



# DEFRA / AHT / BEVA EQUINE QUARTERLY DISEASE SURVEILLANCE REPORT Volume 8, No.2: April – June 2012



## Highlights in this issue:

- **Equine Influenza in France**
- **Contagious Equine Metritis in the United Kingdom**
- **Focus article: Equine Influenza**

### Important note:

The data presented in this report must be interpreted with caution, as there is likely to be some bias in the way that samples are submitted for laboratory testing. For example they are influenced by factors such as owner attitude or financial constraints or are being conducted for routine screening as well as clinical investigation purposes. Consequently these data do not necessarily reflect true disease frequency within the equine population of Great Britain.



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## Introduction

Welcome to the second quarterly equine disease surveillance report for 2012 produced by Department of Environment, Food and Rural Affairs (Defra), British Equine Veterinary Association (BEVA) and the Animal Health Trust (AHT). Regular readers will be aware that this report collates equine disease data arising from multiple diagnostic laboratories and veterinary practices throughout the United Kingdom giving a unique insight into equine disease occurrence on a national scale.

### National disease occurrence

#### Contagious Equine Metritis (CEM)

A case of CEM was confirmed by the Department of the Environment, Food and Rural Affairs (Defra) on 28<sup>th</sup> March 2012, following submission of a voluntary pre-breeding clitoral swab sample taken from an asymptomatic 15-year-old Thoroughbred mare in Gloucestershire. The mare had not previously been covered and had never been pregnant, but had been unsuccessfully inseminated with semen from a non-Thoroughbred stallion last season.

The affected mare has undergone treatment and has been confirmed negative after post-treatment testing. A single in-contact mare on the same premises, and two mares and a gelding identified as tracings as a result of the epidemiological inquiry, were restricted and have tested negative.

As a result of further tracings from the epidemiological inquiry, CEM was detected on second separate infected premises. Three horses, comprising a non-Thoroughbred mare, a non-Thoroughbred stallion and a gelding, tested positive to CEM. A total of eight in-contact equidae were traced to the south east, north and south west of England which have since tested negative. Following confirmation of the infection, all known reproductive contact tracings have been identified and tested negative.

The two affected premises remain under restrictions until all infected horses have completed their course of treatment and the relevant sampling / testing

#### Equine Herpes Virus-1 (EHV-1)

Between 1<sup>st</sup> April and 30<sup>th</sup> June 2012, four outbreaks of Equine Herpes Virus-1 (EHV-1) abortion have been reported and confirmed by the Animal Health Trust. Outbreaks occurred in the south west of England, eastern England and Shropshire. As of 28<sup>th</sup> August, no further outbreaks of EHV-1 have been reported.

#### Equine Influenza (EI)

Equine influenza continues to be of importance within the United Kingdom. In this issue we report on one outbreak that occurred in Lancashire where the index case involved an unvaccinated horse. As of 28<sup>th</sup> August 2012, no further outbreaks of EI have been reported.

The outbreak has been reported by the new text alert service sponsored by Merial Animal Health, **Tell-Tail**. This free of charge service alerts practitioners to outbreaks of equine



influenza in the UK by a text message to the practitioner's mobile phone. If you are an equine veterinary practitioner and would like to sign up for this scheme, please register at the following website <http://www.merial.co.uk/>. This service has also been offered to the members of the National Trainers Federation (NTF). If you would like to contact us regarding outbreaks of equine influenza virus or would like to sign up for our sentinel practice scheme, please send a message to: <mailto:equiflunet@aht.org.uk> or follow the link to <http://www.equiflunet.org.uk/> for more information on equine influenza.

## **International disease occurrence**

### **Contagious Equine Metritis (CEM)**

An outbreak of CEM was reported in Co. Galway, Ireland on 30<sup>th</sup> April 2012. The last case of CEM in the country occurred in 1982. The affected horse was a non-thoroughbred stallion that was imported in 2009 and had negative CEM tests in 2009, 2010 and 2011. The stallion and all mares covered by this horse had not shown any clinical signs of disease. There were seventy one non-thoroughbred horses residing on the affected premises and all mares were covered using artificial insemination. The other stallion on the premises tested negative to CEM at the same time as the positive stallion however this horse tested positive for CEM on culture and PCR on 1<sup>st</sup> May 2012.

