



EQUINE SCIENCE UPDATE

Reports from the world of equine science

Winter 2019

Asthma research finds possible link to latex



A study into the causes of severe equine asthma (sEA) has revealed associations with over 113 substances, including latex found in artificial surfaces.

Lead researcher Sam White found that natural rubber latex was among 'the most surprising and significant' of several new allergens present in the dust horses breathe.

The study used advanced computing power to assess 400 potential allergens in over 130 sEA-affected and healthy horses, working with research groups in Switzerland, France, Canada and USA.

The study revealed several previously suspected allergens, such as pollen, mould and insect proteins, are likely involved in sEA, but the most surprising finding was the implication that natural rubber latex might also play a role. In fact, four of the five most significant allergens associated with sEA were latex

proteins. The fifth was a protein from *Aspergillus fumigatus*, a common fungus previously linked with sEA. Until now, latex had not been tested due to limitations associated with classical allergen assessment methods.

White, now based in Nottingham Trent University's School of Animal, Rural and Environmental Sciences, carried out the study for the Royal Agricultural University (RAU) and the University of Nottingham.

The research used mathematical modelling to allow diagnosis of sEA from a blood sample, avoiding the need for more invasive diagnostic techniques currently employed.

He said: "The most significant and surprising allergens associated with sEA were from natural rubber latex. Latex is historically associated with the equine environment in the form of artificial surfaces on arenas and racetracks.

"The high level of respirable dust associated with training on these surfaces has already been linked with chronic bronchitis, inflammation and oxidative stress in riding instructors, and latex has long been associated with a variety of respiratory conditions in humans.

"These early results show it could be linked to respiratory problems in horses too, although it is too early to make a firm conclusion based on these data."

He added that further research is needed to establish the levels of latex horses are exposed to in their environment, and the effects it has on them.

White said the identification of new allergens would improve allergen avoidance and inform future diagnostic tests and therapies.

For more details, see:

Antigen array for serological diagnosis and novel allergen identification in severe equine asthma

S. J. White, M. Moore-Colyer, E. Marti, D. Hannant, V. Gerber, L. Coüetil, E.A. Richard, M. Alcocer
Sci Rep (2019) 9, 15170

[doi:10.1038/s41598-019-51820-7](https://doi.org/10.1038/s41598-019-51820-7)

Possible shock wave treatment markers identified



Extracorporeal shockwave therapy (ESWT) is used to promote healing of injured tendons and ligaments. Using high-pressure sonic waves, ESWT is thought to increase blood flow to the treated area. It has been shown to reduce pain for several days after treatment.

This can cause problems if pain is masked before healing is complete. Overworked minor injuries could lead to major ones or even pose the risk of catastrophic life-threatening breakdown.

Competition authorities have introduced restrictions on horses participating after treatment. For example, the British Horseracing Authority banned the use of ESWT on the day of the race or on any of the preceding five days.

However, it's one thing to restrict the use of ESWT; quite another to enforce a ban, as the therapy leaves no trace. That is, until now.

A team led by Mary Robinson, director of the University of Pennsylvania's Equine Pharmacology Research Laboratory, and lab member Jinwen Chen has found that the practice does in fact leave a trail. In a paper

in *Equine Veterinary Journal*, they report finding potential biomarkers of ESWT that, with further testing, could one day be used to enforce the ESWT ban.

"Because it's not a drug--it's applied to the surface of the skin--it's just not an easy thing to detect," says Robinson. "After a lot of trial and error, our study was able to measure changes in levels of five inflammatory factors, some of which we could detect up to three weeks after the shockwave therapy."

The search for these biomarkers dates back roughly a decade.

"It was Dr. Lawrence Soma, my predecessor, who said the lab was going to have to look at blood-based or urine-based biomarkers to try to detect shockwave therapy," Robinson notes.

To find the fingerprints that ESWT might leave behind, the researchers tested the therapy on 11 horses kept as a study herd at the University's New Bolton Center. The researchers collected blood samples from the group of horses, composed of Thoroughbreds and Standardbreds, at several times both before and after each received a single dose of ESWT to a leg.

Over the years, the lab investigated various potential biomarkers - molecules that would indicate a horse received ESWT. They targeted 10 pro-inflammatory and anti-inflammatory signaling molecules, called cytokines, which they can measure from the blood using a sensitive test called ELISA, short for enzyme-linked immunosorbent assay.

