



General Medicine

Chaired by Malcolm Morley

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08.30–08.45

Validation of a point-of-care test for measurement of equine blood and serum triglyceride levels

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Aims: To determine if a point-of-care (POC) device used in human medicine for whole blood triglyceride measurement could be used for triglyceride measurement of equine whole blood or serum.

Methods: Heparinised blood samples from equine patients undergoing venipuncture for another clinical reason were used to perform whole blood and serum triglyceride measurements on the POC device, and also submitted for laboratory serum triglyceride measurement. The POC device measures triglyceride values between 0.8 mmol/l and 6.86 mmol/l, so samples with high readings were diluted and measurements repeated and calculated, and low readings were recorded as 0.8 mmol/l for the purposes of comparison of values. Results from the POC machine were compared to the commercial laboratory results using the Bland-Altman statistical tests of agreement. **Results:** Seventy-four samples were collected; 35 were collected whilst patients were inappetent or being starved (perioperatively); 39 were from horses that were appetent. Accuracy of the POC machine using either whole blood or serum had excellent overall correlation and agreement with the standard laboratory test, with correlation coefficients of 0.99 and mean difference of -1.0 and -1.1, respectively. However, accuracy varied with triglyceride concentration and the POC machine tended to overestimate TG values, particularly when TG values were above the POC machine's range. Within the readable range of the POC machine (0.8–6.86 mmol/l), in order to calculate the reference laboratory TG value the POC machine value needs to be multiplied by a factor of 0.82 when using whole blood and 0.75 when using serum. **Conclusions and practical significance:** The POC machine reliably predicts equine TG values for application in the clinical setting. Use of this hand-held device provides rapid, easy to perform, reliable assessment of equine blood triglyceride levels acceptable for use in clinical assessment of equine patients at risk of developing hypertriglyceridaemia. **Acknowledgements:** The Horse Trust

08.45–09.00

Expression of melanoma-associated antigen mRNA in equine melanoma biopsies: Potential targets for cancer immunotherapy

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Aims: To determine the profile of mRNA expression of melanoma-associated antigens (MAA) in equine melanoma tumours and to inform future research into development of a therapeutic DNA vaccine. **Methods:** Equine MAA sequences (Tyrosinase, Tyrosinase-related protein 2, MelanA and SILV) were identified from the horse genome assembly and MAA-specific primers designed. RNA was extracted from melanoma biopsies recruited from 3 clinical practices. Conventional reverse transcriptase and quantitative RT-PCR assays were performed to assess MAA mRNA expression profiles. Selected equine MAAs were cloned into a DNA vaccine vector (pVAX). **Results:** Thirteen melanoma biopsies, confirmed by histopathology, were recruited. Ten out of 13 yielded cDNA of sufficient quality to allow subsequent analysis. Conventional PCR assays demonstrated a degree of heterogeneity in expression profiles, although most tumours expressed all 4 MAAs. Using real-time PCR, 9 out of 10 samples expressed tyrosinase, Melan A and SILV. Tyrosinase and Melan A coding sequences were amplified and cloned to generate pVAX/EqTYR and pVAX/EqMelanA. **Conclusions:** Equine melanomas express similar antigens to human and canine melanoma. Further morphological classification of equine melanomas might provide data about which melanoma types express which MAAs. The pVAX constructs are now available as potential vaccine candidates for therapeutic DNA vaccination of horses suffering from melanoma. **Practical significance:** Melanomas occur frequently in older grey horses, where a prevalence of 80% has been reported (MacFadyean 1933). DNA vaccination is one treatment strategy for melanoma where plasmid DNA encoding the MAA gene of interest is used to stimulate an immune response. In recent studies, dogs vaccinated with plasmid DNA encoding tyrosinase showed improved survival times (Bergman *et al.* 2006). Success of such a strategy is dependent upon ensuring that MAA(s) chosen for inclusion in the vaccine are expressed by the tumour in most cases. Having identified the MAAs expressed by most tumours, such a strategy can be employed. **Acknowledgements:** We wish to thank The Petplan Charitable Trust for funding this research. Also, thanks to Dr. T. Mair of Bell Equine Veterinary Clinic, Ms. K. Church of Newnham Court Equine Clinic and clinicians at the Cambridge Equine Clinic for the recruitment of melanoma tumour biopsy/excision samples and Madeleine Fordham, histopathology lab technician for processing the samples.

References: Available on request from the author.

09.00–09.15

A PCR study of *Theileria equi* parasitaemia in 590 horses in Israel

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Aims: To determine the prevalence of *Theileria equi* infection and the associated risk factors, and to identify the strains of *T. equi* prevalent in Israel. **Methods:** Blood samples were collected from 590 horses in various regions of the country. The information

recorded for every horse included age, gender, breed, geographical location and management. The prevalence of *T. equi* DNA was assessed using a polymerase chain reaction for a segment of the *Theileria* 18S rRNA gene. **Results:** The overall prevalence of *T. equi* infection was 26.4%. There was a significant geographical variation in the prevalence of *T. equi* infection, ranging from 9.3% in the Central lowlands to 81.7% in the Golan Heights. Initial analysis of management and farm type showed a significant difference between horses of different management and farm types. However, after adjustment for other factors using a multivariate analysis, these differences became insignificant. Breed was identified as another risk factor for *T. equi* infection. However, a correlation between geographic location and breed was found in the sample of the study which might indicate that the difference results from exposure and not from breed related characteristics. Age and gender were not found to be associated with *T. equi* infection. Phylogenetic analysis of *T. equi* sequences showed 3 clusters of *T. equi*. **Conclusions:** *T. equi* infection was found to be associated with breed and geographical area. The high prevalence rates found in some areas are likely to be related to high exposure to the vectors of *T. equi* but this should be further studied. **Practical significance:** Horses coming from geographical areas where *T. equi* is prevalent should be monitored for the development of clinical theileriosis when being exposed to various stressors such as surgery. Infection should also be evaluated if exportation is considered.

