



ANNE M. EBERHARDT/THE HORSE

Which Biomarkers Best Predict Late-Term Pregnancy Loss?

Decreases in estradiol concentrations and elevations in AFP concentrations could help predict abnormal pregnancy outcomes during late gestation.

Late-term pregnancy loss in mares continues to be a significant problem in reproduction practice. In recent years, researchers have identified several biomarkers that can indicate when trouble's brewing (TheHorse.com/38108), but hadn't yet done a large-scale field study to evaluate them.

So a team from the University of Kentucky (UK), in Lexington, examined changes that occurred in four established biomarkers in mares with both normal and abnormal pregnancy outcomes. Barry Ball, DVM, Dipl. ACT, presented their results at the 2016 American Association of Equine Practitioners' Convention, held Dec. 3-7 in Orlando, Florida.

The biomarkers of interest in this study were:

- **The estrogen estradiol-17B** The fetus and placenta produce estradiol during pregnancy. Previous study results have shown that estradiol levels decrease when experimental placentitis is induced at nine months of gestation.
- **Progesterone** The placenta plays a large role in progesterone metabolism. Progesterone falls to low or nondetectable concentrations

during gestation. When researchers induced experimental placentitis at nine months, however, these levels increased in the days before abortion.

- **Alpha fetoprotein (AFP)** This protein is present in the fetal fluids and can cross the placenta into the maternal circulation. Concentrations increase in mares with induced placentitis.
- **Serum amyloid A (SAA)** This biomarker increases in response to any inflammation in the body and has been shown to increase in pregnant mares a few days post-placentitis induction.

In their study, Ball and his team recruited 700 mares from 15 Thoroughbred farms in Central Kentucky. Starting in December, they collected blood samples weekly until the mares either foaled or aborted.

From this group, 15 mares aborted (8) or had lesions on their placentas after foaling (7). For the purpose of the study, the team matched each of these mares with two matched control mares.

The affected mares' mean age was 11, and their diagnoses included umbilical cord lesions (2), equine herpesvirus-1 (1), abortion of unknown cause (3), nocardiform placentitis (2), bacterial placentitis (5), and premature placental separation (2).

Looking at these mares' weekly blood sample results, Ball said estradiol levels decreased as parturition (foaling) approached. At the week of pregnancy loss or foaling,

In This Issue

UK, University of Copenhagen Team Up for Dual PhD Program	02
Tall Fescue Pasture Renovation Workshop	05
2017 UK Equine Showcase, Breeders' Short Course Scheduled	06

Biomarkers

all case mares had significantly lower levels than did controls. This decline was particularly steep in mares with placentitis.

Progesterone levels increased as expected in both groups, rising more rapidly in mares with placentitis. There were no significant differences between case and control mares, however, at the week of pregnancy loss or foaling.

Alpha fetoprotein concentrations were significantly higher in case mares than controls and increased the closer the mare got to foaling.

And, lastly, Ball said SAA levels were not significantly different between case and control mares in the two weeks before foaling or abortion.

So, from Day 290-300, estradiol levels decrease and progesterone levels increase in affected mares. At foaling

or abortion, estradiol decreases, AFP increases, and progesterone and SAA are not predictive. In mares with placentitis, progesterone increases in the four weeks prior to foaling or abortion, and estradiol decreases in the two weeks prior.

“This study suggests that decreases in estradiol concentrations relative to control mares and elevations in AFP concentrations, within seven days of parturition or abortion, may be useful in predicting abnormal pregnancy outcomes during late gestation based upon a single serum sample,” the authors wrote.

Said Ball, “If you’re going to use this information in a clinical setting, first establish normal reference levels for estradiol and progesterone based on the assay used and gestational age.” **UK**

>Alexandra Beckstett is the managing editor for *The Horse: Your Guide To Equine Health Care*.

UK, University of Copenhagen Team Up for Dual PhD Program

The University of Kentucky and the University of Copenhagen, in Denmark, have a long history of collaborating on research.