"We looked a week before giving the shockwave therapy to see if there were any changes in the baseline period, due to changes in time of day or anything else, and didn't see anything we could define

as significant," Robinson says. "And in the post-shockwave period we went out to three weeks."

No changes were detected in five of the cytokines they examined. But the other five-- TNF- α , IL-1 β , IL-1RA, IL-6 and TLR2 - were significantly affected by ESWT.

Of those, TNF- α levels were significantly increased through the whole of the three-week post-therapy study period.

More study is necessary, Robinson emphasizes, before these biomarkers could be used to assess inappropriate use of ESWT in racehorses. For one, the researchers would like to see if measuring these same molecules in horses that are actively training and racing or that have an acute injury might change their results.

For that, she and her colleagues are actively pursuing follow-up studies to look at these biomarkers and other indicators using a biobank of samples from client-owned animals, including injured and active racehorses, treated at New Bolton Center.

The end goal is to keep the sport safe.

"Shockwave therapy is great as long as people rest the horse after using it," she says. "We are concerned that it's being abused in the racehorse industry and that it could potentially result in breakdowns. That's exactly what we're trying to avoid."

For more details, see: Inflammatory mediators are potential biomarkers for extracorporeal shockwave therapy in horses

J.-W. Chen, D. Stefanovski, J. Haughan, Z. Jiang, R. Boston, L. R. Soma, M. A. Robinson
Equine Vet J (2019)
<https://doi.org/10.1111/evj.13183>

Donkeys are natural heat lovers



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Donkeys, it seems, love sun and warmth. That's the finding of the first study to examine the conditions under which healthy (non-working) donkeys and mules seek shelter in hot, dry climates.

It found that whilst mules would seek shelter from the heat and insects, donkeys enjoyed the sunshine and warmth for longer.

The research by equine behaviour expert Dr Leanne Proops, at the University of Portsmouth's Department of Psychology, is published in the *Journal of Applied Animal Behaviour Science*.

Dr Proops said: "We found that donkeys are less likely to seek shelter from the heat and light than mules. The sensitivity of mules to higher temperatures and sunlight may be due to the geographically different evolution of horses and donkeys and their adaptations to different climates. Donkeys are better adapted to arid, hot climates and hence higher sunlight levels."

"In contrast, horses are more adapted to cold conditions, and our previous research has shown that donkeys seek shelter far more often than horses in cold, wet conditions. As a hybrid, mules often display attributes that are a mixture of both species, such as their winter hair coat

growth. Therefore, it might be expected that mules are less adapted to conditions of high temperatures and sunlight levels than donkeys, as we found in this study."

It is known that the effect of heat in the environment becomes physically challenging for animals once the ambient temperature surpasses their thermal neutral zone (TNZ). The TNZ is different for every species. An important method of controlling heat stress from solar radiation is for an animal to seek shade.

A total of 130 donkeys and mules were studied in two locations in Southern Spain in a seven-week period during the Summer. In both locations, researchers recorded the animals need for shade.

All the animals in the study were healthy, had free access to shelter and were regularly monitored by vets from The Donkey Sanctuary. Temperatures during the study period ranged from 14 to 37° C and data was collected between 8am and 4:15pm. For each location outside temperature, wind speed, light levels, rainfall, insect density and harassment levels were recorded.

Emily Haddy, PhD student on the project, said: "It has been very interesting to see the results from this study. Despite what equid owners

may think, it is clear that different equid species have specific needs and so should be given free access to shelter - there is no 'one size fits all'."

Dr Faith Burden, Director of Research and Operational Support at The Donkey Sanctuary and co-author on the paper, points out the importance of these findings, "The majority of working equids worldwide are exposed to hot climates and as a consequence may suffer from issues such as dehydration and heat stress. By establishing the natural shelter seeking behaviour of healthy donkeys and mules across climates we hope to be able to inform welfare guidelines and encourage good management of these animals."..