A full epidemiological investigation is being undertaken. All animals directly in contact with or inseminated with semen from the stallions have been tested and found negative. All other animals on the premises in question have been tested and found negative. As a further precaution, animals on a second premise were tested to investigate any risk of spread via indirect contact. All animals have tested negative and no risk of spread via this route is apparent. Both stallions have been treated and tested and results of these tests are awaited.

### **Equine Herpes Virus-1 (EHV-1)**

Numerous outbreaks of Equine Herpes Virus-1 (EHV-1) have been reported in France throughout April and May 2012.

One outbreak of EHV-1 (abortion) was reported on 9<sup>th</sup> May 2012 in Haute Marne, France. The affected horse was a French Saddlebred broodmare and a positive diagnosis was made by PCR of foetal organs.

Three outbreaks of EHV-1 (respiratory disease) were reported. The first occurred in Oise on 4<sup>th</sup> April which involved a three year old Thoroughbred mare from a training centre. The mare showed clinical signs of nasal discharge, anorexia and pyrexia. Further cases were reported in Charente Maritime on 23<sup>rd</sup> May and in Orne on 24<sup>th</sup> May. In all three cases diagnoses were made by PCR of a nasal swab.

### **Eastern Equine Encephalomyelitis (EEE)**

The number of equine cases of EEE in the USA currently stands at ninety five. The total number of cases recorded in each state as of 28<sup>th</sup> August 2012 is as follows: Louisiana



(24), Mississippi (23), Florida (17 cases), North Carolina (10), Alabama (7), S. Carolina (6), Georgia (5), New Jersey (2) and New York (1).

### Equine Infectious Anaemia (EIA)

A number of outbreaks of equine infectious anaemia (EIA) have been reported throughout Europe during this quarter.

A case of EIA was reported on 11<sup>th</sup> May 2012 in Weilheim-Schongau, Germany. One horse was affected and a positive diagnosis was made by serological testing.

On 15<sup>th</sup> May 2012 an outbreak was reported in Liege, Belgium. One horse, kept in a group comprising fourteen horses, showed clinical signs of the disease. A diagnosis was made using a Coggin's (agar gel immunodiffusion) serological blood test. The affected animal has been euthanased but the source of the infection is still unknown. The affected premises is under restrictions and further screening testing is being conducted.

This year four cases of EIA have been reported on farms in Italy that have been previously affected by the disease. These cases occurred in the regions of Abruzzo (2 cases), Lazio (1) and Puglia (1). Throughout this year cases have been reported on farms for the first time in the following regions: Campania (7), Lazio (7), Abbruzzo (6), Puglia (3), Umbria (3), Molise (2), Marche (1), Piemonte (1), Toscana (1) and Veneto (1).

### Equine Influenza (EI)

Outbreaks of EI have occurred throughout the second quarter in France, South America and the Middle East.

On 3<sup>rd</sup> April 2012 an outbreak of EI was reported in Montevideo, Uruguay. A Thoroughbred horse from a training centre showed clinical signs consistent with equine influenza, which was confirmed by PCR testing. It is not known if the horse had been vaccinated. One thousand horses were affected in the outbreak. Quarantine and movement control measures were implemented.

On 31<sup>st</sup> May 2012 an outbreak of influenza occurred in Dubai affecting two endurance horses from a group of eighteen vaccinated horses that had been imported from Uruguay. The horses developed clinical signs of pyrexia, serous nasal discharge and a cough during their post arrival quarantine period. Both horses tested positive on Directigen for Influenza A virus and virus was cultured from the samples obtained. Nasal swabs were taken from the remaining horses on 3<sup>rd</sup> June and one horse tested positive for influenza. This horse had developed clinical signs of a cough and pyrexia on 1<sup>st</sup> June. The three affected horses were re-sampled on 4<sup>th</sup> June and all tested negative on Directigen. On 5<sup>th</sup> June all 18 horses were re-tested by nasal swab on Directigen for influenza and all were negative. The tests were repeated on 12<sup>th</sup> and 18<sup>th</sup> June but all remained negative despite sporadic coughing and some mild nasal discharges being noted. The horses were released from quarantine on 24<sup>th</sup> June 2012 without any further complications. The virus was confirmed to be a Clade I virus, similar to that identified in Uruguay.



