

Zweig

From the Harry M. Zweig
Memorial Fund for Equine
Research at Cornell University
College of Veterinary Medicine



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Dr. Heidi Reesink named next Harry M. Zweig Assistant Professor in Equine Health

By Patricia Walddron

Heidi Reesink has been named the Harry M. Zweig Assistant Professor in Equine Health in honor of her ambitious research program to detect horses at risk for catastrophic injuries and to develop new treatments for arthritis.

The professorship is a three-year, endowed position for a junior faculty member who shows great promise for advancing equine research. It can be instrumental in helping junior faculty secure funding and develop high-level publications necessary for long-term success. Reesink has received grants previously from the Zweig Memorial Fund to support individual research projects. She has also received support from the Grayson-Jockey Club Research Foundation, the Cornell Center for Advanced Technology, the Cornell Center for Materials Research and the National Institutes of Health through a Mentored Clinical Scientist Development Award, a highly competitive grant to advance the careers of promising researchers.

"Dr. Reesink is recognized as a rising star among junior faculty and an important contributor to our college community," says Robert Weiss, Associate Dean for Research and Graduate Education. "One of the main concerns of the Harry M. Zweig Memorial Fund is catastrophic racehorse injury. Solving this problem is a critical need in the racing industry and she's doing some exciting work in that area."

Catastrophic musculoskeletal injuries – mainly broken legs – are the main cause of death for racehorses. "We would like to understand how these fractures occur and to develop better methods to screen for racehorses at risk of fracture," says Reesink.

She is working with Dr. Scott Palmer, the equine medical director for the New York State Gaming Commission, in addition to epidemiologists and pathologists to examine horses that died after sustaining fractures to their proximal sesamoid bones (PSBs) – two knobby, triangular bones at the back of the fetlock joint. Often, racehorses with this injury have no telltale signs of lameness during pre-race



Heidi Reesink, Ph.D. '16

examinations or X-rays. Reesink is comparing the PSBs from the uninjured leg of those horses to PSBs from horses that died of other causes, using advanced CT scans. She hopes to develop better screening procedures to identify horses susceptible to fractures.

Reesink is also looking into new treatments and early detection methods for arthritis. "Joint disease and osteoarthritis are the leading cause of lameness in horses, but there are limited options for treating arthritis in horses and in humans," says Reesink. "A long term goal is to develop better therapies, that will both provide longer and better pain relief and that, ideally, will prevent or delay the development of arthritis."

After an injury, many – but not all – horses develop arthritis, so Reesink is examining the synovial fluid that bathes the joints to identify biomarkers that would indicate which horses are at risk and might benefit from preventive therapies. She is also investigating lubricin, a sugar-coated protein in the synovial fluid that provides lubrication, to see if an injection of lubricin can treat lameness. Additionally, along with pharmaceutical industry colleagues, Reesink is testing whether horses benefit from human arthritis medicines that are not available on the veterinary market.

Reesink is passionate about "one medicine," the concept that human and veterinary biomedical research can each inform the other. She believes that while providing treatment for animals, she can also offer insights to advance human health, and hopes her work will translate into clinical applications that benefit both horses and people.

As a former athlete herself, Reesink has fractured bones and injured joints while playing volleyball, competing in tae kwon do events, snowboarding and running, and so she understands the challenges and potential for developing better treatments for sports injuries. "I saw equine orthopedic surgery as a way to combine my love of the horse as well as my desire to advance the science of sports medicine." ■

Powers combined: Cornell D.V.M. - Ph.D.'s unite skills to advance veterinary medicine

By Olivia Hall

Veterinarians who also hold a Ph.D. are a rare breed, but two programs at the College of Veterinary Medicine are working to increase their number.

Students may arrive with a D.V.M. in hand and earn a Ph.D. in Biomedical and Biological Sciences (BBS), or they launch directly into the Combined D.V.M.-Ph.D. Degree (CD) Program. Whether completed consecutively or together, both graduate degrees contribute distinct perspectives to shape researchers uniquely positioned to tackle cutting-edge issues in veterinary science.