09.15–09.30

Outbreak of equine herpesvirus myeloencephalopathy (EHM) in France: A clinical and molecular investigation

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Aims: Equine herpesvirus type 1 (EHV-1) associated myeloencephalopathy (EHM) is a disease affecting the central nervous system, in particular the spinal cord of horses. Despite the constantly increasing interest about this syndrome, epidemiological data are limited especially when related to the description of large outbreaks. The objectives of this study were to describe clinical, virological and molecular data obtained throughout a severe outbreak of EHM, with emphasis on laboratory diagnostic methods. **Methods:** The epizootic disease concerned a riding school in the North of France where 7/66 horses aged 12–22 years developed signs of a neurological disease in July 2009. Diagnosis of EHM was supported by EHV-1 detection using both real-time PCR and virus culture, and SNP-PCR test for viral strain characterisation. **Results:** Morbidity was observed at 10.6% (7/66), mortality was 7.5% (5/66) and case fatality rate was 71.4% (5/7). Clinical presentation of the disease was characterised by a strong association between fever and subsequent ataxia being systematically observed 2 days later. Neuropathogenic strain only (G2254) was isolated during the current outbreak; EHV-1 was detected by PCR in each available blood and nasal swab samples. Ct values, used as an indicative level of the viral load, ranged 26.0–37.0 among the 6 harvested horses. The amount of virus in biological samples was not systematically related to the intensity of the clinical signs being observed.

Conclusions: The molecular data strongly suggested taking into account any low viral load as being a potential risk factor for neurological manifestations. **Practical significance:** In the context of an EHM outbreak, considering EHV-1 as a highly contagious virus independently of season and genotyping should be recommended.

09.30–09.45

Risk factors for palmar osteochondral disease (traumatic osteochondrosis) of the metacarpo/metatarsophalangeal joint in Thoroughbred racehorses

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Aims: The aims of this study were to determine horse, race and training level risk factors for palmar/plantar osteochondral disease (POD) of the metacarpo/metatarsophalangeal joint in a population of Thoroughbred racehorses. **Methods:** The metacarpo/metatarsophalangeal joints of 164 Thoroughbred racehorses were examined at routine *post mortem* and graded for POD at the Hong Kong Jockey Club (HKJC). The relationship between horse, training and racing related factors, and grade of POD were determined using multilevel, multivariable, ordinal logistic regression models. **Results:** A total of 1288 condyles were examined; 56.4% had no evidence of POD, 28.2% *grade 1* and 15.2% *grade 2* or *3*. Multivariable analyses, allowing for clustering within horse and sire, showed that factors associated with higher grades of POD were: the total number of races run by the horse, an increase in the number of gallop sessions in the season prior to euthanasia and racing before import to Hong Kong. Horses in the first racing season were more likely to have lower POD grades compared to horses in later seasons and horses that had an interval off work of greater than 16 weeks in the season prior to euthanasia were also more likely to have lower POD grades. The days since the last race showed that POD *grade 0* was significantly more likely as days since last race increased up to 400 days. **Conclusions and practical significance:** Palmar/plantar osteochondral disease in the racing Thoroughbred does appear to be associated with increased racing and training intensity. Intervals of greater than 16 weeks since the previous race were associated with decreased POD, suggesting that healing may occur. **Acknowledgements:** This project was supported by the Horse Race Betting Levy Board and the Hong Kong Jockey Club.

09.45–10.00

Scintigraphic anatomy of the cervical spine

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Aims: Equine cervical vertebral pathology can manifest itself in many different ways. Diagnosis and localisation of lesions can be a difficult task; scintigraphy is often used to localise the lesion. This study aimed to demonstrate the scintigraphic anatomy of the cervical spine of the horse. **Methods:** An equine cadaver neck was obtained from a local abattoir. Once all soft tissue was



removed plastic tubing was used to outline facet joints, vertebral bodies and transverse processes. A solution containing 6.5 MBq/ml ^{99m}Tc was injected into the tubes until the solution surrounded the specific processes. Lateral and dorsal images were taken without musculature and a lateral image was taken with surrounding musculature. A static camera was used for each scan, with a set time of 300.00 s on a 128 x 128 matrix. **Results:** Right lateral images resulted in left facet joints being almost completely masked by the right facet joints. The transverse processes also bisect every vertebral body and in the case of C1, the surfaces of articulation also. The facets were in close approximation to the

vertebral bodies and transverse processes, although not superimposed this could still pose as a diagnostic consideration. The study found that on dorsal images each structure remained easily identifiable and in its entirety with minimal superimposition of structures, however this is of limited value in the live horse due to attenuation and distance. **Conclusions and practical relevance:** Many of the structures within the cervical vertebra are masked by other structures and left and right laterals are required to assess each facet joint, vertebral body and transverse process for potential increase in radiopharmaceutical uptake.

NOTES

Head and Neck/Orthopaedic Research

Chaired by Fran Henson

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10.30–10.45

Long-term arytenoid abduction and arytenoid stability following laryngoplasty

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Aims: To assess long-term arytenoid abduction (Ab), and arytenoid cartilage (AC) stability following laryngoplasty (LP) for treatment of recurrent laryngeal neuropathy. **Methods:** Horses previously undergoing LP between 2005–2010 were offered upper airway endoscopy at rest and during overground exercise. Comparisons were made with the grade of Ab currently present with the grade during the first week post operatively (PO) and, where available, at 6 weeks PO. **Results:** Of 89 horses, 33 were available for examination that had endoscopy within the first week PO and 16/33 had also been examined at 6 weeks PO. Mean interval between surgery and current examination was 33 months (range 4–71 months). The median grade of Ab immediately PO was 2, reducing to 3 by Week 6, and this grade was maintained in the long term. Between the immediate PO to long-term examination; 8/33 horses maintained the same Ab grade, 14/33 lost one grade, 9/33 lost 2 grades, and 2/33 lost 3 grades. An unstable AC was observed during exercise in 7/33 horses, but this was not statistically significantly associated with long-term Ab grade ($P = 0.50$), or the number of grades lost ($P = 0.64$). Grades of Ab at 6 weeks PO and at long-term examination, were well correlated ($P < 0.001$), with most (11/16) horses having no further Ab loss; 4/16 horses losing one further grade and one losing 2 grades. **Conclusions and practical significance:** The results indicate that most Ab loss occurs within the first 6 weeks PO, with only 31% experiencing further Ab loss. Repeat endoscopy at 6 weeks (prior to reintroduction of exercise) is, therefore, likely to provide a reasonably accurate prediction of long-term Ab. Dynamic stability of the AC is often considered the most important indicator of LP 'success', but was not associated with long-term grade of abduction or the amount of abduction lost.