For more details, see:

Shelter seeking behaviour of healthy donkeys and mules in a hot climate. Emily Haddy, Faith Burden, Leanne Proops. *Applied Animal Behaviour Science* (2019) 104898 <https://doi.org/10.1016/j.applanim.2019.104898>

Association between insulin and iron in equine metabolic syndrome



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The relationship between iron and insulin sensitivity has long been recognized and studied in humans and other animals, but largely ignored in the equine population. With the knowledge that elevated circulating insulin is the direct and most common cause of laminitis associated with equine metabolic disorders, the association between equine insulin and iron dysregulation needs further investigation.

Drs. Eleanor Kellon and Kathleen Gustafson of the Equine Cushing's and Insulin Resistance Group (ECIR) performed a retrospective analysis of lab results maintained in the group's database and data from the only controlled feeding study in horses. The latter study was specifically designed to substitute horses as a model for captive black rhinos, a cousin of the horse, because the researchers recognized the relationship between metabolic disease and iron overload in rhinos (Nielsen et al., 2012).

All animals from the ECIR database had abnormally elevated insulin. Ferritin, a measure of body iron stores, exceeded the published reference range in all animals and there was a tendency for ferritin to increase with age. Likewise, data from the previously published report showed that ferritin was significantly elevated in the group with confirmed hyperinsulinemia when compared to

the group with a normal insulin response.

Kellon and Gustafson suggest that these results indicate possible similar interactions between hyperinsulinemia and body iron burden in the horse and that iron may be a modifiable risk factor for hyperinsulinemia. They emphasize that iron is unlikely to be a primary causal factor but that the interaction is worth scientific investigation in controlled studies.

"Studies investigating the bidirectional relationship between iron and hyperinsulinemia in horses are extraordinarily limited, despite considerable scientific inquiry in other species. Our goal is to increase awareness of the potential for iron overload in horses with hyperinsulinemia and stimulate further study."

For more details, see:

Possible Dysmetabolic Hyperferritinemia in Hyperinsulinemic Horses
Eleanor M. Kellon and Kathleen M. Gustafson
Open Veterinary Journal, (2019), Vol. 9(4): 287–293
<https://www.openveterinaryjournal.com/OVJ-2019-04-078%20E.M.%20Kellon%20and%20K.M.%20Gustafson.pdf>

Nielsen, B.D., Vick, M.M. and Dennis, P.M. 2012. A Potential Link between Insulin Resistance and Iron Overload Disorder in Browsing Rhinoceroses Investigated through the Use of an Equine Model. *J. Zoo Wildl. Med.* 43, S61–S65.

<https://doi.org/10.1638/2011-0145.1>

For more about the Equine Cushing's and Insulin Resistance Group go to <https://www.ecirhorse.org/>

Can intestinal micro-organisms warn of laminitis risk?

New research will examine the gut microbiome and try to identify changes that occur in horses with pasture associated laminitis.

The gut microbiome (the mixture of microorganisms [such as bacteria and fungi] that live along the intestinal tract) is a topic of growing interest in both human and veterinary medicine.

Changes in its composition have been associated with various diseases in human medicine. Could changes in the microbial populations or their metabolic activity, give an early indication of disease susceptibility?

PhD student, Ashley Ward, will be working with Dr Philippa Morrison and Professor Caroline Argo, from Scotland's Rural College (SRUC) in conjunction with WALTHAM and the Rowett Institute (University of Aberdeen).

The research is supported by funding from SPILLERS™, via the brand's science arm THE WALTHAM™ Equine Studies Group.

The project will run over three and a half years and will build on existing work on the equine gut microbiome. The aim is to try and identify changes in the faecal microbiome patterns or urinary molecules (ie "biomarkers") that could be used to predict a case of pasture-associated laminitis.

Clare Barfoot RNutr, the Research and Development Manager at SPILLERS™ said: "We are excited about Ashley's appointment to help progress this new project. We hope it will improve our understanding of changes in the gut microbiome/urinary metabolome associated with pasture-associated laminitis and identify potential novel ways to intervene in its development."

Ashley Ward added: "I am thrilled to be part of this project, which will allow me to utilise my laboratory experience, develop my skills in

Prebiotics: help or harm?

Continued...

postgraduate research and, ultimately, produce work which will supplement our current understanding of laminitis. I am passionate about working to improve the outcome for horses and ponies that are likely to develop laminitis."

Eventually, the researchers hope the work will improve animal welfare by allowing for timely preventative interventions.

Read more about SPILLERS' research work:

<https://www.spillers-feeds.com/blog/>

Prebiotics may do more harm than good according to a recent study in Germany.