"A veterinary degree teaches you a lot about how to recognize, diagnose, and treat disease, but not a lot at all about how those things were found out," said John Parker Ph.D. '99, associate professor of virology with the Baker Institute for Animal Health and the Department of Microbiology and Immunology. "If you want to be able to advance the field, you need advanced training in a discipline that's going to allow you to do that."

At the same time, veterinarians' broad education in animal physiology and health problems prepares them to identify important issues across species and conduct impactful translational research. "The students tend to be more analytical how these problems arise, what's known about their causes and how they're being treated," said Dr. Hélène Marquis, professor in the Department of Microbiology and program director and oversight committee chair of the CD program. "They make connections that others without the veterinary medicine knowledge would not necessarily make as easily."

But the path to becoming a D.V.M.-Ph.D. can be long and expensive, so that only few choose to pursue it.

"Securing a position in the Graduate Training Program in Comparative Medicine for Veterinary Scientists (GTPCM) is what gave me the confidence to take that leap," said Michelle Delco '98, D.V.M. '02, Ph.D. '16, assistant research professor in the Department of Clinical Sciences. She began her career as a



dedicated equine surgeon but became frustrated with diagnosing injuries that carried poor prognoses and had no good treatment options. "I came back to academia because I wanted to help change that," she said.

Delco completed her Ph.D. with three years of support from the GTPCM, which has been backed by a grant from the National Institutes of Health since 1990. (Other D.V.M.s seeking a Ph.D. at Cornell may receive state-supported graduate research assistantships as an alternative source of funding.)

While students who fill the three or four available GTPCM positions every year cover a wide range of interests, quite a few – like Delco – have worked in equine surgery and medicine, according to Parker, the program's director. "That's because it's almost impossible to get a job as a faculty member in equine surgery without a Ph.D.," he explained. The program allows them to spend up to ten percent of their time on clinical work to maintain their surgical skills while getting advanced training.

Meanwhile, the Combined D.V.M.-Ph.D. Degree Program – developed in 2001 out of an existing Veterinary Scientist Training Program – accepts two to three students annually. After they complete both degrees over the span of about seven to eight years, it forgives their D.V.M. tuition loans.

"The students are extremely self-motivated, successful in winning fellowships, and proactive in terms of what they want to do with their degrees," Marquis said. Like individuals admitted to the GTPCM, they have been selected for the depth of their research experience, as well as their likelihood to thrive in an intense program and contribute to veterinary science.

Cornell in turn offers a very strong research community and a lot of flexibility. "Students can find a research lab at the CVM or down campus, as long as that person has a connection to BBS," Marquis said.

In addition, Parker makes sure trainers participating in the GTPCM have a record of successful mentorship and external funding that can pay for students' research experiments. "It wouldn't be surprising that a graduate student would cost \$24,000 in supplies per year," he said. "Science is expensive."

This careful approach to selecting both students and trainers has proven successful: graduates have advanced into a variety of positions in academia, government, and pharmaceutical and biotechnology industries. Delco, for one, has been very happy with her choice to go through the GTPCM. "Anyone considering research as part of their career should learn more about this program," she said. ■



Michelle Delco '98, D.V.M. '02, Ph.D. '16

Cornell looks to spur expansion in equine programs

By Melanie Greaver Cordova

The college's equine programs may soon be expanding their impact in the local community thanks to a new proposal crafted by a committee at the Cornell University College of Veterinary Medicine (CVM). "The committee wanted to assess where we are now and where we're going," said committee chair Lisa Fortier, Ph.D. '98, the James Law Professor of Large Animal Surgery.