10.45–11.00

A study of the thickness of subocclusal secondary dentine in overgrown equine and donkey cheek teeth

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Aims: Overgrowth of a cheek tooth due to a defect or loss of the opposing cheek tooth is a common finding in horses and donkeys. Little is known about the factors controlling the deposition of subocclusal secondary dentine (SO2D) in normal equid teeth, but stimulation of the occlusal surface is likely to be very important. There appears to be no information on the possible alterations to

this process when teeth develop overgrowths, and consequently of the net effect of reduced stimulation of the occlusal surface and of absent/reduced normal occlusal wear (attrition) on the thickness of SO2D. Knowledge of the likely thickness of SO2D of overgrown teeth should reduce the risk of pulpar exposure or pulpar thermal injury when therapeutic floating of overgrown teeth becomes necessary - in order to prevent soft tissue trauma and/or malocclusion-related dental disorders. **Methods:** This study utilised 32 permanent cheek teeth with complete ($n = 17$) or focal ($n = 15$) overgrowths (mean overgrowth height 8.6 mm, range 2–17.9 mm), and 25 control cheek teeth obtained from horses and donkeys of different ages, sizes and breeds. The teeth were sectioned on a tile saw and the thickness of SO2D was measured above individual pulp horns and a mean SO2D value was obtained for each tooth. **Results:** The mean SO2D thickness of overgrown teeth was found to be 16.0 mm, which was significantly thicker ($P < 0.001$) than the mean value of control teeth (10.1 mm). However, there was considerable variation in this finding with 13% of overgrown teeth actually having less SO2D than control teeth and in 19% of overgrown teeth the SO2D thickness was < 2 mm greater than controls. **Conclusions and practical significance:** Whilst this study showed that overgrown cheek teeth usually have thicker SO2D than normal-height teeth, this is not a constant feature and great care should be taken when reducing such overgrowths to prevent pulpar exposure or thermal damage.

11.00–11.15

Three-dimensional rotational angiography (3D-RA) of the carotid arterial tree in the equidae

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Aims: To compare the images produced by the 3D-RA of the carotid arterial tree in equidae to those produced using a conventional angiographic technique. **Method:** All imaging was performed on cadavers. A conventional angiographic technique was performed in 7 horses, followed by rotational angiography on 43 horses, 26 donkeys and one zebra. These animals of mixed age and sex were collected with the guttural pouch and the carotid trifurcation intact. Rotational angiography was performed using a Ziehm Vario 3D image intensifier. Algebraic reconstruction algorithms of the 2D angiographic series were used to generate a 3D image. **Results:** 3D rotational angiography allowed for superior vessel visualisation compared to those with the conventional 2D angiographic studies. Among the problems faced in standard 2D angiography were vessel overlapping and difficulties determining the course of eccentric or tortuous vessels. In many cases the contralateral carotid arterial tree impaired visualisation of the point of take off in cases where the internal carotid artery and occipital artery shared a common trunk. Observation of an aberrant branch of internal carotid artery was also limited and could lead to the misrepresentation of such a branch as a dilatation or aneurysm within the vessel. With



multiple projection angles in rotational angiography combined with 3D images, these limitations were overcome. Presence of aberrant branch or odd connections could be followed through the series of angiographic views, from the point of origin to the point of termination. As a result, anatomical variation and vessels eccentricity of the carotid arterial tree in equidae were determined and classified into groups. **Conclusions and practical significance:** 3D rotational angiography allows access to a new, wider range of viewing planes that are unavailable when using a conventional angiographic technique, and therefore provides more accurate information for surgeons performing cerebral vascular surgery. **Acknowledgement:** The Donkey Sanctuary.

11.15–11.30

Comparative proteomic analysis of the early osteoarthritic equine cartilage secretome

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Aims: Articular cartilage is composed of the chondrocyte, embedded within an extracellular matrix (ECM). Osteoarthritis (OA) is characterised by the slow degeneration of cartilage ECM. Here we conducted a comparative mass-spectrometry based proteomic analysis of an equine early OA model to ascertain the cellular mechanisms involved in early OA. **Materials and methods:** Equine cartilage explants ($n = 8$) were incubated for 5 days alone or in the presence of human recombinant IL-1 β . Media was reduced, alkylated and trypsin digested in solution. Digests were resolved by liquid chromatography-mass spectrometry (LC-MS) using a linear ion-trap Orbitrap mass spectrometer. Media from 4 donors was separated by 1D SDS-PAGE and analysed using LC interfaced with a linear ion trap quadrupole (LTQ) following in-gel tryptic digestion. Data was used to search for protein identifications against mammalian entries in the SwissProt database using MASCOT. Relative abundance data was provided using exponentially modified protein abundance index (EmpPAI). **Results:** 1D SDS PAGE and LC-MS elucidated both qualitative differences and treatment induced changes in relative protein abundance in the secretome protein profiles of explants models of early OA. In-solution digest identifications were accepted when identified more than once in different study cohorts and in 3 or more donors. Additionally, proteins had a MASCOT score of >28 with >1 identifying peptides, a confidence interval of 95% within a mass accuracy of 10 ppm. The comparative empPAI analysis of 65 proteins resulted in over-expression of proteins including vimentin, MMP1, fibulin-7 and TR11B. A relative reduction was evident in proteins including clusterin, fibronectin and TIMP1. **Conclusions:** This study enabled the characterisation and relative quantitation, at the protein level of the early equine OA secretome. Our results improve the understanding of the equine OA secretome and provide a useful tool to identify candidate proteins for further study in the pathogenesis of OA. **Acknowledgements:** Mandy Peffers is funded by a Wellcome Integrated Research Training Fellowship.

11.30–11.45

Thickness of the palmar cortex of the navicular bone: Comparison between horses with foot pain and sound horses

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Aims: To evaluate variation in thickness of the palmar cortex of the navicular bone in clinically sound and horses with foot pain, comparing those with and without navicular pathology. **Methods:** Digital radiographs were acquired for all horses. Sound horses had radiographs acquired as part of a prepurchase examination. Lameness horses had forelimb lameness abolished by palmar nerve blocks performed at the base of the proximal sesamoid bones. The thickness of the palmar cortex was measured objectively at standardised sites, after a repeatability study to determine accuracy of measurements. In lame horses final diagnosis was determined prospectively based on response to local anaesthesia and assessment of all imaging modalities (radiography, ultrasonography, scintigraphy and MRI). Nonparametric tests were used to determine differences in palmar cortex thickness at different sites within each group and to compare data from sound and lame horses. A Chi-square test was used to relate thickness of the palmar cortex to final diagnosis. **Results:** There were 55 sound and 377 lame horses. In sound horses the palmar cortex was thinner distally than in the middle third ($P < 0.0001$); in lame horses there was a significant difference between measurements obtained from the proximal and middle thirds ($P < 0.0001$) and the middle and distal thirds ($P < 0.0001$). All measurements were significantly larger in lame compared with sound horses. There was an association between mean thickness and primary navicular bone pathology and navicular pathology associated with lesions of the deep digital flexor tendon, collateral sesamoidean ligament or distal sesamoidean impar ligament ($P = 0.023$). **Conclusions:** Palmar cortex thickness decreases from proximal to distal and is thicker in lame compared with sound horses, which may reflect a change in loading pattern. **Practical significance:** Increased thickness of the palmar cortex of the navicular bone may be observed in association with navicular pathology.