Prebiotics are often added to horse feed in order to stabilise the horse's intestinal flora and promote good digestive health. They are indigestible fibres that can stimulate the growth and activity of certain beneficial bacteria in the large intestine.

However, researchers at Martin Luther University Halle-Wittenberg (MLU) and the University of Veterinary Medicine Hannover (TiHo) found that prebiotics only have a limited stabilising effect on the intestinal flora of horses. Before they can reach the intestines, commercially available supplements partially break down in the animals' stomachs, which can lead to inflammation of the stomach lining.

The team therefore suggests preparing prebiotic food supplements so that they don't take effect until they reach the large intestine. The study appeared recently in the journal "PLOS ONE".

"Horses have a relatively small, non-diverse core microbiome and are therefore very susceptible to digestive disorders," explains Professor Annette Zeyner, head of the animal nutrition group at MLU. However, according to the scientist, insufficient research has been conducted on whether the use of prebiotics actually does produce the desired effects. Her research group explored this question in partnership with Professor Gerhard Breves' lab from TiHo.

For the study, the team investigated the effect of feeding Jerusalem artichoke meal (JAM) to horses. Jerusalem artichoke is often used as a prebiotic for horses and

contains high amounts of certain carbohydrates; fructo-oligosaccharides and inulin.

In addition to their normal feed, six animals received JAM. Another six horses received a placebo with their normal feed. The researchers then analysed the balance of bacteria in the digestive tract of the animals of both groups.

They found that the prebiotics were already being fermented in the stomach by the microorganisms naturally living there - i.e. they were taking effect much too early. "The fermentation process leads to the formation of organic acids that - unlike in the large intestine - can damage the mucous membrane of the horse's stomach," says Maren Glatter, a member of Zeyner's group and lead author of the study.

However, the bacterial diversity of the entire digestive tract did increase, which probably also produces the desired protective effect. "Still, the prebiotics are probably more harmful than beneficial when used in their present form," Zeyner surmises. Instead, the substances must be treated so that they arrive in the large intestine in one dose in order to have a positive effect on the intestinal bacteria living there without stimulating overactivity.

For more details, see:

Modification of the equine gastrointestinal microbiota by Jerusalem artichoke meal supplementation.

Glatter M, Borewicz K, van den Bogert B, Wensch-Dorendorf M, Bochnia M, Greef JM, Bachmann, H. Smidt, G. Breves, A. Zeyner. PLoS ONE (2019) 14(8): e0220553. <https://doi.org/10.1371/journal.pone.0220553>

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Response of horses to increased rider's weight

Previous studies have found that physiological responses and gait symmetry parameters are adversely affected when horses carry heavy riders, for example when the rider:horse weight ratio increases from 20 – 35%.

New research should help shed more light on how increased rider weight may affect a horse during exercise under saddle, looking at lower rider:horse weight ratios which are more typical for warmblood horses.

Janne Winther Christensen, from Aarhus University in Denmark, and her research team looked at the impacts of a sudden increase in rider weight on horse behaviour, physiological responses, and gait symmetry. The initial results of this study were presented on August 19, 2019, at the 15th annual International Society for Equitation Science (ISES) conference held at the University of Guelph.

Christensen explained, "The effect of rider weight on horse welfare is much debated and is likely affected by a number of factors including horse type, work intensity, horse training level, and rider skills."

The study included 20 rider-horse combinations, and the researchers asked riders to complete a standard dressage test in a balanced cross-over study. The riders rode with no additional weight, or with an extra 15% or 25% of their body weight added to a vest. The horses' heart rate, salivary cortisol, gait symmetry and behaviours (e.g. head tossing, tail swishing, mouth opening) were measured during the test.

The researchers found that the increased rider weights did not significantly affect the heart rate, salivary cortisol, behaviour and gait symmetry of horses. It should be noted that the maximum rider: horse weight ratios fell between 15 – 23% and the exercise intensity was relatively low. Christensen says, "Thus, within this weight ratio range and during light to moderate exercise, acute increases in rider weight did not



induce changes in the parameters analysed so far."