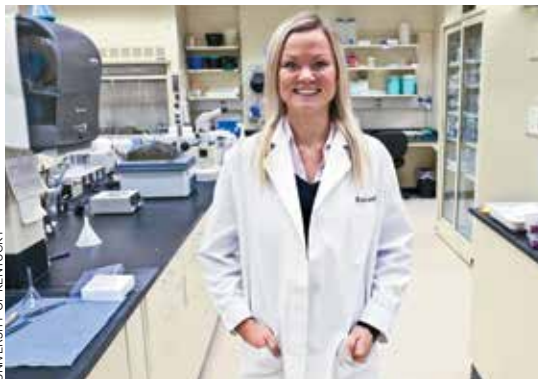
A few years ago, the two universities extended this history by partnering to offer a dual doctoral degree program. In the summer of 2015, Jasmin Bagge, DVM, from Denmark, became the first student enrolled in the program.

James MacLeod, VMD, PhD, John S. and Elizabeth A. Knight chair and professor of veterinary science at the UK Gluck Equine Research Center, serves as Bagge’s co-mentor at UK. Across the pond, Lise Berg, DVM, PhD, associate professor in applied clinical biomedical sciences, and Denis Verwilghen, DVM, MSc, PhD, DES, Dipl. ECVS, associate professor, are Bagge’s co-mentors at the University of Copenhagen.

Bagge came to UK with a strong interest in equine orthopedic injuries. A dressage rider, she is particularly excited about the future of stem cells and regenerative medicine to facilitate tissue repair following injury. The University of Copenhagen is paying for Bagge’s tuition, stipend, and some research funding—a bonus of entering the dual degree program.

Bagge first heard about the program before completing her veterinary medicine degree and was excited about such a unique opportunity, especially after reading peer-reviewed articles published by MacLeod and Berg.

“I just think Gluck is an absolutely unique equine research facility,” she said. “I haven’t heard about anywhere else where you have so much equine-centered



UNIVERSITY OF KENTUCKY

Jasmin Bagge, DVM, is studying stem cells and regenerative medicine for treating horses with orthopedic injuries.

Masthead

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Dual PhD Program

research going on in one building, and it's a privilege to be in this dual degree program."

The program is structured as four years of study split between UK and the University of Copenhagen. Bagge said the program is flexible and directly relates to the research she's conducting when it comes to determining where she will be each semester.

Berg said the University of Copenhagen's graduate students have always had great experiences working at the Gluck Center during informal exchange programs. This new doctoral program formalizes the collaboration and allows enrolled students to be a part of research training programs at both institutions.

"In addition, it has given us as supervisors a unique opportunity to collaborate and discuss not only research, but also how we view research training, and what we can learn from each other," Berg said. MacLeod agreed, adding that the program should also facilitate opportunities for UK students to have research rotations in Denmark.

Bagge described being part of this program as the "best of both worlds." Before coming to UK, she had a strong veterinary background with a lot of clinical training when working toward her veterinary medicine degree. In the PhD program, Bagge has switched gears to an education in experimental biology and learning how to become a good researcher. She said it's a great international collaboration between the two universities.

Bagge said she hopes to complete the program in 2019. When asked about the future, she reflected on serious orthopedic injuries in horses and said she hopes to one day be able to turn what today might be a career-ending problem into something that can be successfully treated using stem cells.

"I hope to contribute positively to this very promising field of regenerative medicine," she said. "My dream is to combine academics, research, and teaching, while getting more surgical training and combining those while working at a large equine facility."

MacLeod, Berg, and Verwilghen hope the two universities continue collaboration in the future.

"Cross-Atlantic projects like this require financial and administrative support to succeed, and we are working hard to secure the future for the program," Berg said. **UK**

>Taylor Pence, a senior marketing major at UK, is the marketing and communications intern at the UK Gluck Equine Research Center. She is also president of the UK Dressage and Eventing Team.

2016 Kentucky Net Farm Income Likely to Hit Lowest Level Since 2010

Kentucky's net farm income is expected to dip to less than \$1.5 billion in 2016, down from \$1.7 billion in 2015 and potentially its lowest level since 2010.

A significant decline in cash receipts over the past couple of years, plus the end of tobacco buyout payments in 2014, have been the major reasons behind the rapid fall in Kentucky's net farm income since peaking at nearly \$3 billion in 2013.

The state's agricultural cash receipts in 2016 are projected to fall to \$5.4 billion, off 7% from \$5.8 billion in 2015 and off 17% from the record high of \$6.5 billion in 2014. On the national front, prices and incomes fell for the third

straight year.