11.45–12.00

A randomised, controlled, double blinded, placebo controlled study on the efficacy of an extract of a unique green-lipped mussel (*Perna Canaliculus*) in horses with chronic fetlock lameness

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Aim: To investigate the effects of a unique LPPC (Biolane[®]) in improving clinical signs of OA in the fetlock. Lyophilised products from green-lipped mussel *Perna canaliculus* (LPPC) are used to orally treat horses with osteoarthritis (OA). However, no randomised, controlled or double-blinded studies on the efficacy of this treatment in horses have been reported to date. **Methods:** Twenty-six horses with primary fetlock lameness were enrolled in a controlled, randomised and double-blinded, multi-centre clinical trial. The study design was a partial crossover with a washout period and consisted of 19 horses treated with LPPC and 20 with the placebo. Horses were dosed orally with 25 mg/kg bwt/day LPPC or placebo for 56 days. Efficacy was evaluated by clinical assessment of lameness in the affected joint. Relationships

between variables were analysed using an ordinal logistic model, with random effects for horse and horse x treatment. **Results:** Clinical evaluation of horses with a fetlock lameness that were treated with LPPC showed a significant reduction in severity of lameness ($P < 0.001$) and reduced joint pain ($P = 0.019$) when compared with horses treated with placebo. **Conclusions:** The LPPC (Biolane®) administered orally at a dosage of 25 mg/kg bwt significantly alleviated lameness in affected fetlock joints as assessed by veterinary lameness examinations. **Practical significance:** The LPPC (Biolane®) is an efficacious, palatable and well-tolerated treatment for osteoarthritis and degenerative joint disease, which can be administered orally by supplementation to daily feed. **Acknowledgements:** Biolane® LPPC was supplied by Vitaco Health (NZ) Ltd, Auckland, New Zealand. This study was partially funded by Vitaco through a grant from The Foundation for Research Science and Technology, New Zealand.

12.00–12.15

Specialisation of tendon mechanical properties results from inter-fascicular differences

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Aims: To determine if the differing mechanical properties of equine superficial digital flexor (SDFT) and common digital extensor (CDET) tendons are due to differences in fascicle mechanical properties.

Methods: Macroscopically normal SDFTs and CDETs were collected from both forelimbs from horses ($n = 13$). Left forelimb tendons were kept whole; fascicles ($n = 12$) were dissected from right forelimb tendons. Tendons and fascicle CSA was measured, and samples preconditioned for 20 cycles followed by testing to failure (strain rate: 5%/s). Ultimate stress, failure strain and modulus were calculated for each sample. Interfascicle binding strength was measured by dissecting free 2 fascicles ($n = 12$ from each tendon) bound together by fascicular membrane. The opposite ends of each fascicle were removed, so just one fascicle was held in each grip and the fascicles pulled apart to failure. **Results:** In whole tendons, failure stress and modulus were significantly greater in the CDET than SDFT ($P \leq 0.004$) whereas failure strain was greater in the SDFT ($P < 0.0001$). Failure stress and modulus of SDFT and CDET fascicles did not differ, however SDFT fascicles failed at lower strains ($P < 0.0001$). Individual tendon material properties were not correlated with fascicle material properties. At low loads, interfascicle sliding was greater in the SDFT but there was no difference in interfascicular failure load or extension between the SDFT and CDET. **Conclusions and practical significance:** Differences in SDFT and CDET material properties are not due to differences in fascicle material properties. Although the SDFT is more extensible than the CDET, at the fascicular level this relationship is reversed, therefore tendon mechanics may be governed by matrix components between fascicles, allowing increased sliding between SDFT fascicles. Elucidation of the mechanisms that enable large SDFT extensions without damage will aid development of both effective treatments and potential preventative interventions for this injury-prone tendon. **Acknowledgements:** Funding: Horserace Betting Levy Board.

12.15–12.30

Winner of the Voorjaarsdagen Award 2011

Aorto-pulmonary fistulation in the Friesian horse: clinical characterisation of 31 cases combined with histopathological features. Lifting a tip of the veil

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Introduction: Ruptures in the aortic arch near the *ligamentum arteriosum* are uncommon in domestic animals. However, 4 cases have been described in Friesian horses (Van der Linde-Sipman *et al.* 1985) and many cases have been admitted to the Utrecht University Faculty of Veterinary Medicine ($n = 15$), Wolvega Equine Clinic ($n = 13$) and the Ghent University Faculty of Veterinary Medicine ($n = 3$) over the course of several years. Our aim was to clinically characterise these cases and to histologically investigate the site of fistulation with special attention for collagen features.

Materials and methods: Clinical and autopsy reports of 31 cases (1997–2010) were reviewed. Histopathology was performed on 20 cases (7.2 ± 3.3 years old; 9 ♀, 11 ♂), at the level of the aortic rupture, at a more distal part of the aortic arch and compared with 4 controls. **Results:** A persisting high (60–80 beats/min) and bounding arterial pulsation was reported in all cases. Interestingly many cases show evidence of slow progressing rupture over the course of several weeks to even months before progressive manifestation of cardiac failure. Recurrent bouts of colic, dyspnoea, coughing and/or epistaxis and complaints of poor performance are typical case history features of these patients. In many cases aortic dissection was accompanied by aorto-pulmonary fistulation with left to right shunting. Chronic liver congestion was often reported at autopsy emphasising the slow progressive evolution. HE staining revealed significant presence of degeneration, collagen fibre fragmentation, necrosis and inflammation at the site of rupture. Van Gieson's stain showed no significant difference in collagen fibre density and thickness, however a significantly pronounced wavy pattern in ruptured cases. Picro-sirius red stain demonstrated no significant differences.



Conclusions: Aorto-pulmonary fistulation in Friesian horses seems to be a slowly progressing event which finally culminates into overt



cardiac failure. This slow progression makes early recognition of these patients very important and could even open interesting considerations on treatment options like vascular stenting. Several collagen features seem to be aberrant in attained cases.