In April of 2018, Lorin D. Warnick, D.V.M., Ph.D. '94, the Austin O. Hooey Dean of Veterinary Medicine, tasked the Equine Programs Planning Committee to recommend steps for the college to maintain excellence in equine education, research and clinical service. Warnick instructed the committee to consider how the college can best remain the number-one choice for students, clients and faculty.

Fortier approached this tall order with systematic precision: Gather a committee of well-informed staff and faculty; outline all of the college's equine programs and their reach; gather extensive community feedback; and create a comprehensive report that could be shared broadly with the CVM community. "It was a very healthy process," said Fortier. "A lot of people came to the meetings to share what they thought about what we were already doing well, and where they see us going in the future. We got very good feedback."

Dreaming big

Some plans for the equine programs are already underway, such as transforming the Cornell Equine Park into a working farm. "It helps the veterinary students to see a working farm, where you do your own hay and manure, rather than a university model where you hire all those tasks out," Fortier said.

The park may become more versatile in other ways, too. "One of the visions we have for the park is that it becomes something like the Lab of Ornithology," she said. "While we're designing the new barn, do we design it only for horses, or do we have an entertainment space, a space where people can get married and hold events."

She and her team have already started hosting events there, like "Hoof it for the Horses," a 5K race raising money to send Cornell Equine-focused veterinary students to the American Association of Equine Practitioners meeting. "We started the race last fall, and that helped to send nine veterinary students to the conference. It was a huge success."



The Cornell Equine Park's Sarah Ruby leads one of their warmblood horses.

A sturdy foundation

The new report on equine programs, submitted to the dean in early 2019, offered administrative and programmatic recommendations. Their top three suggestions were ordered in terms of priority and impact:

- (1) An equine primary care and farrier hire, who would work in the field with all Cornell-owned animals as well as Cornell's referral base. "Everything in equine programs comes back to having the best clinicians in the world," said Fortier. "If you don't have the best clinicians, if you don't attract the best residents or students, then you don't attract the caseload — it's very cyclical."
- (2) Retain the Cornell Equine Park and proceed with consolidation of a new facility, which would include redesigning the park to maximize its role as a recruitment and teaching tool.
- (3) Review the current mechanism of admission and funding for graduate students with an interest in equine research, specifically those seeking a dual degree.

In addition to the top three recommendations, the report further outlined suggestions for Cornell Ruffian Equine Specialists, hospital caseload, the overall veterinary curriculum, the equine summer school course and presence at the New York State Fairgrounds. Fortier anticipates many of these recommendations being implemented over the coming months, further strengthening the college's focus on education, research and clinical care. ■

Dr. Thomas Divers, clinician and clinical investigator

By Lauren Cahoon Roberts

One might call him horse healer — others might call him horse sleuth — either way, Dr. Thomas Divers, the Steffen Professor of Veterinary Medicine at the Cornell University College of Veterinary Medicine (CVM), has saved the lives of countless horses worldwide thanks to his drive to solve puzzling clinical cases.

“My passion has been treating clinical cases,” says Divers. “Therefore, my research has always been clinically driven. I’ll see a disease in clinical practice and recognize that the disease needs further investigation.” Divers notes that the research he’s done during his almost 30-year tenure at Cornell has always been collaborative; “I have never solved any clinical mystery by myself.” Thanks to Divers and his research collaborators, some major equine diseases are no longer the deadly threats they once were.

Vitamin fix

One of Divers’ favorite projects while at Cornell was on Equine Motor Neuron Disease (EMND). This frequently fatal degenerative condition affects motor neurons and results in muscular wasting and weakness and remains the only naturally-occurring animal disease model that mimics Lou Gehrig’s disease in humans.

