European Equine Health & Nutrition Congress

Digital congress sessions
March 25-26, 2021

Follow-up sessions 2021 & 2022

10th edition

In cooperation with

Wageningen University & Research

Utrecht University

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Virtual Congress
March 25-26, 2021

Fiber First

European Equine Health & Nutrition Congress
10th Edition

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Preface

On behalf of the Equine Health & Nutrition Association, we would like to welcome you to the 10th edition of the European Equine Health and Nutrition Congress.

Due to the current Covid-19 situation all throughout the world, it is unfortunately not possible to organise a live 10th edition of the EEHNC. However, we prefer to look at this as an opportunity to host our first virtual congress and online follow-up webinar sessions throughout 2021 and 2022. This set-up allows us to share knowledge and experience with delegates from all over the world who would normally not be able to make the trip to our congress location.

The Equine Health & Nutrition Association hopes to encourage a continuing multidisciplinary discussion about the potential health effects of equine nutrition, especially in relation to sport, performance, training, breeding and well-being of the horse in general.

The general theme for the 10th EEHNC and follow-up webinar sessions will be “Fiber first”. Adequate fiber and forage provision and management is key for keeping horses healthy. Questions such as “How much forage does a horse need?”, “Can we feed forage only diets without any supplementation?”, “What factors affect the nutrient content of pasture & forage?” and “How can we manage pasture intakes by horses and ponies?” will be addressed.

During the second congress day several (diagnostic) systems applied for parasite control and the relationship between parasite control and pasture management will be addressed. During the panel discussion the question: “Are there nutritional strategies for parasite control?” involving both nutritionists and equine parasitologists will be discussed.

Additional topics of the follow up sessions are “Moulds, mycotoxins & atypical myopathy”, “Fiber intake, fermentation & dental condition” and “Equine gastric ulcer syndrome & nutritional management”.

We are happy that once again renowned experts have confirmed their presence as speakers at the congress.

The organization would like to thank our organizing partners from Ghent University, Utrecht University, Wageningen University and Research Centre and the University of Liège for their continuing support in the congress organization.

We would like to thank the invited speakers for sharing their knowledge.

We would also like to thank our discussion leaders and scientific committee members and volunteers for their contribution.

Last but certainly not least, we would like to wholeheartedly thank our sponsors for their contribution to our congress.
Without their continuous support this congress could never take place.

We hope that this first virtual EEHNC will fulfill all your expectations and that we will be able to meet you all again in person for our 11th edition.

Peter Bollen
President EEHNA

The 10th European Equine Health & Nutrition Congress

The following persons were involved in the organisation of the 10th EEHNC

Scientific Committee & Organizing Committee
Peter Bollen (President EEHNA)
David van Doorn (Utrecht University, Secretary)
Geert Janssens (Chairman Scientific Committee)
Gunther van Loon (Gent University)
Wouter Hendriks (WUR & Utrecht University)
Irene Tosi (University of Liège)
Ellen Roelfsema (Utrecht University)
Marie-Thérèse Picavet (Gent University)
Myriam Hesta (Gent University)
Emmanuelle van Erck (Gent University)

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Tim Maes (Registration Desk)
Esther Peek
Roseanne Minderhoud
Andrea Ellis
Marie Gillesen

Multidisciplinary experts
Meriel Moore-Colyer
Cecilia Müller
Emanuela Valle

“Coffeetable” hosts
Peter Scheffers
Elynn Thys
Ruth Bishop
Pauline Rovers – Paap
Bob Fabri

Invited Speakers

Pat Harris

After qualifying from Cambridge, Pat completed her PhD at the AHT into the Equine Rhabdomyolysis Syndrome. She joined the WALTHAM Petcare Science institute in 1995 and is responsible for their equine research conducted in collaboration with experts at institutes and universities globally. This provides the science behind the SPILLERSTM, BUCKEYETM Nutrition and WINERGYTM brands. Pat is a European Specialist in Veterinary Clinical and Comparative Nutrition, a RCVS recognised specialist in veterinary clinical nutrition (equine) and a BEVA Past-President. She is the author or co-author of over 500 scientific papers, abstracts and book chapters with recent emphasis on obesity, laminitis and senior horse nutrition.

Myriam Hesta

Myriam started working at the Animal Nutrition Laboratory at the veterinary faculty in Ghent shortly after she graduated as a veterinarian in 1996. She started the nutrition consultation service and successfully passed her ECVCN (European College of Veterinary and Comparative Nutrition) diplomate exam in 2001. In 2003 she also received a PhD degree with her work on prebiotic supplementation in dogs and cats.

At this moment she is associate professor in animal nutrition at ECAN (equine and companion animal nutrition) at the department of veterinary medical imaging and small animal orthopaedics at Ghent university.

Her current topics of interest are obesity, gastrointestinal health and nutritional effects on immunity in companion animals including equines. She is supervising 3 ECVCN residents and is promoter of several PhD students at this moment. She is also former president of the European college (ECVCN). Myriam is an active member of several scientific committees (Scientific advisory board of FEDIAF) and is regularly invited as a speaker at international congresses and symposia.

Karst Brolsma

I grew up at a cattle farm in Friesland, the Netherlands and I have a background in animal, plant and soil sciences. After completion I worked at the Grass Science Institute and focused on fatty acid composition of ruminants and roughage. It always fascinated me to see what happens under our feet and how that affects plant growth.

My Ph.D research focused on soil microorganisms and how they are affected by plant traits. The link between crop development and the underground world is still largely unknown. Fortunately, that is slowly but surely changing.

Currently, I am working as a agronomy researcher at Eurofins Agro in Wageningen (The Netherlands). Assessing soil fertility is one of our key businesses. As such I am in charge of the improvement of techniques to measure soil fertility and explore the potential of innovative techniques by means of lab, greenhouse, and field trials. The emphasis of that work is on nutrient flows in relation to crop quantity and quality (e.g. roughage quality characteristics). For the conference, I would like to share some of my experience of the role of soil fertility in the production of good roughage.