Reference

Van der Linde-Sipman, J.S., Kroneman, J., Meulenaar, H. and Vos, J.H. (1985) Necrosis and rupture of the aorta and pulmonary trunk in four horses. *Vet. Pathol.* **22**, 51-53.

12.30–12.45

Pathology of the forelimb suspensory ligament may be associated with increased cross-sectional area detectable using low-field magnetic resonance imaging

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Aims: To establish whether standing low-field MR images can be used to determine changes in cross-sectional area (CSA) of the forelimb proximal suspensory ligament (SL) associated with pathology. To establish whether measurements of the SL might be standardised by comparison to the deep digital flexor tendon (DDFT). **Methods:** Standing low-field (0.27 Tesla) MR imaging of 5 sound control horses and 7 with unilateral lameness localised to the proximal metacarpal region by diagnostic anaesthesia was performed. Coil placement just distal to the carpus produced an 82 mm field of view which extended 66 mm distal to the carpometacarpal joint (CMCJ) in all horses. Slices 5 mm thick with 1 mm gaps were taken at standardised distances from the CMCJ allowing direct slice comparisons. The CSA in T1-weighted images of the medial and lateral SL lobe and derived DDFT:SL ratio was measured using Osirix and compared to the contralateral limb using a *t* test ($P < 0.05$). **Results:** All limbs in which lameness had been identified showed signal changes consistent with pathology of the SL. The ratio of DDFT:SL was not found to be useful with no differences evident between the pathological and normal limbs. Three pathological limbs showed increased CSA with respect to the contralateral limb ($P = 0.004$ – 0.041). No difference in CSA was detected in any of the control cases. **Conclusions and practical significance:** More investigation of the variation in size of the SL within individuals and in the presence of pathology is warranted.

This study is the first documented image series of the proximal metacarpal region using a standing low-field magnet and demonstrates the image quality and resolution which can be achieved. **Acknowledgements:** The authors would like to acknowledge the staff of Oakham Veterinary Hospital.

12.45–13.00

The effect of proximal hindlimb flexion on vertical movement symmetry in sound horses

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Aims: To determine the effect of proximal hindlimb flexion on vertical movement symmetry in sound horses. **Methods:** Movement of *os sacrum* and left and right *tuber coxae* was measured using inertial sensors. Thirteen horses with no hindlimb lameness were trotted in-hand in a straight line on a hard surface. Eight baseline trials were recorded, then proximal hindlimb flexion of the left and right hindlimbs was performed (60 s) by the same experienced veterinarian and the movement after each flexion test recorded. Amount of vertical force and tarsus angle were monitored. Flexion was repeated after 5 min. Movement asymmetry was calculated from vertical displacement data for strides 2–10 for each trial. **Results:** Across horses, proximal hindlimb flexion resulted in signs of lameness in the flexed limb, with a decrease as a function of stride number. For individual horses, data suggested that flexion of either limb resulted in a change in movement (a)symmetry dependent on the baseline movement. Across horses, there was no systematic difference between first and second flexion of the same limb, but individual horses showed variable responses between the 2 tests. **Conclusions:** Proximal hindlimb flexion causes changes in the vertical movement pattern of sound horses, although it has to be distinguished between the effect on the individual horse and the overall effect across horses. **Practical significance:** In cases of mild lameness, flexion of the affected limb can increase asymmetry while 'levelling the horse out' after flexion of the nonaffected limb, thus exacerbating the difference between the 2 limbs. Due to the variability between horses and after repeats, the interpretation of flexion tests has to be approached with caution. **Acknowledgements:** Thanks to Holly Buchan and Rachel Ashley-Smith for help during data collection. S.D. Starke is funded through a RVC studentship.

NOTES



Head and Neck

Chaired by Chris Pearce

Sponsored by University of Liverpool



14.00–14.15

A histological study of peripheral dental caries of equine cheek teeth

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Aims: Peripheral caries (PC) of equine cheek teeth is an increasingly recognised but poorly described disorder. In particular, little is known of its histopathology. The aim of this study was to describe the histopathology of PC affected teeth to further our understanding of their disorder. **Methods:** Twenty-one PC affected and 3 control cheek teeth were decalcified, fixed and stained with Haematoxylin and Eosin, Picrosirius Red and Gram-stain. **Results:** Histological examination showed 2 different patterns of cemental lesions; firstly, a progressive enlargement of focal, flask-like lesions leading to breakdown of the adjacent cementum and secondly, a more generalised flaking off of thin layers of surface cementum that was under-run by plaque. A thick layer of plaque and food material usually overlay the surface of affected cementum and as well as lying within cemental defects. Gram-stained sections showed large numbers of bacteria within the lacunae and canaliculi of affected peripheral cementum and within the associated plaque. Pioneer bacteria were also seen in dentinal tubules of adjacent, normal-appearing dentine. Sub-gingival extension of PC lesions with localised periodontal destruction was rare. Grading of PC lesions by gross examination was found to underestimate the severity of the disorder as compared to histological grading. **Practical significance:** These findings demonstrated that equine PC lesions that appear superficial on gross examination can extend deep into the underlying dental structures. The demonstration of bacteria within underlying normal-appearing dentinal tubules suggests that bacteria can extend to dentine and even to pulp in some cases, possibly leading to pulpar and resultant apical infection, unless defence mechanisms such as dentinal tubules sclerosis occur which can prevent pulpar infection. The common presence of plaque and food material overlying affected teeth suggests that PC lesions may develop when normal intra-oral food and saliva movement is impeded. **Acknowledgements:** Our thanks to Neil McIntyre for his skilful help with the histological preparations and to Carsten Staszky for reviewing the project.

14.15–14.30

Can relative coupling intervals be used to detect ataxia?

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Aims: Relative coupling intervals (RCIs) are proportional changes between strides from left front hoof-on to either left hind hoof-on (Lateral; RLCI) or right hind hoof-on in the next stride (Diagonal;

RDCI). They are reported to be unaffected by preferred over-ground walking speed and lameness in the normal horse. In this study, we assessed whether RCIs can be used to detect subtle gait changes in horses, such as ataxia induced by sedation. **Methods:** Seven horses with a mean age of 6 years (range 2–11 years), without history or clinical signs suggestive of neurological disease were studied. An experienced handler walked the horses along a 25 m runway with a 4.8 m data collection area consisting of 8 embedded Kistler force platforms surrounded by a 12 camera kinematic system. Kinetic and kinematic data were collected synchronously and analysed at a rate of 200 Hz. Hoof-on timing was detected from the force platform data. Data was collected from horses before, and 10 min after sedation with 0.01 mg/kg bwt detomidine (i.v.), and analysed using a linear mixed model with repeated measurements on each horse, assessing mean speed, coefficient of variation (CV) of speed, standard deviation (s.d.) of speed, age, weight, hip-height and lameness with condition (normal or sedated) as fixed effects. **Results:** There was a significant effect of sedation on RLCI ($P = 0.0001$) and RDCI ($P = 0.02$). There was a significant effect of CV of speed ($P < 0.0001$) and s.d. of speed ($P = 0.0005$) on Lateral RCI, and mean speed ($P = 0.003$) on RDCI. Thus, within trial variation in speed affects RLCIs and the significant difference in average speed across a trial affect RDCIs. **Conclusions and practical significance:** We conclude that relative coupling intervals enables characterisation of ataxic gait induced by sedation and that this may be a promising technique for objective assessment of clinically-relevant ataxia in horses. **Acknowledgements:** RCVS Trust.