The study also compared rider symmetry measured on the ground with their symmetry on horseback when riding with and without additional weight. On ground symmetry was measured as weight on left and right leg respectively, while standing on two identical bathroom scales. In addition, their mobility and balance when sitting on a gymnastic ball was scored based on their ability to perform standardized exercises. Poor mobility on the gymnastic ball was associated with weight asymmetry, i.e. the poorer the mobility the larger the weight asymmetry. Rider crookedness in the saddle was measured using a saddle pressure mat.

Almost all riders (19/20) had more weight on the right side of the saddle. Crookedness correlated significantly with weight asymmetry on the ground, but only in the 0% weight treatment, and not when the riders rode with an additional 15 and 25% weight, suggesting that artificial addition of weight might make some riders less crooked as they become more aware of their relative asymmetry.

Thus, a simple weight symmetry test with two ordinary bathroom scale weights reflects rider crookedness in the saddle and can help riders become aware of their imbalance. Lack of

mobility of the pelvis on a gymnastic ball also reflects this imbalance.

Kate Fenner, ISES council member, was enthusiastic that Christensen attended this year's conference to share the results. Fenner says "We know that there is a great deal of interest in the potential effects of rider weight on equine welfare. We're happy that we are able to provide a meeting area for researchers to share new findings like these each year, and hopefully spark more collaborations and research in these areas."

For more details, see:

Did you put on weight? The influence of increased rider weight on horse behavioural and physiological parameters

J.W. Christensen, M. Uldahl
Proc 15th ISES Conference, (2019)
p33

On-ground rider weight symmetry mirrors balance in the saddle M.

Uldahl, J.W. Christensen
Proc 15th ISES Conference, (2019)
p34

You can download the Proceedings of the 15th International Society for Equitation Science Conference at:

<https://equitation-science.com/previous-conferences/2019-15th-international-conference>

Free access to gait analysis articles



Photo © Dr. Constanza Gómez Álvarez and Professor René van Weere

Historically, assessing the severity of lameness has been a matter of opinion. The various gait analysis systems that are now available provide a more objective way of doing so.

Quantitative gait analysis involves the use of electronic sensors, enabling the assignment of numerical values to motion, with the application of kinetics and kinematics.

Interest in gait analysis has grown; it now has applications beyond the pure assessment of lameness. Gait analysis is being used to assess the value of new therapies and in scientific studies that have implications for horse health and welfare.

Copyright Dr. Constanza Gómez Álvarez and Professor René van Weeren

The exceptional capacity of the horse's locomotor system largely led to its domestication as a working, sport and leisure animal. It has resulted in a continuing fascination with equine performance, whether physiologically in terms of footfall patterns in different gaits or pathologically, when locomotion may be impaired.

Articles on gait analysis that have been published in the *Equine Veterinary Journal*, have now been brought together in one place. This virtual collection will be free to view online for one year from 4th October 2019.

Topics covered include:

- Combined influence of expertise and fatigue on riding strategy and horse-rider coupling during the time course of endurance races
- Head and pelvic movement asymmetry during lungeing horses with symmetrical movement on the straight
- Does 'hacking' surface type affect equine forelimb foot placement, movement symmetry or hoof impact deceleration during ridden walk and trot exercise?

"We have now reached a stage in which technical developments have permitted the introduction of user-friendly quantitative gait analysis techniques in clinical practice," says Professor René van Weeren, who

jointly edited the collection with Dr. Constanza Gómez Álvarez.

"Accuracy and reliability of these techniques have increased to improve our performance in the assessment and monitoring of equine locomotor performance. However, these developments also urge us to reconsider our position as clinicians and pose new challenges in terms of interpretation of the data that are generated."

Professor Celia Marr, Editor of the *EVJ* said: "The breadth and substance of this research shows how far we have advanced with equine quantitative gait analysis. It has moved far beyond solely being a tool for objective lameness assessment and continues to develop as an exciting method for the support of equine welfare and performance."

Dr. Constanza Gómez Álvarez added: "Today, objective, quantitative gait analysis in the horse has outgrown the laboratory and is infiltrating all horse-related activities."

The virtual collection is available at:

[https://onlinelibrary.wiley.com/doi/toc/10.1111/\(ISSN\)2042-3306.Practical_uses_of_quantitative_gait_analysis](https://onlinelibrary.wiley.com/doi/toc/10.1111/(ISSN)2042-3306.Practical_uses_of_quantitative_gait_analysis)

Blink of an eye: stress level indicator?