Annette Longland

She gained a BSc in Biology at the University of Stirling in 1978 and after two years of teaching in the Caribbean, returned to undertake a PhD at Imperial College of Science and Technology, London. Thereafter, she was a post-doctoral research fellow at the University of Hull, specialising in microbial degradation of plant cell walls. She subsequently joined the Institute of Grassland and Environmental Research (IGER), first at Hurley (in 1985) and then Shinfield, where she focussed on the digestion, absorption and metabolism of fibrous feeds by pigs. In 1991 she moved to IGER, Aberystwyth, where initially she worked on ruminant nutrition but by the mid-1990's her work had shifted focus to equine nutrition, regarding the utilisation of plant carbohydrates by ponies. She was concurrently involved in an EU project evaluating changes in the carbohydrate content and composition of temperate grasses throughout the growing season. In 2005 she left IGER to run her own equine nutrition research consultancy, ELNS.

In addition to consultancy work and lecturing, ELNS undertakes in vivo and in vitro equine nutrition research. The in vivo studies range from grazing intake trials and ways of manipulating pasture intakes, to feed digestibility studies. The in vitro work is more fundamental, including investigations of the effects of carbohydrate fractions on various fermentation parameters in a simulated equid hind gut system. Over the years she has supervised several MSc and PhD students in the UK and abroad and has been an external examiner for various BSc and higher degrees.

Edwin Claerebout

Edwin Claerebout is an EBVS® European Veterinary Specialist in Parasitology (dipEVPC) and professor in parasitology at the Faculty of Veterinary Medicine of Ghent University, Belgium, where he lectures on parasitic diseases in domestic animals. His research interests are parasitic diseases in livestock, in particular gastro-intestinal parasites. Prof. Claerebout serves on the board of the Benelux branch of the European Scientific Counsel Companion Animal Parasites (ESCCAP) since 2008.

Deborah van Doorn

Deborah van Doorn works at Utrecht University - Faculty of Veterinary Medicine, Department of Biomolecular Health Sciences. She is a senior teacher in veterinary parasitology. In the past few years her research activities were mainly focused on: the epidemiology of cyathostomin infections in horses and the resistance development of cyathostomins against macrocyclic lactones. Molecular identification of cyathostomin species and involvement in anthelmintic resistance. Resistance development of Parascaris equorum against macrocyclic lactones.

Development of web based tool for practitioners, professionals and students (https://www.parasietenwijzer.nl/e/). Investigation of the attitude of practitioners and horse owners towards helminth control in horses. Incidence and prevalence studies of a variety of parasite species in horses and other mammals. Therefore she invested in knowledge transfer through lectures and practicals/workshops and nonscientific articles on animal helminth and protozoan infections.

Aránzazu Meana Manes

Aránzazu Meana, DVM, PhD, EVPC Diplomate and EBVS® Veterinary Specialist in Parasitology was graduated from Veterinary Medicine Faculty at the University Complutense of Madrid (UCM), Spain.

After a short period as general practitioner in a private clinic, she became assistant for the Animal Health Department of the same University, where she completed her PhD thesis in 1990 about pathogenesis of ruminant gastrointestinal parasitic diseases. She did some postgraduate studies in Cambridge and Glasgow Veterinary Schools and is currently Full Professor in Parasitology and Parasitic Diseases, while being also in charge of Parasitology Laboratory at the Veterinary Teaching Hospital (UCM).

Her areas of research are the epidemiology and control of parasitic diseases, focusing mainly on gastrointestinal parasites of herbivores (ovine, bovine and equine) in which she has an active participation on meetings, and scientific congresses, including several books on clinical cases equine and bovine parasitology and many published papers. She was involved in the discovery in Europe of the honeybee intestinal microsporidium Nosema ceranae, closely related with recent honeybee high colony losses.

She is a member of the Spanish Society of Parasitology, the European Scientific Council for Companion Animal Parasites (ESCCAP) and the World Association for the Advancement of Veterinary Parasitology (WAAVP). Diplomate of the European Veterinary Parasitology College (EVPC) since 2005, she has been secretary of ESCCAP- Spain from 2005 to 2011 and EVPC from 2012 to 2018. She is currently the EVPC Vicepresident.

Adolfo Paz-Silva

Adolfo Paz-Silva is senior lecturer at the Animal Health Department, in the Faculty of Veterinary of Lugo, University of Santiago de Compostela (Spain). In 2003 he obtained his current position with full of his time dedicated to lecturing subjects in Epidemiology, Zoonoses and Public Health, and Parasitic Diseases, as well as supervising undergraduate, graduate and postgraduate students. His main area of research consists of the control of parasites, through feasible diagnostics, proper treatment and development of preventive measures. He is Diplomate of the European Veterinary Parasitology College (EVPC Diplomate) and EBVS® Veterinary Specialist in Parasitology, member of the Spanish Society of Parasitology and the World Association for the Advancement of Veterinary Parasitology (WAAVP).

Since 2013 he is the coordinator of the COPAR (Control of Parasites) Research Group at the USC, focused on reducing the levels of contamination by certain pathogens in the soil as a contribution to the integrated control of parasites among grazing animals, with a especial interest in applying strategies relying on biological agents as soil filamentous fungi.
Current research interests include the search for introducing sustainable procedures into routine programs for the control of parasites, mainly through the formulation of fungi with parasiticide activity into different presentations as a useful tool to prevent that grazing animals, especially horses, become infected while feeding on grasslands.

Wilbert Pellikaan

Wilbert Pellikaan is assistant professor at the Animal Nutrition Group of Wageningen University & Research. In 2007 he obtained his current position within the Animal Nutrition Group with half of his time dedicated to lecturing subjects in general animal nutrition and animal nutrition physiology, and supervising undergraduate and graduate students. His main area of research is ruminant nutrition with a special interest in using novel tanniniferous fodder legumes in dairy cow nutrition to reduce enteric methane emissions. Since 2011 he conducts equine nutritional related studies within the Centre for Animal Nutrition, in collaboration with the Faculty of Veterinary Science at Utrecht University.