With respect to the influenza outbreaks in France reported in the last quarterly disease surveillance report, one further case has been reported along with an epidemiological update of the situation. In total, outbreaks of equine influenza have occurred on eight premises between 4<sup>th</sup> May 2012 and 15<sup>th</sup> June 2012. On 4<sup>th</sup> May horses on three premises in Calvados were affected along with two positive horses at the international showjumping event at La Baule and a premises in Oise. The affected horses were mostly elite sports horses however broodmares, foals and young horses were also affected in Calvados. Clinical signs consisted of cough, nasal discharge and pyrexia of various severities depending on the horses' vaccination status. Most of the affected horses had been regularly vaccinated. On the premises in Calvados horses less than three years old and broodmares were unvaccinated and a ten day old foal died from the disease. On 25<sup>th</sup> May 2012 a second outbreak of influenza occurred which was not epidemiologically linked to the first outbreak. The first affected premises was confirmed at an equestrian centre in Yvelines. The second affected premises also occurred in Yvelines at another equestrian centre located close to the first. The affected horses comprised leisure horses and sports horses that competed at regional and local levels. The horses had been vaccinated on an annual basis and showed similar clinical signs to the horses affected in the first outbreak of EI. Horses that attended competitions on a regional level were the link between the two affected premises.

Two further outbreaks were also reported. On 25<sup>th</sup> May 2012 an outbreak occurred at an equestrian centre where the affected horse was unvaccinated and had recently been imported from Portugal by a horse dealer. The horse showed clinical signs of nasal discharge and a cough on arrival and was isolated. No other horses were affected on the premises. The second outbreak was confirmed on 15<sup>th</sup> June where three horses at an equestrian centre in Essonne tested positive. A vaccinated horse imported from Spain developed a cough, pyrexia and nasal discharge several days after arrival. This horse was considered to be the most likely cause of the outbreak. The two outbreaks described were isolated outbreaks, have been resolved and no epidemiological link has been made to previous outbreaks.

The epidemiological monitoring of strains obtained from positive horses has been carried out by the Frank Duncombe laboratory. The circulating strain that has affected the eight different premises was identified in France more than five years ago and is a similar strain to that identified during the equine influenza outbreak in 2011. Many other horses have been reported to show similar clinical signs to the confirmed cases of equine influenza but diagnoses have not been confirmed by laboratory testing.

No further outbreaks have been reported as of 28<sup>th</sup> August 2012.

### Equine Viral Arteritis (EVA)

Several outbreaks of EVA have been reported in France during this quarter.

Ten seroconversions to EVA were noted in mares of which eight were Thoroughbreds. Serological testing has showed an increase in antibody from negative in the 2011 breeding season to positive in 2012, indicating circulation of the virus within the equine population. The ten affected mares included five Thoroughbred mares from a stud in Orne, three Thoroughbreds aged six, seventeen and twenty years old from Calvados, a nine year old



French saddlebred from Ille-et-Vilaine, a seven year old Anglo-Arab mare located in Mayenne.

Two Thoroughbred stallions from a stud/training establishment in Orne, were confirmed to be shedding EAV and were placed in isolation. Mares which were covered last year by these horses on the establishment were seronegative or seropositive with a stable titre and appear not to be the source of infection. There has been no contact between stallions and horses in the training centre and the stud.

### Glanders (*Burkholderia mallei*)

On 23<sup>rd</sup> May 2012 an outbreak of glanders was reported in Brasilia, Brazil. The outbreak was detected following movement control activities carried out by the Official Veterinary Services. One horse from Montes Claros, Minas Gerais, tested positive by complement fixation test, however, the animal died from a snake bite before an additional test could be performed.

Investigations on neighbouring farms and on premises epidemiologically linked to the farm with the positive animal. One sample, from a ten year old Quarter Horse crossbred mare in a farm located in the municipality of Varzelândia, Minas Gerais, tested positive by complement fixation test, on 2<sup>nd</sup> May 2012. A mallein test was then carried out and diagnosis was confirmed on 17<sup>th</sup> May 2012. The animal was destroyed on the farm under the supervision of the Official Veterinary Services.