14.30–14.45

Caudal compression of the infraorbital nerve as a treatment for idiopathic headshaking in 58 horses

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Aims: Trigeminal neuropathy is a plausible aetiopathogenesis of idiopathic headshaking. The condition carries a poor prognosis. Caudal compression of the infraorbital nerve is a novel surgical intervention which may alleviate the signs associated with trigeminal neuropathy, probably through a reduction of sensory input. We first reported results of this technique in 2009 (Roberts *et al.* 2009) where, following a single surgery and with a median time to follow-up of 6 months, 13/22 (59.0%) horses had a successful outcome. This updated study reports longer-term



follow-up of the original cases and of 36 further patients.

Materials and methods: Case records were reviewed at 3 referral hospitals of all horses undergoing this procedure for idiopathic headshaking. Follow-up information was obtained by telephone contact with owners. **Results:** A total of 58 horses underwent the procedure between 2005 and 2010. The surgery was repeated in 16 horses. In 27 cases, diagnostic regional analgesia of the posterior nasal (ethmoidal) nerve (PET block) was performed preoperatively, with a positive result in 23/27 (85%). Median follow-up time from the last surgical procedure performed was 18 months (range 2–66 months). A period of nose-rubbing and/or increased severity of headshaking after surgery was observed in 28/42 (67%) horses. Of these, 4 were subjected to euthanasia due to nonresolution of this complication. Considering only the response to the last performed surgical procedure, owners of 30/56 (54%) horses reported the surgery to be beneficial. The number of horses with negative results to the PET block was insufficient to test for a correlation between positive response to PET block and outcome of surgery. **Conclusions:** At present, caudal compression of the infraorbital nerve is the most effective treatment available for idiopathic headshaking. The technique requires further development and the disease requires further investigation.

Reference: Available on request from the author.

14.45–15.00

Gross, computed tomographic and histopathological findings in mandibular cheek teeth extracted from horses with clinical signs of pulpitis

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Aim: To compare gross, computed tomographic and histological appearances of sectioned mandibular cheek teeth extracted from horses showing clinical signs of pulpitis, and from controls.

Methods: Mandibular cheek teeth extracted from horses showing clinical signs of pulpitis (cases) and from cadavers with no history of dental disease (controls), were imaged using computed tomography in the transverse plane at 1 mm intervals. Teeth were sectioned transversely, photographed and processed histologically. Tomographs were compared to corresponding gross and histological sections. **Results:** Photographs of 188 and 178 gross sections from 18 cases and 15 controls (respectively) were compared to tomographs from corresponding levels in the teeth. Histological sections from 6 cases and 3 controls were compared to gross sections and tomographs. Cement, enamel, dentine and pulp were identifiable grossly and histologically. Cement, dentine and bone had similar ranges of attenuation (550–2000 Hounsfield Units [HU]) in tomographs but could be differentiated from pulp (-400–500 HU) and enamel (2500+ HU). It was not always possible to differentiate primary and secondary dentine grossly or on transverse tomographs. Thirteen discrete dental lesions were

identified grossly, 10 of which were characterised histologically. Reactive and reparative dentinogenesis and extensive pulpar calcification, previously undescribed in horses, were identified. Pulpar oedema, neutrophilic inflammation, cement and enamel defects, and reactive cemental deposition were also described. Computed tomographic and pathological findings corresponded well where there was mineralised tissue deposited in the pulpar area or peripherally, defects in mineralised tissue, or food material in the pulpar area. Pulpar and dentinal necrosis and cement destruction, evident grossly and histologically, did not correspond to computed-tomographic changes. **Conclusions:** Gross changes in sectioned equine cheek teeth are associated with histological changes. Computed tomography is useful for identifying deposition and defects of mineralised material but less useful for identifying earlier inflammation and tissue destruction. The equine dentin-pulp complex responds to insult with regenerative and reparative changes. **Acknowledgement:** The Horse Trust

15.00–15.15

Quantitative radiographic analysis of third carpal bone sclerosis in racehorses

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Aims: To develop and determine the diagnostic value of an image analysis programme to objectively quantify third carpal bone (C3) sclerosis/densification in Thoroughbred racehorses. **Methods:** Seventy-four dorsoproximal-dorsodistal oblique (DPr-DDiO) projections of the distal row of carpal bones of Thoroughbred racehorses were retrieved from the archive of Rosssdales Diagnostic Centre. An orthopaedic clinician, experienced in racehorse lameness examinations, (*observer 1*) subjectively scored all radiographs, describing radial facet sclerosis as absent, slight, mild, moderate or severe (*grades 0–4*). Regions of interest (ROI) were determined and quantitative values of bone density (BD) were determined using data analysis software (ImageJ, National Institutes of Health) for each radiograph. Following normalisation of the raw BD parameters, results were compared to the subjective gradings. Inter- and intra-observer agreement of the subjective gradings was assessed by blinded interpretation of previously graded radiographs by 2 further clinicians; one less experienced (*observer 2*) and one highly experienced in racehorse lameness (*observer 3*) (*n* = 15). Repeatability of image analysis results was investigated by re-evaluating the radiographs following changes to windowing and levelling. **Results:** The ability of image analysis software to quantify C3 sclerosis was proven with excellent repeatability (intra-class correlation = 0.99). Subjective analysis between observers was excellent if the observers were highly experienced, but less good if the observer did not have extensive experience of this projection (*n* = 20; Cohen's Kappa = 0.78 and *n* = 20; Cohen's Kappa = 0.55, respectively). **Conclusions and practical significance:** C3 sclerosis is a common and important cause of lameness in racehorses. An accurate and easily applicable method for objectively documenting the degree of radiologic change is of benefit to clinicians and researchers who wish to develop preventative and therapeutic strategies.