In 2007 he participated as a workpackage leader in an EU funded research training network 'HealthyHay', focussing on the effect of sainfoin tannins on methane production. This project was successfully continued in a subsequent EU funded initial training network 'LegumePlus' (www.legumeplus.eu) in which he also participated as a workpackage leader of the animal nutrition section. Currently, he is involved in an FACCE ERA-GAS network 'Methlab', where lactic acid bacteria are being used as silage inoculants or direct fed microbials to reduce enteric methane emissions from dairy cows, and is a partner within the EU-funded project 'Equianfun'. The latter program studies the functioning of anaerobic fungi in the equine hindgut, which are of key-importance to dietary fibre degradation.

Current research interests and projects include the use of alkanes combined with stable isotope technique to assess botanical composition in diets of free ranging ruminants and equids, the use of tanniniferous feeds in dairy cow and equid nutrition, and further developments of in vitro techniques to study fermentation processes and microbial responses in the gastro intestinal tract of ruminants and equids.

Cecilia Müller

Cecilia E. Müller, SLU. Cecilia graduated in Animal Science year 2000 and completed her PhD on Wrapped forages for horses in 2007. She is Associate Professor in Equine Feed Science at the Swedish University of Agricultural Sciences (SLU) since 2013 and senior lecturer in equine nutrition and management at the Department of Animal Nutrition and Management, SLU. She is a member of the Committee appointing Associate Professors at the Faculty of Veterinary Medicine and Animal Scinece at SLU, and in the Horse Committee at the same faculty.

Her research so far comprise different aspects of forages for horses including nutritive and hygienic quality and associations to equine health. Her research has been performed in e.g. forage production techniques, feed evaluation in vivo and in vitro, forage microbiology with special emphasis on moulds, plant maturity at harvest and nutritional composition of different grass species, equine hindgut digestion, equine eating behaviour, equine health related to nutrition, nutrition in aged horses, and intermediate metabolism in horses particularly from an insulin resistance and laminitis perspective.

Currently she is running a research project on presence of Free faecal liquid in horses and its relation to feeding and management as well as hindgut microbiota. Cecilia enjoys horses both in science and practice and could not imagine a life without them.

Dominique-M Votion

Dr. Dominique-M Votion, DVM, PhD is a senior researcher at the ‘Fundamental and Applied Research for Animals & Health’ (FARAH) research unit from the University of Liège (Belgium). She is currently in charge of research programs related to muscle disorders.These researches aimed at developing new diagnostic tools for muscle disorders in sport horses as well as at defining the preventative measures for atypical myopathy.

In 2005, she launched the “Atypical Myopathy Alert Group” (AMAG) an informal European epidemio-surveillance network consisting of owners of horses, equine practitioners, national epidemiological networks and universities gathered to warn alerts regarding atypical myopathy (http://www.myopathie-atypique.be).

Her teaching activities are related to environmental toxicology. She is the author of peer-reviewed scientific publications and conference papers that are available on request through an open repository and bibliography (http://orbi.ULiège.ac.be/).

She loves riding her horse and attaches great importance to her horse having access to the pasture while minimizing risk of environmental intoxication.

Invited speaker session I

Fiber First!

So what do we mean by forage?; how much should be feed? and nutritionally can we just feed forage to equines?

Pat Harris MA PhD VetMB MRCVS DipECVCN

Head of Equine Studies: WALTHAM Petcare Science Institute
Director of Science: SPILLERS™

Definitions

- ***Forage***: high fibre whole plant (except roots): includes cool (C_3) and warm season (C_4) grasses (incl. C_3 & C_4 cereal plants) and legumes[1]. May be fed fresh (i.e. grass pasture) or preserved.
- ***Roughage***: high fiber feedstuff generally obtained as a crop residue or a by-product e.g. straw, cereal hulls, beet pulp. Typically used interchangeably with the term forage.
- '***Foraging***' used to encompass all feed intake activities of horses both on pasture and in housing situations.
- Preserved forages *typically* fed to equines:
    - ***Straw****:* stalks of harvested cereal plants, preserved through drying: DM[2] content ideally above 85%.
    - ***Hay***: grasses/legumes preserved at a DM content ideally above 85%: Preserved through drying.
    - ***Haylage****:* grasses/legumes stored airtight whilst only semi-wilted and with DM content ≥ 50% (and typically < 85%): Preserved through being airtight with some (but variable) fermentation. WSC content may be very similar to that of the grass when it was harvested.
    - ***Silage:*** for forages (incl. grain grasses such as corn) stored moist and airtight with DM contents below 50%: Preserved through fermentation and therefore WSC should be lower than that of the grass when harvested.

Key Take Home Messages

1. **FORAGE should be the foundation of all equine diets** (for health and welfare reasons)
    - Equines at a healthy weight (i.e. not overweight) should ideally be fed forage *ad libitum* and at least 1.5% of their bodyweight in DM per day.
    - Even equines in very high intensity work should be fed at least 1.25% of bodyweight (e.g. 6.25kg DM for a 500kg horse) in DM as forage.
    - Even in weight resistant animals during a weight loss programme do not recommend <1% BW DM.
      NB Equines (especially some ponies) can eat ~1%BW in DM within 3hrs and up to ~5%BW DM/day.
2. Important where-ever possible to **Match forage (type/intake provision/timings etc.) to individual needs**
    - Nutritionally variable within and between grass types and stage of maturity when cut.
    - Need to make changes slowly especially if very different nutrient profiles/types of forage.
    - Avoid prolonged periods without forage provision.
3. **Forage ANALYSIS is key** BUT recognise
    - Analytically variable depending on sampling, laboratory methodology etc. especially for Water-soluble carbohydrate content.
    - Need to understand the variability of any analytical method used by a chosen lab (which should have good in-house quality control systems).
4. **Unlikely forage alone will meet optimal nutrient needs**: especially at certain life stages/work intensities
    - Studies in Standardbreds have shown that it is possible to train (both growing and mature horses), and race, horses provided with forage as the only source of dietary protein and energy: BUT digestibility, protein and energy content must be appropriately high.
    - Most, if not all, forage-based rations will require an equine specific vitamin- and mineral balancer or an amino-acid, vitamin-mineral balancer which complements that forage
        - Especially if feeding soaked forage.