EMND was a mystery up until the nineties, when Divers, along with renowned CVM faculty Dr. Hussni Mohammed; Harold “Skip” Hintz, M.S. ’61, Ph.D. ’64; John Cummings ’58, D.V.M. ’62, Ph.D. ’66; and Alexander de Lahunta, D.V.M. ’58 Ph. D. ’63, discovered that it was an oxidative disorder caused by vitamin E deficiency. “One of the highlights of my career was traveling with Mohammed and Cummings to a great many equine stables throughout the Northeast United States, Brazil, Ireland and Switzerland to investigate field cases of EMND,” says Divers. “I can still hear Dr. Cummings emphasizing how important it was to visit every case possible, regardless of where it was located, in order to better understand the epidemiology and to let practitioners and horse owners know that we were trying our best to determine the cause.”

Doing so, however, amounted to many 15-plus-hour days driving round-trip around the Northeast in all sorts of weather to examine affected animals, collect samples, fill out risk factor surveys and, most importantly, speak with the owners and attending veterinarians.



Dr. Thomas Divers. Photo provided

Unfortunately, Cummings passed away just prior to the research group’s experimental reproduction of the disease which confirmed that prolonged vitamin E deficiency was the cause of the disease. “Cummings was perhaps the most brilliant individual that I worked with in my career and also one of the most modest,” says Divers. Today, thanks to their research efforts, horses rarely suffer or die of EMND due to owners and feed manufacturers now providing adequate supplies of vitamin E.

The search for the suspect

The bulk of Divers’ research has focused on infectious diseases, including another favorite Cornell-based investigation that searched for the cause of acute equine hepatitis, a frequently deadly condition also known as Theiler’s disease or serum hepatitis. The disease, first reported in South Africa in 1919, was most commonly associated with recently administered equine blood, serum or plasma, but an etiologic cause had not been found.

Divers and his long-time research collaborator and close friend, Dr. Bud Tennant, James Law Professor of Comparative Medicine Emeritus, had been searching unsuccessfully for 30 years for the cause of Theiler’s disease. They had theorized the disease was viral, but could not find proof for this hypothesis.

In 2011, an outbreak of the disease in horses on a Nevada farm reignited their focus on the disease. “We got really serious about our investigation because of both the

Nevada outbreak and recent advances in deep sequence technology that could lead to identification of previously unknown infectious agents,” says Divers. Tennant had collaborated with hepatitis C researchers at Novartis, and asked them to investigate the Nevada samples for a similar virus. From that investigation, they found a novel RNA virus which they named “Theiler’s disease associated virus” (TDAV). In Zweig-funded research, Divers and Tennant next explored the association of this virus with other North American field cases of Theiler’s disease. With TDAV as their suspect, Divers and Tennant gathered and tested samples from horses with acute hepatitis from around the country, but TDAV was not present in the other diseased horses. Furthermore, later experiments performed at Cornell confirmed that the virus (TDAV) did not cause liver disease.

Although disappointed, Divers and Tennant broadened their search for a causative agent. They next collaborated with Columbia University and Rockefeller University to conduct a broader-based deep sequencing on a sample from a Nebraska horse that had died from Theiler’s disease, and the tetanus antitoxin that had been administered to the horse.

This time, they found a previously undiscovered parvovirus. This DNA virus was named Equine Parvovirus — Hepatitis (EqPV-H) — and when two research horses at Cornell were inoculated with this newly discovered parvovirus, the horses developed acute hepatitis.

Armed with this knowledge, Divers and Tennant collaborated with Dr. Edward Dubovi’s molecular virology laboratory in the Department of Population Medicine and Diagnostic Sciences. The team found the new virus in 18 consecutive equine cases of serum hepatitis, in the blood products the horses had received four to ten weeks earlier, and in the same Nevada horses that had ignited the investigation to begin with.

Thanks to these findings, the USDA Center for Veterinary Biologics now requires that all equine blood plasma and serum commercial products are tested and proven free of equine parvovirus, a policy move that should save the lives of numerous horses. Sadly, Tennant passed away in November of 2016, but studies on the immunopathology and transmission of the disease continue at Cornell with Divers and the viral hepatitis research team, which includes Dr. Gerlinde Van de Walle, associate professor, post-doc Joy Tomlinson, D.V.M. ’10, and graduate student Mason Jager, D.V.M. ’12..