Sports Medicine

Chaired by Charlie Schreiber

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15.45–16.00

Results of contrast enhanced computed tomography in horses with lameness localised to the distal limb

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Aims: To describe the use of contrast enhanced computed tomography (CECT) to diagnose and treat orthopaedic and soft tissue injuries of the distal limb and report the findings in 95 cases with lameness localised to below the fetlock. **Methods:** Retrospective review of all cases undergoing CECT of the distal limb at the Rainbow Equine Hospital between April 2006 and January 2011. **Results:** Two-hundred-and-seven lesions were identified in 95 cases undergoing CECT. Ninety-five percent of cases had one or more lesions and 41% of lesions involved the deep digital flexor tendon (DDFT). Lateral and medial lobes were affected equally (51% and 49%, respectively). Deep digital flexor tendon lesions were just proximal to (54%), at the level of (21%) or just distal to (14%) the navicular bone. Deep digital flexor tendon insertional lesions were identified in 10% of cases. Core lesions, horizontal splits, fibrillation of the dorsal and palmar/plantar borders, lobe enlargement and mineralisation were seen. Twenty-five percent of DDFT lesions had contrast enhancement. Twenty-eight percent showed marked, 44% moderate and 28% mild contrast enhancement. Navicular bursal effusion was present in 23% of all cases, navicular bursal adhesions in 9% of cases. Bony pathology included phalangeal subchondral bone cysts (10 cases), navicular bone avulsion fractures (4), navicular bone remodelling (11) and incomplete sagittal fractures of P3 (4). Other soft tissue abnormalities included lesions of the distal sesmoidean ligament lesions (6), distal sesmoidean impar ligament (7), suspensory ligament of the navicular bone (7), medial (7) and lateral (5) collateral ligaments of the distal interphalangeal joints, distal digital annular ligament (3), distal interphalangeal joint effusion (12) and keratomas (2). Computed tomography was used to facilitate intralesional therapy in 12 cases. **Conclusions and practical significance:** Contrast enhanced computed tomography provides detailed diagnostic information of soft tissue and bone related injuries in the distal limb in cases lacking radiographic or ultrasonographic findings. It facilitates intralesional treatment of soft tissue injuries, which can be conducted during the same examination.

16.00–16.15

Standing magnetic resonance imaging (MRI) findings in horses with clinical foot pain in the Netherlands

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Aims: A retrospective study was performed to determine the added value of magnetic resonance imaging (MRI) in a large

group of lame horses with clinical foot pain, and to determine the type and prevalence of identified lesions. **Methods:** Data were analysed of 253 horses that underwent standing MRI (low field, 0.27T) between January 2004 and May 2010. Horses included in this study were selected for having lameness diagnosed in the foot with perineural analgesia. **Results:** This study revealed that in 97% of the cases in which regular lameness and radiological examination failed to give a diagnosis, it was possible to detect critical tissue lesions in the foot using MRI. The majority of horses (62%) showed multiple abnormalities; on average 1.8 lesions were detected per foot. Most common lesions were desmitis of the collateral ligament of the distal interphalangeal (DIP) joint (27%) and bony deformities, mainly oedema of the navicular bone (23%), followed by lesions of the deep digital flexor tendon (15%) and the impar ligament (13%). Desmitis of the collateral ligaments of the DIP joint was often found as a single lesion (48%) while other lesions like bone oedema were more frequently observed in combination with other abnormalities. **Conclusions and practical significance:** The results of this study are in contrast with those of a previous MRI investigation in the UK (Dyson *et al.* 2005), which revealed mainly lesions of the deep digital flexor tendon. In addition, the observed high prevalence of bone abnormalities has not been reported before. This is likely to be related to the use of STIR as an additional sequence on MRI; this sequence is known to be very sensitive for the detection of oedema and therefore of acute inflammation. Taken together, this study illustrates the relevance of MRI to get a specific diagnosis for adequate treatment choice and follow-up.

Reference: Available on request from the author.

16.15–16.30

Using positive reinforcement to train young horses to cooperate during handling

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Aims: Interventions on young horses may be particularly risky for breeders or veterinarians due to the young animals' bad/nonexistent education, often leading them to use constraint on the animals, thus increasing the risks even more. Here, we investigated the effects of using positive reinforcement (food reward) to train young horses to stand still and cooperate during handling, and we evaluated the effects of such training on the horse-human relationship. **Methods:** Twenty-three yearlings were trained to remain immobile on a vocal order and accept various handling procedures (brushing, picking feet, surcingle, rectal thermometer), giving half of them a food reward (positive reinforcement group, $N_{PR} = 11$) whenever they responded correctly to the command (i.e. remained immobile throughout the handling procedure), while the other half (control group, $N_C = 12$) was never given any reward. **Results:** Results showed that using positive reinforcement promotes faster learning ($P < 0.001$) and better memorisation of the immobility task ($P < 0.05$). Horses that received



the food reward also behaved better during training (less biting, kicking, $P < 0.05$) than controls, and not only did they easily accept the tasks included in training, but also it was easier and safer to perform new tasks such as oral deworming or radiography, and at a later stage to perform saddle breaking ($P < 0.05$). Moreover, rewarded animals sought and accepted more contact, both with the familiar trainer ($P < 0.001$ and $P < 0.01$, respectively) and with a nonfamiliar person ($P < 0.01$ and $P < 0.01$, respectively), even several months after completion of training (at least 6 months later).

Conclusions and practical significance: This study reveals that using positive reinforcement can be used to safely train horses to stand still and accept diverse handling or veterinary procedures and it promotes a long-term positive human-animal relationship.

Acknowledgements: Thanks to the COST of the Haras Nationaux and the region Bretagne, France, for funding this research.