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[1] NB Other forages that are ingested by equines include non-leguminous 'weeds' e.g. dandelions etc as well as herbs within pastures plus browse species. Browse species may actually constitute a significant proportion of intake by native wild ponies esp. during winter (e.g. heather or gorse) as well as domesticated animals that forage in hedgerows etc. and animals in tropical countries that may rely to some extent on 'cut and carry' browse. These, however, will not be discussed further in the talk. [2] DM = Dry matter.

- Especially if on a restricted diet.

- Need to be aware of any possible specific nutrient considerations linked with the forage type being fed as well as any non- nutrient aspects such as hygienic quality.

Recommendations

- Forages, especially when sold commercially, should come with a guide as to the likely range of key analytical values that an individual 'bale' of that forage would provide.
- 'We' should work together to agree optimal methods for analysis of key analytes to enable common interpretation.

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Amount of conserved forage fed to horses: is there a problem?

Myriam Hesta

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Take home message

- There is still a big need to educate horse owners on the importance of feeding enough roughage. This is not only true for people owning one or two horses at a hobby level; but also for professionals and owners of competing horses.
- Veterinarians play an important role in increasing the awareness on this topic.
- Evaluating absolute roughage intake (kg DM/kg BW) should be part of the standard clinical examination of the veterinarian during each consultation as owners are still making too many errors and roughage intake plays an important role in prevention of several disease

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General considerations for forage & pasture management: which factors affect the nutrient content of pasture & forage

Dr K.M. Brolsma

Eurofins Agro

Take home messages

- Soil fertility has a key role in the growth and development of grass and in roughage composition.
- However, soil fertility comprises many facets and is often difficult to assess, expensive, hazardous and time consuming.
- The combination of two broad spectrum tests, we can routinely assess the physical, biological and chemical characteristics of a soil by:
    - The multi nutrient 0.01 M $CaCl_2$ extraction procedure, which gives insight in the availability of beneficial plant nutrients in a soil, and
    - Near infrared spectroscopy which gives insight in, among others, the soil nutrient stock and the complete pool of soil nutrients.
- Combining $CaCl_2$ extraction and NIRS technologies has resulted in the routine assessment of 50 soil characteristics and provides insight in the biological, chemical and physical soil fertility.
- Assessment of soil fertility gives a better understanding of, and grip on grass production and roughage quality, e.g. in the nutrient content of grasses (phosphorus and lysine content).
- Large efforts have been made to validate the addition value of measuring more soil fertility characteristics, including fractions of nutrients. However, further underpinning remains necessary.

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Pasture intakes by horses and ponies: control and management

Annette Longland

ELNS

Take home messages

Equines with free access to ample pasture have been reported to ingest between 1.3->5% of BW as DM/d although most estimates report intakes of 1.8-3.5% of BW/d. Dry matter intakes (DMI) of 2% of BW/d are generally considered sufficient for most equines to maintain an appropriate body condition, so for many animals with high pasture intakes there is a danger of their becoming obese. Therefore, some means controlling pasture intakes of such animals is necessary.

Methods of restricting pasture intakes explored:

Sward height: only very short swards (1-2cm) likely to be effective in reducing daily pasture DMI, probably due to physical limitations imposed on intake rates. Higher sward heights unlikely to be effective in reducing pasture intakes.

Strip grazing: Gradual access to fresh pasture by strip grazing, either with a lead fence only (so grazing area gets larger as time progresses) or with a lead and back fence (so grazing area stays the same with previously grazed areas recovering) were equally and highly effective in reducing weight gain in ponies compared with ponies that had free access to the same initial total herbage mass as the strip grazed ponies.

Time at pasture. Restricting time at pasture was only partially effective in reducing pasture DMI. Animals with restricted pasture time showed compensatory ingestive behaviour, accelerating their intakes such that they consumed disproportionately large amounts of pasture. Thus, DMI of animals with 3, 6, and 9 hours pasture access respectively consumed 43, 69 and 74 percent of the DMI of ponies with 24 h pasture access. Other animals with 3 hours pasture access increased their pasture intakes to 41 percent of their total daily DMI. Such information should be factored into regimens using restricted grazing times as a means of controlling intakes to allow appropriate forage provision when not at pasture.

Grazing muzzles. Consistently reduce pasture intakes, ranging from 30-80% reductions in DMI compared with when grazing unmuzzled. Reductions in intakes were apparently unaffected by season or grass species. Some ponies that were muzzled for 10h/day and allowed free pasture access for 14 h, maintained their current weight, whereas others gained as much weight as unmuzzled ponies grazing for 24 h. Thus, grazing muzzles may be most effective when used in conjunction with stabling when unmuzzled rather than with periods of being muzzled and unmuzzled at pasture.