"2016 has been another challenging year for Kentucky agriculture with considerable price and weather volatility," said Will Snell, MS, PhD, Extension professor in the UK Department of Agricultural Economics. "Price and profit challenges will remain a major concern heading into 2017 in the midst of ample commodity supplies, a strengthening U.S. dollar, and sluggish global economic growth. However, assuming there are no major supply or demand shocks, net farm income for Kentucky farmers may show signs of stabilizing in 2017 as the global markets work off excess supplies and global economies begin to show some modest

growth."

Snell and other UK College of Agriculture, Food and Environment faculty, including agricultural economists Kenny Burdine, MS, PhD, Todd Davis, MS, PhD, and Tim Woods, MS, PhD; Bobby Ammerman from the Department of Forestry; and Kentucky Farm Business Management Program coordinator Jerry Pierce, MS, shared their agricultural economic outlook for 2017 and an overview of 2016 on Dec. 1 during the Kentucky Farm Bureau's 97th annual meeting in Louisville.

Poultry receipts should be back on track in 2016 after rebounding from the effects of avian influenza in 2015, with growth



The equine industry had another steady year and accounted for 17% of Kentucky's sales receipts in 2016.

Net Farm Income

continuing in 2017. Poultry remains Kentucky's No. 1 agricultural enterprise with 23% of projected sales, followed by equine, which had another steady year and accounted for 17% of sales receipts. Soybeans (15%), corn (13%), and cattle (12%) were next on the list.

Much of the decline in Kentucky agricultural sales for 2016 can be attributed to rapidly falling cattle

receipts, which fell by more than 30% in response to mounting beef, poultry, and pork supplies.

"Efficient operations are likely covering cash costs and breeding stock depreciation, but there is little to no return on capital, land, and management costs," Burdine said.

He predicts producers will see some improvement in price during spring 2017, but expects a significant drop from spring to fall, given an expected increase in beef cow numbers, as well

as continued growth in the production of competing meats.

Horse receipts remain flat. September yearling sales were down about 3%, and early November breeding stock sales were solid before slumping at the end when mid- to lower-quality horses were placed on the market.

A record U.S. soybean yield and production is projected to increase total supply to a record of more than 4.58 billion bushels. Exports finished 265 million bushels above October 2015 estimates because of South American production problems, which also increased corn exports. The U.S. corn supply will set a record in 2016 of more than 17 billion bushels, with exports finishing above April 2016 estimates. In wheat, a record U.S. yield offset a 3.4-million-acre reduction in harvested area, with the supply projected to increase 448 million bushels from 2015. Wheat exports are projected to top the preceding year, but are still 200 million bushels below 2013, Davis said.

Tobacco receipts slumped to their lowest post-buyout level due primarily to unfavorable weather and curing conditions. A combination of much lower yields and a very poor-quality crop will likely cause the Kentucky value of tobacco production to fall below \$300 million in 2016.

The excessive rain in summer 2016 resulted in modest decreases in produce sales to about \$38 million, down from \$40 million in 2015, Woods said. Stronger greenhouse sales should offset slower nursery sales and reach about \$96 million, the same as last year.

"The big winner in the current depressed ag economy are consumers, with lower meat prices primarily leading the way and fruits and veggies relatively stable in 2016," Snell said. "Food price inflation is expected to remain relatively tame for 2017, as well."

Overall, the forestry sector declined 4.8% from 2015. Lackluster markets for most of the hardwood lumber species, decreased demand for products such as railway ties, and the Verso pulp and paper mill closing in Wickliffe dragged down the sector. Bucking the trend, however, was the increased demand for white oak stave logs used for bourbon whiskey barrels. The seller's market in that area should continue into 2017.

"Without any major supply or demand shocks, ag commodity prices in 2017 may not be as volatile and

GRAD STUDENT SPOTLIGHT

JESSICA SCARE

From: Fort Wayne, Indiana

Degree and institute where received:
Murray State University, BS in Animal Science with an emphasis in Equine Science



Jessica Scare chose UK for her doctoral studies in veterinary science because of the vast array of unique opportunities.

"I began reading about all of the research, the very distinct equine research herds, and the multitude of equine disciplines available for study, and I instantly fell in love," Scare said. "The opportunities are endless here, and I would recommend it to any undergraduate student who has a passion for science, particularly equine science. Plus, what horse lover wouldn't want to live in the Horse Capital of the World?"

