a condition that can cause rapid liver failure in horses.

EqHV is ubiquitous and between 20 to 40% of horses have circulating antibodies against the virus without signs of liver disease, and only a small number of horses develop clinical disease. This suggests that exposure to the virus is frequent but in most cases the horse's immune system can successfully combat the virus without causing visible signs of disease. Similarly, approximately one-third of horses have been exposed to EqPV-H. While these infections often go unnoticed and do not cause clinical signs, a small percentage of cases can result in severe, potentially life-threatening liver disease, sometimes manifesting in several horses simultaneously as an outbreak.

How Are These Viruses Diagnosed?
Diagnosing these viruses involves a combination of blood testing and liver biopsies. For EqHV, veterinarians may use serial biochemistry and PCR tests to monitor viral load and liver enzyme activity. Chronic cases are confirmed when viremia (presence of the virus in the blood) and hepatitis persist for more than six months. For EqPV-H, liver biopsies are commonly used to confirm the diagnosis.

Managing Infected Horses
Managing horses infected with EqHV or EqPV-H requires supportive care and careful attention to biosecurity.

For EqPV-H, infected horses should be isolated for four to eight weeks after the onset of hepatitis. Horses that test positive for the virus can be housed together, but they must be kept separate from yet uninfected horses until the viral load decreases sufficiently to make transmission unlikely. Regular screening of all horses in the herd is recommended to identify new infections early. Typically, horses infected with EqHV do not require isolation due to the widespread distribution of the virus among non-clinically infected horses. However, monitoring the horse's health and liver function is essential. With both viruses, severely ill horses may need to be referred to a veterinary care facility for specialized treatment. Routine monitoring of serum biochemistry and signs of disease progression are important.

Prevention Tips for Horse Owners
While no specific antiviral treatments or vaccines are currently available for these viruses, prevention efforts emphasize the importance of quality control in equine biologic products. It is crucial to use biologics that have been tested and confirmed as free from these viruses to minimize the risk of transmission.

Research and Future Directions
Research on equine hepatitis viruses is moving forward quickly to better understand how these viruses cause disease and explore potential treatment options. Another important research focus is investigating how environmental factors and potential reservoirs/carriers might spread these viruses. Although small amounts of viral genetic material have been found in stable flies (*Stomoxys calcitrans*), it is still unclear if this represents an infectious dose of virus or if stable flies can actually transmit the disease. Clarifying these transmission pathways could lead to improved prevention strategies.

For prevention, early pilot studies on new vaccines for EqHV are already in progress, paving the way for more effective ways to protect horses in the future.

Conclusion
Equine hepatitis viruses can pose a serious risk to a horse's health, but with proper management and preventive measures, the impact can be minimized. Awareness of these viruses, their modes of transmission and the importance of early diagnosis can help horse owners take proactive steps to protect their animals. If you suspect your horse may be affected, consult your veterinarian promptly for diagnosis and guidance.

CONTACT:

Jessika-M. Cavalleri, Dr.med.vet., Dipl.ECEIM
Head of the Clinicical Department for Small Animals and Horses
University of Veterinary Medicine Vienna
Vienna, Austria
Jessika.Cavalleri@vetmeduni.ac.at