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Stro
Paille
Straw
Stroh
18 Kg
Stofvrij natuurhooi
Foin naturel dépoussiéré
Natural Hay
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Invited speaker session II

Grazing, parasite control & nutritional strategies

Parasite control: introduction to several (diagnostic) systems

Edwin Claerebout

Ghent University

Take home messages

- **Test**, don't guess!
- **Monitoring** strongyle infections during the grazing season can reduce the number of anthelmintic treatments needed.
- **Pooled faecal samples** can be used to monitor at herd level.
- **Individual faecal samples** are needed to identify susceptible animals.
- Test for **anthelmintic resistance** with the faecal egg count reduction test.
- Test for **tapeworm** infections using a saliva antibody detection test

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Parasite control & grazing systems for horses: The North-Western European perspective

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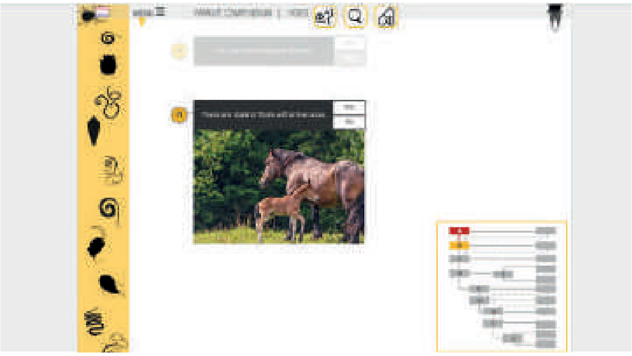
Take home message

In temperate climates monitoring of worms through egg counts in order to keep pastures safe is a relatively new recommendation. The aim of such a Selective Anthelmintic treatment System (SAT), aimed mainly at strongyle worms, in horses:

- Is slowing down resistance development against anthelmintics (and check efficacy);
- through treatment of horses that are "high" strongyle egg shedders (not treat the others);
- targeted treatments also against specific other parasites, for example against *Parascaris* spp
- Anthelmintics may also burden the environment through residues, therefore treat animals only when warranted

In the Netherlands a parasite compendium was developed that integrates grazing management for several animal species. These tools we especially use for teaching veterinary students about helminth control strategies. For more information please visit: https://www.parasietenwijzer.nl/e/



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Parasite control & grazing systems for horses: The Southern-European perspective

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Take home message

About parasitism

- **Parasitism is based on a continuum equilibrium among hosts, parasites and environment**
  - *It is considered 9 out of 10 parasitic form (oocyst, egg, larvae, adult) are in the environment*
- **Pasture is contaminated by few animals**
  - *Approx. 20% animals tend to burden 80% of parasites*
  - *They are considered high egg shedders, should be identified*
- **Southern European regions have climatic conditions characterized by high temperatures and low pluviosity, that impairs internal parasite development and survival and enhance ectoparasites and related diseases**
  - *Horses are rarely indoors, they pasture all year long*
  - *Major internal parasites in grazing animals are species of Gasterophilus (mainly G.intestinalis), strongylines (even Strongylus vulgaris), ciathostomines, tapeworms (A.perfoliata and A.magna) and ascarids (Parascaris univalens as well), while indoors animals also harbour Oxyuris equi and coccidia. Infection by hepatic trematodes such as Fasciola o Dicrocoelium can also be detected.*
  - *Major external parasites are ticks and flies and agents of Vector Borne Diseases as piroplasms or tripanosomatids; Habronema/Draschia species and Setaria can be also seen.*

About control parasite strategies

- **Horse health and welfare are focused on high value animals, as well as breeding farms (individual medicine vs population medicine)**
  - *Horse parasite control needs a "Taylor made" deworming program*
  - *Faecal sample analyses are needed*
- **To build up a sustainable and health care deworming management**
  - *Know which worm species should be controlled*
  - *Keep fields and stables as clean as possible*
  - *Animal age, hygiene and management must be considered in any strategy*

General Reading

- ESCCAP Guideline 08 Second Edition – March 2019. A Guide to the Treatment and Control of 8 Equine Gastrointestinal Parasite Infections. https://www.esccap.org/guidelines/gl8/
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Strategies relying on biological agents to prevent parasite infection

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Take home messages

Biological control

- **Biological control is defined as the use of living organisms to control pests.**
  - A natural enemy is introduced into the environment, or if already present, is stimulated to multiply to effectively reduce the number of pest agents.
- **Different microorganisms frequently present in the soil are antagonists of parasite stages**
  - Some viruses, bacteria, fungi and worms feed on cysts, eggs or larvae to obtain carbon and nitrogen.
  - Other microorganisms feed on biological agents, which requires their regular administration.
- **Some filamentous saprophytic fungi have been successfully tested against parasites in the soil.**
  - *Duddingtonia flagrans*, *Monacrosporium thaumasium* and *Arthrobotrys oligospora* are trapping nematodes agents.
  - *Mucor circinelloides*, *Pochonia chlamydosporia* and *Trichoderma atrobrunneum* are able to invade and destroy cysts and eggs of helminths or ticks.

Fungi as biological agents to prevent parasite infection

- **Spores or mycelium are the main structures of fungal multiplication.**
  - Fungi reproduce asexually by fragmentation, budding, or producing spores.
- **A useful and practical way of spreading parasiticide fungi is required.**
  - Spores or mycelium can be sprayed directly on the soil/fecal pats.
  - Certain fungi can resist the passage through the digestive tract and develop their antagonistic activity in the feces, where parasite stages are also present.
- **The oral administration of fungi offers a simple method that ensures their presence in the feces.**
  - Edible formulations are well suited for horses to receive adequate concentrations of spores of parasiticide fungi.
  - The periodical administration of parasiticide fungi spores is advised to develop integrated programs to prevent infection by helminths in horses under pasturing regimes.

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<u>The potential of selected plant secondary components to control parasites in horses; a nutritionist perspective</u>

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Definitions
Plant secondary metabolites (PSM) form a complex group of biochemicals made by plants that are regarded as being not directly essential to the life of the plant. Currently, at least five classes of secondary metabolites (glucosinolates, benzoxazinoids, terpenes, aromatics, and green-leaf volatiles) are confirmed to act in the natural defence system aiding plants to protect themself e.g. from herbivory (Erb and Kliebenstein, 2020; Mueller-Harvey, 2006).

Tannins are polyphenolic PSM's that crosslink with proteins and as such they can nutritionally exert both beneficial and detrimental effects. Cross linkages between tannins and dietary proteins can affect dietary protein utilisation. Tannins can crosslink with the resident gastro-intestinal microbiota, hence, modulating the microbiome and redirecting the fermentation and metabolites thereof. Tannins can improved animal welfare and health through the prevention of bloat and lowering intestinal parasite burdens. Tannins can be categorised into two groups, the hydrolysable and condensed tannins.