Scare has two ongoing projects under the supervision of Martin Nielsen, DVM, PhD, Dipl. EVPC, ACVM, associate professor in the UK Department of Veterinary Science. One of the projects involves evaluating the combined efficacy of two dewormers targeting equine cyathostomin parasites, and the second is validating a smartphone-based automated fecal egg counting system. As she begins her thesis work, she is attempting to culture *Parascaris* worms, a rather large parasite that is very prevalent in foals and difficult to keep alive outside of the horse.

"Culturing the worms will allow me to expose them to anthelmintic drugs in vitro (in the lab) and observe the genes expressed upon exposure," Scare said.

Overall, Scare hopes to gain insight into how those parasites gain resistance to anthelmintic drugs.

When asked what her most valuable takeaway from the program was, Scare said, "The program has taught me the value of animal research."

Scare said she also enjoys working with and learning from the parasitology horse herd at UK's Maine Chance Equine Campus.

"Our research horses are very loved by us," Scare said. "Not only do they provide us with an excuse for weekly farm visits, but the knowledge that we gain from them is invaluable!"

Scare said today's working equids and sport horses would not be able to reach their full potential without the medications, supplements, and treatment regimens provided to them, which is made possible through animal research.

Scare plans to graduate in 2019 and hopes to become an animal or equine science professor or a student advisor. **UK**

>Alexandra Harper, MBA, is the operations and communications coordinator for the UK Ag Equine Programs.

Net Farm Income

production expenses may remain relatively stable, but government farm payments could be lower in response to the structure of the current farm bill," Snell said.

Find the outlook publication, including information on individual farm sectors, at uky.edu/ag/agecon/pubs/extoutlook161758.pdf. **UK**

>Carol Lea Spence, agriculture communications specialist in UK's College of Agriculture, Food and Environment, supplied this information.

UK to Host Tall Fescue Pasture Renovation Workshop

Anyone who has spent a considerable amount of time around livestock or forages knows tall fescue is a double-edged sword: The grass is hearty and generally grows well, but it can be infected with a fungus that can be dangerous to grazing livestock, including horses. So, UK forage specialists are teaming up with the Alliance for Grassland Renewal to host a workshop aimed at teaching producers how to renovate their old tall fescue pastures with a novel endophyte variety.

The Tall Fescue Renovation Workshop will take place March 9, 2017, at UK's Veterinary Diagnostic Laboratory and UK's Spindletop Research Farm.



Tall fescue grows well, but some varieties can contain a toxic fungus.



Lloyd's of London recently presented UK representatives with a \$50,000 check.

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UK Celebrates 25 Years of Lloyd's of London Partnership

The long-term partnership between Lloyd's of London and the UK College of Agriculture, Food and Environment celebrated 25 years of continued financial support when representatives from Lloyd's recently presented UK with a \$50,000 check.

"Lloyd's has long been a leading bloodstock insurer in Kentucky, and a quarter century of financial support demonstrates the underwriters' commitment to good equine health and cutting-edge research," said Patrick Talley, U.S. central region manager for Lloyd's America.

The partnership supports the Lloyd's *Equine Disease Quarterly*, a publication dedicated to equine health and welfare, produced by the UK Department of Veterinary Science Maxwell H. Gluck Equine Research Center.

"The College of Agriculture, Food and Environment is grateful to Lloyd's of London for this long-standing and unique support of the veterinary science department in general since 1985 and of the *Equine Disease Quarterly* for 25 years," said Dean Nancy Cox, MS, PhD. "Because of Lloyd's support, this publication has achieved iconic status in the international equine industry, and we are so grateful."

The award-winning publication provides timely and authoritative reports on some of the most important issues facing the equine industry. The *Quarterly* reaches more than 18,000 readers in 102 countries. Available in paper and online, its articles are regularly reprinted in scientific and lay equine publications worldwide.

Lloyd's *Equine Disease Quarterly* is available to subscribers at no charge. It is co-edited by Cynthia Gaskill, DVM, PhD; Alan Loynachan, DVM, PhD, Dipl. ACVP; and Peter Timoney, FRCVS, PhD, from the Department of Veterinary Science.

The most recent issue is available online at www2.ca.uky.edu/gluck/q_oct16.asp.