Surveillance and clinical inspections of animals in contact with the sick horse as well as investigations to try and identify the source or origin of the disease are being conducted by the Official Veterinary Services. To date, there is no suspicion of disease in animals on the other inspected farms.

### Hendra Virus

Two cases of Hendra virus were confirmed in Queensland on 29<sup>th</sup> May 2012. One of the affected horses resided on a property near to Rockhampton and died on 26<sup>th</sup> May after showing clinical signs of lethargy, tachypnoea, pyrexia, nasal discharge and epistaxis. Eight other horses on the same property are being monitored. The second case occurred on 28<sup>th</sup> May 2012 on a property in Ingham. The affected horse was of dull demeanour and showed clinical signs of pyrexia, staggering and circling prior to death. Five horses remaining on the property are being monitored. Both of the affected premises are under quarantine and a tracing exercise is being carried out to determine what contact the deceased horses may have had with other animals.

### West Nile Virus (WNV)

An outbreak of WNV occurred on 30<sup>th</sup> July 2012 in the Anatoliki Makedonia kai Thraki, region of Greece. The affected horse was not vaccinated, did not show any clinical signs of disease and was identified during serological surveillance by competitive and IgM capture ELISA.



## **Defra/ Animal Health Veterinary Laboratories Agency (AHVLA) business**

### **Preparations for the 2012 Equestrian Olympic Games**

Defra's preparations for the 2012 Equestrian Olympic and Paralympic Games began in earnest more than two years before the Games started. AHVLA and Defra staff involved in equine exotic disease control, the field services, international trade and laboratory testing services worked closely with the LOCOG veterinary team and Pedens, the appointed international shipping agents. When the equestrian Olympics are considered purely from a disease likelihood point of view, the preparations for the Olympics may seem to have been disproportionate, because all the horses entering the country for the Games were coming in legally through normal channels, and there were no exemptions from standards import rules. In this respect, the Games were no different from any other international equine event, of which we hold many in the UK every year e.g. Badminton, Burghley and Ascot. Although the likelihood of importing exotic disease was very low, it is obvious that with an event as high profile as the Olympic Games, the impact of any disease incursion would have been much greater for all concerned. In this regard, it is also important not to ignore or underestimate the impact of an outbreak of an endemic disease such as equine herpes virus, influenza or strangles, which had a higher likelihood and the potential to have a significant impact. These were also included in the contingency planning by the LOCOG veterinary team and integrated with the exotic disease control measures.

The emphasis on the preparations for the Equestrian Games was on prevention, and having well rehearsed contingency plans, not least because several of the more import equine diseases such as African horse sickness (AHS), equine infectious anaemia (EIA) and West Nile virus (WNV) are vector-borne; although these can be anticipated to a great extent using effective international disease monitoring, their introduction, e.g. via wind-borne spread, is not amenable to control in the same way as contagious diseases. The diseases used as case-studies to test the contingency plans were (1) African horse sickness (a high impact, vector-borne disease), (2) equine infectious anaemia (a vector-borne disease currently in Europe, and therefore more likely, but of a lower impact than AHS), (3) glanders (a zoonotic disease spread mainly by direct and indirect contact), and (4) foot-and-mouth disease (this disease does not affect horses, but has the potential impact equine events due to the media profile and movement restrictions imposed)

To assist the preparation, the International Disease Monitoring team in AHVLA produced concise and easy to read monthly updates on the world-wide situation for equine disease, the frequency of these was increased to weekly updates one month from the start of the Games, and would have been increased to daily if any significant threats had emerged. These were sent to all stakeholders and provided reassurance that all parties were more likely to be able to act in advance of a serious risk emerging and horses arriving at Greenwich Park.

It is important to consider that the 2012 Olympics differed from most recent Olympics, as the majority of horses that qualified were already competing in Europe, and instead of flying in to the host country via one airport, and entering via a Border Inspection Post (where health and identity checks could be carried out before arrival at the venue), the horses were being driven to the event from Europe under normal regulations for the intra-Community movement of horses.