Hydrolysable tannins are produced by a wide variety of plants and can be divided into gallotannins, ellagitannins and complex tannins. They can be easily hydrolysed within an acidic or alkali environment, or in hot water and/ or by enzymes.

Condensed tannins, also referred to as proanthocyanidins, are polyphenolic compounds of high molecular weight that mainly consist of oligomers or polymers of flavan-3-ol monomers (e.g. catechin, epicatechin). Depending on the chemical structure of the monomeric unit, they are classified into four groups, the two most dominant groups being the procyanidins (PC) and prodelphinidins (PD).

Key Take Home Messages
Hydrolysable and condensed tannins both show anthelmintic effects in monogastric and polygastric animal species. Studies show that tannins can give a decrease in larvael exsheathment and faecal egg count, but results are varying in success rate.

Tannin efficacy against parasites depends amongst others on its molecular structure. In addition, the site where the parasites resides and develop within the gastro intestinal tract and the environmental conditions, are factors that could influence efficacy.

Feeding tannins containing legumes either as a fresh forage or as a silage or haylage potentially could be a strategy to reduce gastro-intestinal parasite burden in horse and to decrease the use of anthelmintics.

Applying tannin extracts as a therapeutic dietary additive could be another alternative strategy to aid in gastro-intestinal parasite control in horse.

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Post-10th EEHNC session I

Moulds, Mycotoxins & Atypical Myopathy

Moulds and mycotoxins in wrapped forages for horses: Can we not only analyze the hygienic quality but also prevent the presence of moulds and mycotoxins?

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Take home messages

The presence of moulds and mycotoxins in forages is a sign of impaired hygienic quality for two main reasons; the presence of mould spores, and the potential risk of mycotoxin production. Mould spores may cause airway diseases in horses and mycotoxins can cause different diseases that could be fatal (Scudamore & Livesey, 1998; Tell, 2005; Gallo et al., 2015). Moulds in feeds are often classified into two main groups: the field fungi, and the storage fungi. The field fungi is present on the standing crop and usually consist of genera such as Cladosporium, Alternaria and Fusarium, but other species can also be present. Although these species are often regarded as a problem primarily for plant growth, especially in cereals, they may also be present on grass crops for forage production and they may pose a threat to equine health. The storage fungi develops during improper storage of feeds and commonly includes species belonging to Aspergillus, Fusarium and Penicillium in forages, but other species may also be present (Scudamore & Livesey, 1998; Samson et al., 2010; Gallo et al., 2015).

Forage is commonly conserved as hay, haylage and silage, where haylage and silage are counted as wrapped forages (Müller, 2018; Schenck, 2019). It is important to know the major conservation principles of these forages for the understanding of why moulds may proliferate in them, and which actions should be taken to inhibit it. Hay is conserved through removal of water to a sufficiently low dry matter content (at least 840 g per kg) and water activity (maximum 0.70) where microbes can no longer grow. Hay can therefore be stored aerobically, if it is kept dry during the entire storage period. Moulds are aerobic and only need moisture to be able to grow in hay. Silage has a dry matter concentration up to 500 g per kg and is conserved through lactic acid fermentation (e.g., Müller, 2005). The lactic acid lowers pH and together with the anaerobic environment created by the wrapping mould growth is inhibited. If the anaerobic seal is broken, the low pH and presence of lactic acid may postpone growth of fungi but it cannot hinder it completely. Therefore, anaerobiosis is required for inhibition of mould growth in silage. Haylage can be considered to be "in between" hay and silage, with a dry matter concentration over 500 and up to 840 g per kg, and the conservation relying mainly on air-tight storage for avoidance of mould growth (e.g., Müller, 2018; Schenck, 2019). Some lactic acid can be produced in haylage with dry matter contents up to about 600 g per kg, but in very small amounts and it is unlikely that it has any major conservation effects. Haylage can therefore, compared to silage, be regarded as even more sensitive to mould growth, if the wrappings are not air-tight. Moulds only need oxygen to be able to grow in haylage. It is important to understand that haylage is not the same thing as silage, or hay, as biochemical and microbial composition differ between them. Results from studies on lactic acid fermented silage can therefore not be used straight-off for haylage, as it can result in incorrect conclusions.

Both field and storage fungi may produce mycotoxins (e.g. Wambacq et al., 2016). Field fungi can produce mycotoxins for example when crops are stressed due to cold or dry weather, and storage fungi can produce mycotoxins above freezing temperatures in the presence of oxygen and dry matter contents above 20 % (Scudamore and Livesey, 1998). Fungi that are potential mycotoxin producers do not always produce mycotoxins, but if environmental factors are optimal for mycotoxin production, it could occur. Due to the possible detrimental health effects of moulds and mycotoxins, their presence in feeds in the European Union is regulated to some extent (https://www.efsa.europa.eu/en/topics/topic/mycotoxins). There is however a lack of knowledge for many mould species and mycotoxins.

Analysis of presence of moulds and mycotoxins in forage can be performed. Moulds can be analysed both qualitatively and quantitatively by culturing on selective substrates and/or by molecular methods (Samson et al., 2010). Multi-mycotoxin chromatographic assays are available (e.g. Andersen et al., 2020). However, forages are very heterogenous and mould growth in forages is not evenly distributed within for example a bale. Representative sampling can therefore be very difficult, and different sampling methods can influence the analytical result for both moulds and mycotoxins. In a Swedish-Norwegian study on 124 horse farms where three sampling methods were used on all farms, results showed that the method influenced the possibility to detect different mould species or genera (Schenck et al., 2019a). Visible fungi on bale surfaces was not a useful indicator of moulds in core samples, while direct plating of core samples overestimated fungi growing with hyphae (e.g. Arthrinium spp.) and dilution plating of cores samples overestimated spore-producing fungi (Schenck et al., 2019a). One hundred of the core samples in the same study were analysed for mycotoxins, where Fusarium toxins Enniatin B and Deoxynivalenol were the most common and present in 14 and 12 % of the samples, respectively (Schenck et al., 2019b). Most of the detected mycotoxins were present in low concentrations and in fewer than 10 % of the samples. As shown in previous studies, visual appearance of moulds in forages was not associated with presence of mycotoxins, and mycotoxins could be present in forage samples with no visible moulds (Schenck et al., 2019b).