For more information about the Department of Veterinary Science and the Maxwell H. Gluck Equine Research Center, visit www.ca.uky.edu/gluck.

Lloyd's of London is a 328-year-old insurance market whose members underwrite risk on a direct and reinsurance basis in more than 200 countries. As a global leader in specialty insurance, Lloyd's remains committed to supporting equine research and providing the insurance coverage essential to the health and well-being of horses and the prosperity of equine industries worldwide. **UK**

>Jenny Evans is the marketing and promotion specialist senior at the UK Gluck Equine Research Center.

Fescue Workshop

Producers have widely used tall fescue in pastures for decades, because it survives well under many conditions including drought, cold, overgrazing, insects, and diseases. However, the most common variety, KY-31, also contains toxins that can severely affect cattle and horses.

“Now, with a growing number of novel or friendly endophyte tall fescue varieties on the market, there is a solution to fescue toxicity,” said Ray Smith, PhD, forage extension specialist in the UK College of Agriculture, Food and Environment. “UK’s own novel endophyte variety, Lacefield MaxQ II, will be available in the fall of 2017.”

During the workshop, participants will hear from specialists from UK,

the USDA Forage-Animal Production Research Unit, University of Missouri, USDA Natural Resources Conservation Service, and Missouri Forage and Grassland Council’s Grazing Lands Conservation Initiative, as well as producers and industry representatives. While this will be the first time the workshop is in Kentucky, the Alliance for Grassland Renewal has hosted similar workshops in Missouri and surrounding states.

“This will be one of the most practical workshops available to Kentucky livestock producers in 2017,” Smith said.

To register or for more information visit the UK Forage Extension website at www.uky.edu/Ag/Forage. **UK**

>Katie Pratt is an agriculture communications specialist for the UK College of Agriculture, Food and Environment.

UK Ag Equine Programs to Host 2017 Equine Showcase, Breeders’ Short Course

University of Kentucky Ag Equine Programs will host the 6th Annual UK Equine Showcase and the 8th Annual Kentucky Breeders’ Short Course Jan. 27-28, 2017, both at the Fayette County Extension office, 1140 Red Mile Place, in Lexington.

The UK Equine Showcase will highlight the university’s equine programs and relevant industry findings with an emphasis on immunology. It will run from 1 p.m. to 5 p.m. Jan. 27.

The Kentucky Breeders’ Short Course is an in-depth program on horse management issues and will focus specifically on preventive measures designed to reduce the risks of introducing and transmitting infectious disease. It will run from 8 a.m. to 2:30 p.m. Jan. 28, with lunch provided.

“This year our focus will be on biosecurity, an issue which should be of great interest to the audience,” said David W. Horohov, PhD, chair of the UK Department of Veterinary Science and director of the Maxwell H. Gluck Equine Research Center within the College of Agriculture, Food and Environment. “The program will feature presentations on various aspects of biosecurity ranging from the factors and concerns at the farm, clinic, state, national, and international level.”

Topics and speakers for the UK Equine Showcase will include:

- **Equine vaccination: What, when, and why?**—Horohov;
- **Disease surveillance and monitoring utilizing geographic information system (GIS) and temporal spatial scan statistics in Kentucky**—Jacqueline Smith, PhD, epidemiology section head at the UK Veterinary Diagnostic Laboratory;
- **Rhodococcus equi: An update**—Fernanda Cesar, MS, DVM, Dipl. ACVIM, graduate student at the UK Gluck Center;
- **Barn Ventilation**—Morgan Hayes, PhD, PE, assistant extension professor in livestock systems in the UK Department of Biosystems and Agricultural Engineering;

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Pastures Please!!

Pasture Management for the Horse Owner

The Cooperative Extension Service of Bourbon, Clark, Fayette, Jessamine, Mercer, Scott and Woodford counties invite you to attend an informative meeting on the management of horse pastures. This program presents some of the latest information geared specifically toward the horse owner/manager.

January 30, Fayette County Extension Office, 1140 Red Mile Place, Lexington



5:30 p.m. Registration with light refreshments sponsored by McCauley's

6-8 p.m. Program

Krista Lea, *Managing to Reduce Tall Fescue Toxicosis*

Dr. Karen McDowell, *Grazing Novel Tall Fescues with Confidence*

Dr. Cynthia Gaskill, *Top 10 Equine Poisons in Kentucky*

Dr. JD Green, *Weed Control in Pastures*

Door prizes will be given out. An RSVP is encouraged but not required. Please contact your County Extension Agent to reserve a spot. 2017 Pastures Please!! is organized by the Equine Pasture and Forage Working Group at the University of Kentucky College of Agriculture, Food and Environment, and sponsored by the UK Cooperative Extension Service and UK Ag Equine Programs.