Divers has led several other clinical investigations on equine hepatic diseases at Cornell, including determining the mechanism of biliary obstruction in horses with right displacement of the left colon; discovering that fall panicum (*Panicum dichotomiflorum*) hay caused several outbreaks of acute equine liver failure in the Mid-Atlantic area; and, along with Irish Equine Centre colleague Dr. Ursula Fogarty, discovered that red fescue grass caused liver disease outbreaks in horses in France.

Divers and colleagues also provided the first report of multiple adult horses developing acute hyperammonemic encephalopathy secondary to enteric disease, a condition that is now a commonly observed clinical syndrome.

Bacterial infections – puzzles, progress and problems

Divers has also investigated, with fellow CVM faculty member Dr. Yung-Fu Chang, professor in the Department of Population Medicine and Diagnostic Sciences, equine Lyme (borreliosis) disease and leptospirosis. Chang and Divers have performed experimental infection, antibiotic treatment and vaccine efficacy studies on equine Lyme disease — all supported by Zweig funding. “More research is needed,” says Divers. “There are still many questions to which we do not have answers, including the percent of infected horses that have Lyme disease, and the full spectrum of clinical signs. One of the biggest frustrations of my research efforts has been the lack of help we have provided to practitioners on Lyme disease — I wish we could have done more!”

Divers then noted that research can veer in unintended directions sometimes. “As we were studying doxycycline and minocycline treatments for equine Lyme disease, practitioners reported to me that many stiff and lame horses had responded clinically to these antibiotic treatments — yet testing revealed that they had not been exposed to *B. burgdorferi*.” Divers relayed this information to Dr. Lisa Fortier, Ph.D. ’98, James Law Professor of Large Animal Surgery, whose lab confirmed the anti-inflammatory effects of doxycycline and minocycline on equine synovial membranes and cartilages.

Divers has also worked closely with Dr. Chang’s laboratory to unravel some of the mysteries around equine leptospirosis, a bacterial disease that can cause uveitis in adult horses and abortions in mares. In Kentucky, leptospirosis is considered one of the most common infectious cause of abortions in mares and is

therefore of great concern for the equine industry there. Divers and Dr. Nita Irby, Ruttenberg Senior Lecturer of Ophthalmology and Divers' spouse, believed that equine recurrent uveitis (ERU) is often associated with Leptospira infection, and recent publications now suggest the condition is associated with 50 percent of ERU cases, possibly higher in warmblood horses. Divers and Irby visited Fort Dodge Veterinary Biologic Company 13 years ago to encourage the development of an equine Leptospira vaccine. In 2015, the company (now Zoetis) released a USDA approved equine vaccine, with Divers and Chang performing the preliminary Leptospira experimental infection model studies. The vaccine is now widely and successfully used in endemic areas to prevent abortions.

With retirement on the horizon for Divers, he said he's happy to pass his investigative torch to "the next generation of clinical researchers who are better trained than myself," says Divers. "I hope these younger researchers enjoy clinical research as much as I have, and develop collaborations with other researchers and equine veterinarians that are both fun and successful in improving the health of horses." ■



Dr. Thomas Divers. Photo provided

Thank you to former Zweig Committee Vice-Chair Robert Williams



Robert Williams

We bid a fond farewell to Robert Williams, who stepped down from his position as vice-chairman of the Zweig Committee in 2018, following his appointment and confirmation as Deputy Secretary for Gaming in 2017. Williams served on the Committee for five years. Williams is also chairman of the New York State Franchise Oversight Board, representing the interests and overseeing financial operations of the State's racing franchise. Prior to his appointment, Williams served as executive director of the New York State Gaming Commission, and brought crucial insight to the Committee on the views and needs of New York's racing industry.