Considering the difficulties involved in sampling, analysis and interpretation of analytical data for risk assessment of moulds and mycotoxins in forages, and the fact that a batch of wrapped bales infected with fungi cannot be cured in any way in practice, it is highly important to have a preventive approach in forage production. To be able to prevent mould growth in wrapped forages, knowledge of which factors that are associated with mould growth in such feeds is required. Forage management and production factors were analysed for their association with the presence of moulds and mycotoxins through correlation and multivariate regression analyses in the previously mentioned study (Schenck et al., 2019a,b). Increasing dry matter content and pH, less than 8 layers of stretch film, lower seal integrity, wilting the crop in windrows instead of wide-spread in the field, and higher compared to lower latitude all increased the risk of finding moulds in the forage. Increasing dry matter content also increased the risk of finding Fusarium mycotoxins in the forage in the same study. It was also found that as forage dry matter concentration increased, the preventive effect of a higher number of stretch film layers on inhibition of mould presence disappeared, but at about 50 % dry matter the risk of finding moulds in the forage was halfed by using more than 8 layers of stretch film (Schenck, 2019).

The effect of increased number of stretch film layers on preventing mould growth has been reported previously in several studies where airtightness of bales, carbon dioxide concentration within the bale gas volume and extent of bale surface moulds has been measured (Paillat & Gaillard, 2001; Keles et al., 2009; O'Brien et al., 2007, 2008; Spörndly et al., 2017). These results all point in the same direction, that if haylage is going to be conserved with low risk of mould growth, the wrappings have to be air-tight.

Future challenges within the area include among others increased knowledge of if and which health problems in horses that can be expected from different moulds and mycotoxins in forage. Some secondary metabolites may prove to not be toxic to horses, while others may explain conditions or diseases where we currently do not have a good understanding of the causes. Another challenge is which effect climate change will have on the field fungal flora in grass, and especially on endophytic fungi. These are fungi growing inside the plants and they may produce toxins in the field. One example is Epichloë spp. which produces alkaloids acting as neurotoxins and causing reproductive problems in horses (Anas et al., 1998). It is known that endophytic fungi are present in many grass species, but less is known about when these fungi produce toxins and if it is a problem that will increase with a warmer climate. Yet another challenge are the environmental aspects of using large amounts of polyethylene stretch film for forage conservation. It is required for restricting mould growth in wrapped forages, but could be questioned from a sustainability perspective.

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Prevention strategies to reduce the risk of atypical myopathy resulting from sycamore intoxication

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Take home messages

Equine atypical myopathy (AM) is a severe intoxication of grazing equids resulting from the ingestion of samaras or seedlings of trees from the Acer species. The sycamore maple (Acer pseudoplatanus) is involved in European cases whereas the box elder (Acer negundo) is recognized as the cause of this seasonal pasture myopathy in the Unites States of America. Equids horses become intoxicated after eating the toxic materials that contain at least two toxins. This intoxication is associated to a high mortality rate. Currently, the therapy is mainly symptomatic and the mortality rate average 74%. As there is no specific treatment for AM yet, prevention is the key. By reviewing the most recent literature and by analysing epidemiological data gathered since 2006 by the Atypical Myopathy Alert Group" (AMAG; ULiège, Belgium) and the Réseau d'Épidémio-Surveillance en Pathologie Équine (RESPE; France).

We can identify five levers of action to reduce the risk of AM resulting from sycamore intoxication:
- **Prevent (any) access to the cause**: if feasible, prevent access to sycamore samaras & seedlings but do not forget other potential toxic Acer species
- **Avoid additional sources of intoxication**: during at risk seasons, avoid any additional sources of intoxication such as flowers of sycamore maple tree, their leaves, water in contact with seedlings, forages contaminated with samaras and/ or seedlings etc. Do not forget that toxins transfer to milk that may represent a risk for newborn and unweaned foals. Prevent access to rivers and the possibility of drinking free standing water from the ground during the at risk seasons
- **Identify the risks associated with your pasture**: all pastures with a sycamore tree in the vicinity must be considered at risk. Avoid certain practises that may increase the risk such as harrowing and beware of the risk associated to contaminated forages even if they have been stored for a long period. All equids of any age are at risk but ruminants may also be intoxicated.
- **Favour/ create low-risk meadows for pasturing during autumn and spring**: avoid overgrazing and minimise toxins consumption by ensuring lush pasture and/ or supplementary feeding throughout the outbreak seasons. Visit your pasture in autumn after stormy weather has dispersed sycamore samaras and fence off these areas temporarily to prevent access to toxic areas. Destroy young seedlings as soon as possible. Do not forget they remain toxic until full decomposition. Collect samaras if feasible. Consider the trimming of maple trees in close proximity to avoid flowers and fruits production.
- **Take specific measures during alert**: AM occurs seasonally with outbreaks starting in autumn that may continue in early winter. Spring outbreaks usually cease before summer. Starting and ceasing dates of autumnal and spring outbreaks vary between years, probably depending on climatic conditions. The majority (94%) of "spring" and "autumnal" cases occurred between 1 March and the 31 May and between the 1 October up to the 31 December, respectively. During the risky periods, pasturing time should be modulated according to weather conditions. Remove horses from pastures when you receive alert messages (resulting from cases' declaration to the surveillance networks) or at least, minimise pasture time to less than 6 hours a day especially when stormy weather conditions have been forecast including in spring when there are flowering trees surrounding the pasture. Provide supplementary feeding but ensure forages are toxin-free. Also, it is advised to supply a salt block enriched in selenium and provide drinking water from the distribution network.