16.30–16.45

Saddle pressure patterns are altered by diagnostic analgesia in ridden horses with poor performance

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Aim: To investigate the correlation between saddle pressure measurements and clinical findings in ridden horses with poor performance, before and after diagnostic analgesia. **Methods:** Saddle pressure patterns were obtained for walk, trot and canter in 4 horses with loss of performance and resistance, poor hindlimb engagement and mild to moderate lameness when ridden. Three horses were re-measured after diagnostic local analgesia that improved each horse's symptoms. Gait was graded subjectively by the clinician and a professional rider blinded to saddle pressure measurements, and results were compared with saddle pressure data. **Results:** On initial measurement all horses had an asymmetric pressure distribution between the 4 saddle quadrants. These asymmetries corresponded very well to the clinician's evaluation of each horse. Following diagnostic analgesia these asymmetries were markedly reduced. Further, the sum of pressures (total force) showed an increased range of fluctuation during the stride cycle. The mean increase ranged between 12–48% in canter and between 14–50% in trot for the different horses. However, stride frequency differed <2% in canter and <5% in trot. This indicates an increase in intra-stride accelerations, which corresponds to the improved hindlimb impulsion appreciated by the clinician and rider. There was also an increase in the craniocaudal excursion of the centre of pressure, in canter by 6–21% and for 2 horses also in trot by 8–41%. The horse with unaltered trot also had the lowest increase in canter and was perceived by the rider as persistently uncomfortable to ride, despite improvement. **Conclusion:** Saddle pressure measurements can detect gait abnormalities appreciated by an experienced clinician and a professional rider. It was possible to detect improved hindlimb propulsion and altered gait following diagnostic analgesia. This warrants further study on saddle pressure measurements in riding horses with decreased performance.

16.45–17.00

Outcome after standing fracture repair in twenty-seven racing Thoroughbreds

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Aim: To describe outcome in a case series of horses that had lower limb fractures repaired under standing sedation at Rosssdales Equine Hospital between 2004 and 2010. **Methods:** Inclusion criteria consisted of racing Thoroughbred horses that had a surgical fracture repair under standing sedation and local anaesthesia by R.J.P. Medical records of these horses were examined, and racing performance data retrieved from the Racing Post website. **Results:** Twenty-seven horses satisfied the inclusion criteria. These horses had a metacarpal/tarsal condyle fracture ($n = 11$), an incomplete sagittal fracture of the proximal phalanx ($n = 10$) or a parasagittal or spiral metacarpal fracture ($n = 6$) repaired under standing sedation. One horse was subjected to euthanasia due to ceecal rupture 10 days post operatively; no other significant post operative complications were recorded. Racing records were available for 21 of the remaining horses. At time of writing 11 (52.4%) of these horses had returned to racing (follow-up period 0.4–6.9 years; median 2 years). Mean time from operation to return to racing was 186 days. Lateral condyle repair carried the best prognosis for a return to racing (54.4%). Of the horses that had raced post operatively, 45.5% had won money.

Conclusions: Thoroughbreds that have these fractures repaired under standing sedation are able to return to racing. Longer-term follow-up studies will allow precise evaluation of prognosis and post-operative racing performance. **Practical significance:** Few data have been produced on outcome after repair of lower limb fracture in the horse under standing sedation. It is a procedure that has tangible benefits: it avoids the inherent risk of general anaesthesia, especially catastrophic failure of cannon bone repairs during recovery; the hospitalisation/recovery period is reduced; and it is more financially accessible. The preliminary findings in this series of horses are encouraging and informative when discussing the options available to owners and trainers.

Acknowledgements: The Margaret Giffen Charitable Trust; Rosssdales staff.

17.00–17.15

Musculoskeletal injury following local corticosteroid injection in Thoroughbred racehorses

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Aims: To determine the rate of musculoskeletal injury (MSI) following local corticosteroid injection (LCI) in Thoroughbred racehorses. **Methods:** Veterinary records for 1911 horses were obtained from 3 veterinary practices that exclusively serviced 36 trainers. A LCI was defined as any injection of corticosteroid into/adjacent to a synovial structure, muscle, or tendon/ligament. A MSI was defined as any limb injury following which the horse was rested, and did not race for at least 6 months, or was retired. Hazard ratios (HR) were calculated using a Cox proportional hazards model with time varying covariates. **Results:** Three-hundred-and-ninety-two horses (20.5%) received at least one LCI (median 2, range 1–16), most bilaterally (71.4%) using triamcinolone (65.4%) or betamethasone (31%), and intra-articularly into the carpal (49.7%) or fore fetlock (29.3%) joints. There were 219 MSIs; carpal injuries (47%), fore fetlock (34%) and forelimb tendon injuries (16.0%) were the most common. The



incidence rate of MSI in untreated horses was 1.2 injuries per 100 horse-months. The incidence rate of MSI was greater following LCI than in nontreated horses (HR 4.83, 95% CI 3.54–6.61, $P < 0.001$). The incidence rate of MSI in horses receiving LCI on more than one occasion was greater than in horses receiving only a single LCI (HR 2.10, 95% CI 1.31–3.36, $P = 0.002$). **Conclusions and practical significance:** Thoroughbred racehorses receiving LCI suffer MSIs at approximately 4.5 times the rate of horses not receiving treatment, and for horses receiving multiple LCI the rate is approximately twice that of horses receiving single LCIs. Whether LCI contributes to MSI or is a proxy for other contributing factors is unknown and requires further investigation, however trainers and owners should be made aware of these injury rates. **Acknowledgements:** Funded by the Rural Industries Research and Development Corporation of Australia.

17.15–17.30

The effect of collection and extension on tarsal and fetlock compression at trot

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Background: It has been recognised that young horses prepared for dressage horse sales, where they are presented with extravagant extended trots, have a high incidence of suspensory ligament damage. It was hypothesised that extended trot would be associated with gait characteristics that could predispose to

suspensory ligament (SL) injury. **Aim:** To compare hindlimb movement patterns between collected and extended trot. **Methods:** Four dressage horses were fitted with reflective markers and inertial motion sensors (IMS). High speed video was obtained for 2 strides on each rein in collected and extended trot on 3 different surfaces: waxed outdoor, sand/plastic granules, waxed indoor. Maximal tarsal compression during stance and distal metatarsal coronary band ratio (MTCR) representing fetlock hyperextension, were determined. IMS data determined stride duration, speed and stride length. Data was compared between collected and extended paces within each horse on each surface, and compared between surfaces. **Results:** Collected trot had significantly lower speed and stride length but longer stride duration than extended trot on all surface types ($P < 0.0001$). All horses had less tarsal compression and smaller MTCR value in collected compared to extended trot. **Conclusions:** Greater tarsal compression combined with greater fetlock hyperextension was observed in extended compared to collected trot, which is likely to increase load on the SL. The study findings therefore indicate that extended trot may increase SL strain, providing a possible explanation for the high incidence of SL in horses trained for extravagant movement. It is possible this may be a particular risk for horses without good muscle development to support the limb. **Practical significance:** Considerable use of extended trot might be a risk factor for development of suspensory desmitis and could explain prevalence of proximal suspensory desmitis in successful young horses pushed for extravagant movement or those who are prepared for sales. **Acknowledgements:** British Dressage for funding.

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