Williams has held numerous positions in the industry, including assistant counsel for the New York State Racing and Wagering Board, acting director of the New York Lottery, special assistant counsel in the Executive Chamber, counsel to the New York State Task Force on Casino Gambling, and executive director of the New York State Committee on the Future of Racing.

We are grateful for his leadership and dedication to the Zweig Committee.

2019 HARRY M. ZWEIG MEMORIAL FUND FOR EQUINE RESEARCH AWARDS

The Harry M. Zweig Memorial Fund for Equine Research honors the late Dr. Harry M. Zweig, a distinguished veterinarian, and his numerous contributions to the state's equine racing industry.

In 1979, by amendment to the pari-mutuel revenue laws, the New York State Legislature created the fund to promote equine research at the College of Veterinary Medicine, Cornell University.

New Awards

\$72,954 to Dr. Douglas Antczak for "Functional Gene Annotation in the Horse"

\$98,385 to Dr. Jonathan Cheetham for "Accelerating Recovery after Laryngeal Nerve Graft in Horses"

\$57,540 to Dr. Michelle Delco for "The Role of Mitochondrial Damage Associated Molecular Patterns (mDAMPs) in Equine Joint Injury and Disease"

\$61,351 to Dr. Heidi Reesink for "Does Proximal Sesamoid Bone Mineral Loss Lead to Increased Fracture Risk?"

\$72,568 to Dr. Bettina Wagner for "Intranasal Biomarkers of EHV-1 Susceptibility and Protection"

Continuations

\$88,254 to Dr. Heidi Reesink for "Intra-articular Recombinant Lubricin to Restore Joint Lubrication and Prevent Osteoarthritis in Horses"

\$74,578 to Dr. Gerlinde Van de Walle for "The Mesenchymal Stem Cell Secretome against Equine Herpesvirus Type 1 Infections"

\$99,923 to Dr. Bettina Wagner for "Towards a Neonatal Vaccine against Equine Herpesvirus Type 1 (EHV-1)"

www.vet.cornell.edu/public/research/zweig



40th Anniversary of the Zweig Fund

With support from the Harry M. Zweig Memorial Fund for Equine Research, the College of Veterinary Medicine has been able to conduct cutting edge research benefiting the equine species while helping to ensure a healthy and positive future for the horse racing industry.

Cornell has developed equine research projects in the following areas supported, in part, by the Zweig Fund: reproduction, orthopedics, genetics, cardio-respiratory function, nutrition, and infectious diseases. The Zweig Fund has also been instrumental in supporting the careers of young equine researchers through the Harry M. Zweig Assistant Professorship in Equine Health and the Zweig Equine Clinical Fellowship program.

To mark the 40th anniversary of the Zweig Fund, the College will be hosting a series of presentations, followed by a poster session and reception to share its accomplishments with the broader equine community. The event is held in appreciation of the Zweig Committee's support and to promote a greater awareness of equine health and research.

The presentations are scheduled for November 13, 2019, at the College of Veterinary Medicine, Cornell University, Ithaca, New York, beginning at 1:00pm.

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2019 HARRY M. ZWEIG MEMORIAL FUND COMMITTEE

The Harry M. Zweig Committee is established for the purpose of administering the fund and is composed of individuals in specified state agencies and equine industry positions and others who represent equine breeders, owners, trainers and veterinarians.

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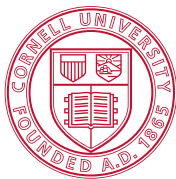
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Information: 1-877-888-3766 | vernondowns.com/racing

Visit us online
vet.cornell.edu/zweig

Our site provides information on the projects and publications resulting from the Zweig Memorial Fund, and demonstrates the objectives of the Fund in promoting equine health in the racing industry. The Zweig News Capsule is published twice a year, and can be downloaded at bit.ly/ZweigNews. Please encourage other equine enthusiasts to visit the site.

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