Atypical myopathy is an emerging intoxication that will definitely be part of the life of equine managers and practitioners. There are no easy solutions, only an adapted management of the pastures will allow limiting the risks.

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Post-10th EEHNC session II

Fiber intake, fermentation & dental condition

Digestive physiology and feeding behaviour of equids – a comparative approach

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Take home messages

- Like other members of their order – the perissodactyla or odd-toed ungulates – equids had a much richer species diversity in fossil times than they have today.
- The main reason for their decline is seen in the comparative success of artiodactyls – even-toed ungulates – and amongst these, especially of ruminants.
- Possible reasons for the comparative success of ruminants in evolutionary time include locomotion (where a single hoof precludes use of swampy or rocky habitats), higher water dependency due to lack of a 'selective brain cooling mechanism', a slower overall reproductive rate due to slower *in utero* maturation, and digestive physiology.
- The digestive physiology of equids, compared to ruminants, is summarized as lower digestive efficiency compensated by higher intake levels (which also necessitates more time spent foraging).
- Historically, this has been linked to differences in fermentation site (foregut vs hindgut fermentation) and digesta retention times.
- Historically, it has been postulated that equids are at an advantage during times of low forage quality, because they are supposed to be able to increase intake in such a situation. The graphical depiction of this theory has been widely reproduced, in spite of a lack of support for it by empirical data.
- Empirical data so far suggests no fundamental difference in the reaction of equids and ruminants to decreasing forage quality (increasing fibre levels): a reduction of *ad libitum* intake.
- Preliminary data suggests that horses may be more susceptible to food scarcity (constrained food intake) than ruminants.
- In contrast to ruminants, the digestive tract of horses does not selectively discriminate by particle size.
- A major difference between equids (and other nonruminants) and ruminants is chewing efficiency.
- Among nonruminants, equids achieve extremely high chewing efficiency, most likely due to their cheek tooth surface anatomy (elaborate enamel folds).
- Ruminants achieve an even higher chewing efficiency, not because of dental anatomy, but due to the sorting mechanism in their forestomach.
- Because particle size-reducing chewing is postponed to rumination in ruminants, their ingestive behaviour and ingestive chewing pattern differs from that of equids. Equids chew more thoroughly during ingestion, with a chewing pattern similar to that used by ruminants during rumination.
- It is an interesting question how extant equid species survived in their respective habitats together with ruminant presence.

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Is there a relation between nutrition and dental condition or the other way around?

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Take home message

Nutrition and dental condition are associated with each other.

Nutrition characteristics can have an influence on:

- Mastication mechanics
- Dental wear
- Dental health (caries)

Severe dental disease will cause oral discomfort but the impact on digestibility and the association with the development of colic problems yet lacks sufficient scientific evidence.

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Post-10th EEHNC session III

Equine gastric ulcer syndrome & nutritional management
Sponsored by Cavalor FiberForce Gastro

Dietary Management of Gastric Ulcers in Horses

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Louisiana state university

Take Home Messages

- Stomach (gastric) Ulcers are common in horses and risk factors include intense exercise, feed management, stall confinement, frequent traveling, administration of NSAIDs, and concurrent illness.
- Diagnosis can be based on development of vague clinical signs and possible response to treatment.
- A confirmatory diagnosis can only be done by endoscopic (visual exam) of the stomach.
- Once ulcers are identified on endoscopic examination pharmacologic agents, such as omeprazole, should be administered to heal or improve ulcer scores.
- Traditional feed management should be initiated and include:
    - Providing good quality hay throughout the day and night
    - Providing Alfalfa hay (mixed with grass hay or fed alone)
    - Limit high starch grain to ≤ 2.2 Kg every 6 hours (may be able to feed higher amounts of low starch grain)
    - Feed grain with chelated minerals such as Zinc-methionine
- Add corn oil to diet to improve stomach lining integrity to improve stomach health
- Gastric supplements (with scientific data) might be administered during and after pharmacology treatment to improve stomach health long-term.
- Monitor horse's behavior for signs of recurrence.

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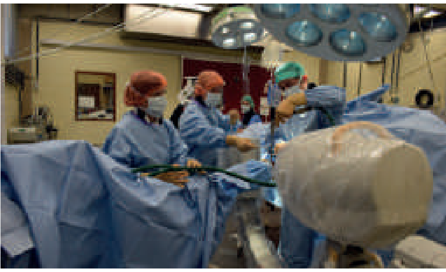

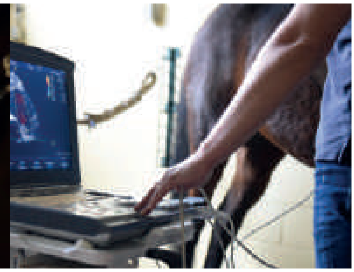

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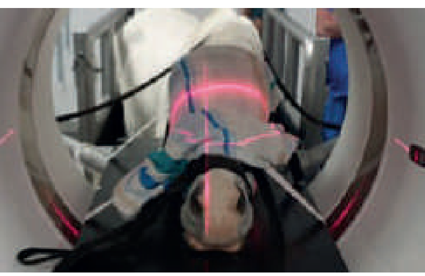
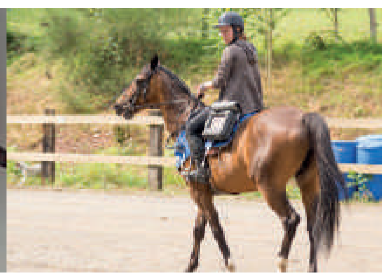
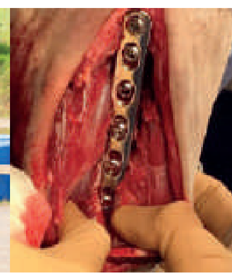


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