Equine behavioural studies often seek to assess the horse's stress response to various stimuli. Physiological methods such as heart rate, heart rate variability, salivary cortisol concentration all have their place, but for some purposes a more hands-off approach might be preferable.

A study at the University of Guelph, Ontario, Canada looked at the correlation of eyelid movements with heart rate and behaviour. The full report is published in *Animals* (Basel).

Dr Katrina Merkies and colleagues studied the response of 33 horses to three stressful situations: being separated from their herd mates; not being fed at their normal feeding time; and being startled by a novel object. The responses were compared with those of the horses in their normal paddock environment.

To assess the horse's response, the researchers monitored heart rate, and counted the number of eye blinks and eyelid twitches. (Each three-minute trial was recorded on video.)

They found that feed restriction was the most stressful situation. Horses showed increased heart rate, restless behaviour and high head position. The horses also blinked less often and had an increased frequency of eyelid

twitches, compared with the normal (control) environment.

Neither the novel object test, nor the separation from herd mates test, produced an increase in eyelid twitches or heart rate, which suggests that the horses did not find these too stressful.

The authors conclude that "observation of eye blinks and eyelid twitches can provide important information on the stress level of horses, with a decrease in eye blinks and an increase in eyelid twitches in stressful environments."

For more details, see:

Eye Blink Rates and Eyelid Twitches as a Non-Invasive Measure of Stress in the Domestic Horse.

Merkies K, Ready C, Farkas L, Hodder A.

Animals (Basel). 2019 Aug 15;9(8). pii: E562.

[doi:10.3390/ani9080562](https://doi.org/10.3390/ani9080562)

Evaluating English saddle fitting

Poorly fitted saddles can adversely affect welfare and impair performance of ridden horses. The Saddle Research Trust Research Workshop, held in December 2018, identified a need for improved education of saddle fit evaluation among professional equine practitioners.

An educational article was subsequently commissioned by the editor of the peer-reviewed scientific journal, *Equine Veterinary Education*, that would simplify the complex subject of saddle fitting evaluation.

The article aims to provide practical guidance to equine veterinarians to assist in their decision-making process whilst carrying out routine assessments when a horse is evaluated ridden, such as for pre-purchase, lameness or poor performance examinations. It also clarifies when a saddle may be contributing to pain and performance problems and when the veterinarian



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should refer the client to a saddle-fitting professional.

"Evaluating the suitability of an English saddle for a horse and rider combination", a collaboration between Anne Bondi, Sue Dyson, Sue Norton and Lawrence Pearman, is a comprehensive mini manual aimed at

vets and physiotherapists and which will be equally of interest to other professional equine practitioners.

Thanks to the generosity of the publishers, the article is free to view. Go to:

<https://doi.org/10.1111/eve.13158>

Equine Grass Sickness vaccine trial results

A four-year trial has been unable to show that vaccination can protect against grass sickness.

Evidence suggests that Equine Grass Sickness (EGS) may be associated with the bacterium *Clostridium botulinum* (*C. botulinum*) type C, which is found commonly in soil and can produce various toxins.

Vaccines can protect against tetanus and botulism, diseases caused by closely related bacteria. Hopefully, a similar vaccine could protect against grass sickness.

As it is not possible to reproduce grass sickness experimentally, the researchers conducted a field trial to determine the efficacy of *C. botulinum* type C vaccination. The aim was to test the ability of the vaccine to prevent naturally occurring EGS by comparing EGS incidence between groups of vaccinated and placebo-treated horses and ponies.

The study was co-ordinated by the Animal Health Trust, in collaboration with the veterinary schools of the Universities of Edinburgh, Liverpool and Surrey, and with support of the Moredun Foundation Equine Grass Sickness Fund.

The research team recruited over 1000 horses and ponies throughout England and Scotland. To be included in the study, the animals had to live on premises where grass sickness had occurred before. Horses and ponies were randomly assigned to two groups: vaccination or control. The primary treatment course comprised three doses of either the vaccine or placebo administered at 21-day intervals. Twelve months later, a further booster dose of either vaccine or placebo was given.

As the study was carried out on premises with a history of grass sickness, the research team anticipated that there would be enough cases to produce a statistically significant difference between the vaccinated and control groups. Unfortunately, only nine

cases of grass sickness occurred in the study population – considerably fewer than would have been expected from recent history.