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Equine Showcase, Breeders' Short Course

- **An overview of research programs: What's the focus?** — Mick Peterson, PhD, incoming UK Ag Equine Programs director and incoming professor within UK's Department of Biosystems and Agricultural Engineering; and
 - **New perspectives on foal nutrition;** Laurie Lawrence, PhD, professor of equine nutrition in UK's Department of Animal and Food Sciences
- Kentucky Breeders' Short Course topics will include:
- **Biosecurity and infectious disease control: What about it?**— Lucas Pantaleon, DVM, MS, Dipl. ACVIM, MBA, a veterinarian based in Versailles, Kentucky;
 - **National biosecurity issues: The need for speed**—Roberta Dwyer,

DVM, MS, Dipl. ACVPM, extension professor of veterinary preventive medicine within UK's Department of Animal and Food Sciences;

- **International movement of horses**—Allen Page, PhD, DVM, a researcher with USDA Animal and Plant Health Inspection Service;
- **State veterinarians' perspective on biosecurity**—Robert Stout, DVM, and Rusty Ford, of the Office of the Kentucky State Veterinarian;
- **Biosecurity in the hospital setting**—Bonnie Barr, VMD, Dipl. ACVIM, veterinarian at Rood & Riddle Equine Hospital, in Lexington, Kentucky; and
- **Biosecurity on the breeding farm: What is practical?**—Nathan Slovis, DVM, Dipl. ACVIM, CHT, veterinarian at Hagyard Equine Medical Institute, in Lexington, Kentucky.

Both programs are open to veterinarians, owners, and managers

Upcoming Events

Jan. 27-28, 2017

UK Equine Showcase and Kentucky Breeders' Short Course
Fayette County Extension Office. For more information and to register, visit 2017ukshowcaseshortcourse.eventbrite.com.

Jan. 30, 2017

Pastures Please!! Educational evening on pasture management for the horse owner. Fayette County Extension Office, Lexington, Kentucky, 5:30 p.m. RSVP to 859/257-5582.

of all horse breeds or anyone with an interest in learning more about equine reproduction and topics concerning horse management. Continuing education credit for veterinarians and veterinary technicians is pending approval by the Kentucky Board of Veterinary Examiners.

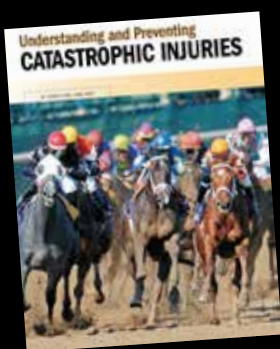
Sponsor participation is also being accepted for the event, and display opportunities are available to participating organizations. Please e-mail equine@uky.edu for details.

To register for the event, visit 2017ukshowcaseshortcourse.eventbrite.com. UK Equine Showcase rates are \$50 per person or \$40 each when two or more people from the same organization register at the same time. Early registration rates for the Kentucky Breeders' Short Course are \$75 per person or \$65 each when two or more people register at the same time. Attendees can enroll in both the showcase and the short course for \$100 per person or \$90 each when two or more people from the same organization register. Registration will close Jan. 23, 2017.

College students are eligible for a reduced rate to the showcase and short course, but student space is limited and available on a first-requested, first-served basis. Students or UK faculty interested in attending either or both days should e-mail jenny.evans@uky.edu. For more details about the event and other information about UK Ag Equine Programs, visit www.ca.uky.edu/equine. **UK**

>Holly Wiemers, MA, APR, is communications director for University of Kentucky Ag Equine Programs.

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*Currently, there are no vaccines available with USDA-licensed label claims against equine abortions, uveitis or acute renal failure due to *L. pomona*.

¹ Data on file, Study Report No. B850R-US-12-011, Zoetis Inc.

² Data on file, Study Report No. B951R-US-13-043, Zoetis Inc.

³ Data on file, Study Report No. B951R-US-13-046, Zoetis Inc.