So, unfortunately, the study was unable to reach any conclusion about whether the vaccine was effective in preventing the disease.

However, some useful findings did emerge from the study. The vaccine was shown to be safe and, unlike the placebo, did produce a significant antibody response. Most horses and ponies in the vaccine group had a significant immune response following the primary vaccination course. (*C. botulinum* type C antibody levels were on average 2.5 times higher after the primary course of injections than before the first vaccination.)

The research team also report that, consistent with previous studies, both young animal age and low *C. botulinum* type C antibody levels were significantly associated with an increased risk of EGS.

They add that, for the first time, findings from this trial confirmed that low *C. botulinum* type C antibody levels were found in horses and ponies affected by EGS before the onset of the disease. The results highlighted the key role a horse or pony's immune response has in their risk of developing EGS.

Dr Richard Newton, Director of Epidemiology and Disease Surveillance at the Animal Health Trust, said: "Although the EGS field trial did not demonstrate a significant protective effect of the *C. botulinum* type C vaccine against EGS, this truly unique research has still achieved a number of things. We now have a greater understanding of equine grass sickness and the trial provided further

evidence of vaccine safety under conditions of field use."

Dr. Jo Ireland from the University of Liverpool added; "We are so grateful to all the veterinary practices, horse owners and supporters who helped make this research possible. The significant amount of data that has been collated during this nationwide field trial will be a very valuable resource for subsequent research studies to benefit future generations of horses and ponies."

For more details, see:

<https://www.aht.org.uk/wp-content/uploads/2019/11/EGS-vaccine-trial-report.pdf>

Benefits of mixed grazing

A French study has confirmed that mixed grazing with cattle helps control strongyle worms in horses.

Grazing horses with cattle is often suggested as a useful pasture management tool to help control strongyle parasites. However, there has been little research to assess the benefit.

With a few exceptions of minor significance, gastro-intestinal parasites of horses and cattle are host specific. Thus, infective stages of horse worms ingested by cattle will not develop to adults (and vice versa).

Not only do horses and cattle play host to different species of gastro-intestinal parasites, they also have different grazing habits. Horses tend to graze close to the ground and avoid areas that have been previously contaminated with faeces – producing “lawns” and “roughs.” Cattle, on the other hand, cannot graze so closely to the ground, but will graze areas avoided by horses.

The study, by Forteau, Dumont and colleagues looked at the management and worm control on horse breeding farms in two regions of France - some of which employed mixed grazing of horses with cattle.

Forty-four farms were enrolled in the study. These included saddlehorse production farms in Normandy (generally specialised sport horse enterprises, on productive grassland) and northern Massif Central (leisure horses- reared on less productive grassland). Some were specialised horse units; others were mixed cattle and horse farms.

Using surveys and face to face interviews, the researchers recorded details such as stocking rate; proportion of pasture used for grazing only or for cutting and grazing; and the extent of integration of anthelmintic control and pasture management.



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Among the findings were:

- many farms were still relying on fenbendazole despite the well-recognised problems of anthelmintic resistance.
- mixed grazing of horses with cattle was uncommon. Only 8 out of 23 mixed horse and cattle breeders knew that grazing them on the same pasture could be used as part of their strongyle control strategy.
- in young horses last treated with moxidectin, those grazed with cattle had 50% fewer strongyle eggs excreted in their faeces than those grazed in equine-only pastures.

They conclude that mixed grazing of horses with cattle “opens a promising alternative for controlling horse parasitic infection that remains largely unknown by horse breeders.”

For more details, see:

Horses grazing with cattle have reduced strongyle egg count due to the dilution effect and increased reliance on macrocyclic lactones in mixed farms. Forteau L, Dumont B, Sallé G, Bigot G, Fleurance G. *Animal*. 2019 Nov 4:1-7. [doi:10.1017/S1751731119002738](https://doi.org/10.1017/S1751731119002738)

Whip use in equestrian sports

The use of the whip in equestrian sports has come under increased scrutiny and public criticism. Research, so far, has centred on the racing industry and has failed to identify improved performance when the whip is used.

Studies reported at the 15th Annual International Equitation Science Conference looked at the use of the whip in other disciplines.

Jane Williams presented the results of a study that looked at how horse-riders use whips. Over 3,000 riders took part in a survey, which revealed that 72% of respondents regularly rode with a whip when doing roadwork, hacking, schooling and or lessons.

Nearly 70% of survey participants agreed that whips should only be used by experienced riders. Additionally, the great majority wanted to see tighter restrictions on whip usage in competitions, including during warmup.

Those surveyed were asked to share how they use whips. Most responded that they are used to reinforce aids, for training, and should be used lightly and never continuously out of aggression or frustration.

Dr Williams said "It is encouraging to see most riders believed the whip should be used as a training aid, however when asked how and when to use it in this way, this was not always aligned to how horse's learn, outlining a need for increased rider education."

Another study, by Kirstin Spencer and colleagues, evaluated recordings of British Show jumping (BS) affiliated competitions between August 2018 and January 2019.

This study included 285 horses and riders competing at heights between 0.8m and 1.25m. Statistical analyses were conducted to determine if and how whip usage related to performance. The findings revealed that approximately 76% of riders carried a whip, and 14% of those riders



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actually used their whip in competition. Additionally, this study found that increased whip usage correlated with decreased performance. Riders using the whip were found to accumulate more faults than those who did not.

Ms Spencer said "Observations found whips often being used with poor timing which may reflect rider education issues such as misunderstanding a horse's cognitive ability and how it learns. Potential issues were also recognised within BS regulations, for example, significant use took place whilst riders held their reins and BS technically excludes this type of use. Initial findings raised further questions as to the efficacy of using a whip to enhance horse performance in BS competition."

Further research into how whips are used across the industry and in competition will provide insight on how to best establish and change regulations in order to promote horse welfare and preserve equestrian sports.

For more details, see:

Understanding whip use in riders in sports horse disciplines
J. Williams, L. Greening, D. Marlin, H. Randle.
Proc 15th ISES Conference, (2019)
p43

Evaluation of whip use in British Showjumping
K. Spencer, R. Verwijs, J. Williams.
Proc 15th ISES Conference, (2019)
P44

You can download the Proceedings of the 15th International Society for Equitation Science Conference at:

<https://equitationscience.com/previous-conferences/2019-15th-international-conference>

NEF advance programme details

The 2020 National Equine Forum, held on 5th March in London, will explore the impact of human behavioural science on horse care and welfare.

The human behavioural science will look at how human behaviour change can make a difference to equine welfare. David Rendle will discuss behaviour change and its potential impact on worming compliance. Sarah Freeman, Professor of Veterinary Surgery at the University of Nottingham will talk about colic and Abigail Turnbull of Richmond Equestrian Centre will speak about strangles.

There will be a comprehensive session on Brexit, animal health, emerging disease and what we have learnt from the 2019 flu outbreak.

Further details on the NEF 2020 programme will be released in the New Year. For further information on the NEF and to view past presentations visit <https://www.nationalequineforum.com>

Influence of music on equine night-time behaviour



Night-time music had a significant effect on behaviour of stabled horses in a recent study.

Research carried out by Naomi Hartmann and Linda Greening in the Equine Science Department of Hartpury University examined the effect of playing classical music to horses at night.

Seven horses, kept on the same yard, were stabled for 24 hours a day and followed the same daily routine. Their behaviour was recorded from 20.30 to 06.30 the following morning for nine nights

For five nights, classical music (Beethoven's ninth symphony) was played continuously from 20.30 to 01.30. On two nights at the start, and again at the end of the study, no music was played to provide control observations.

The researchers found that music had a significant effect on behaviour. Horses spent more time eating when

music was played. Other behaviours – such as standing alert, walking and excreting – decreased compared to the control periods when no music was played. They also found significant differences in the occurrence of lateral recumbency, although these were not clearly linked to exposure to music.

The researchers conclude: "The addition of music appears to have a significant effect on the equine nocturnal time budget that might be beneficial from an equine sleep perspective."

For more details, see:

A Preliminary Study Investigating the Influence of Auditory Stimulation on the Occurrence of Nocturnal Equine Sleep-Related Behavior in Stabled Horses. Hartman N, Greening LM. J Equine Vet Sci. 2019 Nov; 82:102782. [doi:10.1016/j.jevs.2019.07.003](https://doi.org/10.1016/j.jevs.2019.07.003)

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