To ensure that the health status of all the horses could be checked before entering the main venue at Greenwich Park and mixing with other competitors, all the lorries had to go through what was known as the “Equine Staging Facility” (ESF) approximately five miles from Greenwich Park, to allow the lorries and the equipment they carried to be screened for security purposes. Advantage was taken of this facility to allow the horses to be unloaded for health and identity checks to be carried out; however, the ESF operated to a very tight schedule, with lorries arriving every twenty minutes throughout the days it was open, and it was essential that the flow of lorries was not impeded, nor the facility shut down, by disease control restrictions unless this was completely unavoidable, as this would have resulted in horses spending long periods standing in queuing lorries, or having to be off-loaded. Ensuring this was not as easy as it may at first seem, because many common conditions seen in competition horses that travel long-distances, present initially with clinical signs that are difficult to distinguish from exotic disease. An approach was developed that allowed horses to be visually screened before unloading from their lorries; any horses that showed any signs of disease would not be unloaded and would be escorted to a disease secure isolation facility at the Royal Veterinary College at Potters Bar, where they could be assessed by expert clinicians. As hoped, this contingency was not needed, but it was essential that it had been planned for, and that the standard operating procedures (SOPs) that underpin decision-making in high pressure situations such as this had been agreed and rehearsed in advance.

The teams from LOCOG, Pedens, Defra and AHVLA enjoyed working together in what was a very constructive atmosphere throughout both the build-up and the Games themselves; this advance period of working together was essential to integrate the approaches for endemic and exotic disease, develop the levels of understanding of each others' roles, and not least the trust which would have been essential for decision-making in the high pressure environment of a disease outbreak if one had occurred.

### **Focus article**

In this report we are pleased to include a focus article written by Andy Durham from the Liphook Equine Hospital. The article provides a practitioner's perspective of protecting horses against equine influenza. It includes discussion of current threats from specific influenza strains and an overview of UK vaccine products.

We reiterate that the views expressed in this focus article are the authors' own and should not be interpreted as official statements of Defra, BEVA or the AHT.

Access to all of the equine disease surveillance reports can be made on a dedicated page on the recently updated Animal Health Trust website at [http://www.aht.org.uk/cms-display/disease\\_surveillance.html](http://www.aht.org.uk/cms-display/disease_surveillance.html) or via the BEVA and Defra websites:

<http://www.beva.org.uk/news-and-events/news>

<http://archive.defra.gov.uk/foodfarm/farmanimal/diseases/vetsurveillance/reports/listing.htm>

We would remind readers and their colleagues that a form is available on the AHT website for registration to receive reports free of charge, via e-mail, on a quarterly basis. The link for this registration form is available via [http://www.aht.org.uk/equine\\_disease\\_registration.html](http://www.aht.org.uk/equine_disease_registration.html).



## Virology Disease Report for the Second Quarter of 2012

The results of virological testing for April to June 2012 are summarised in Table 1 and include data relating to Equine Viral Arteritis (EVA), Equine Infectious Anaemia (EIA) and West Nile Virus (WNV) from the Animal Health Veterinary Laboratories Agency (AHVLA), Weybridge. The sample population for the AHVLA is different from that for the other contributing laboratories, as the AHVLA's tests are principally in relation to international trade (EVA and EIA). AHVLA now provides testing for WNV as part of clinical work up of neurological cases on specific request and provided the local DVM has been informed.

**Table 1: Diagnostic virology sample throughput and positive results for the second quarter 2012**

	Number of Samples Tested	Number Positive	Number of Contributing Laboratories
<b><u>Serological Tests</u></b>			
EVA ELISA	2132	39 <sup>#</sup>	6
EVA VN	850	114 <sup>#</sup>	4
AHVLA EVA VN	384	12	1
EHV-1/-4 CF test	604	72 <sup>*</sup>	3
EHV-3 VN test	9	0	1
ERV-A/B CF test	250	4 <sup>*</sup>	1
Influenza HI test	288	0 <sup>*</sup>	2
EIA (Coggins)	549	0	4
EIA ELISA	1090	0	5
AHVLA EIA (Coggins)	697	0	1
AHVLA WNV (PRNT)	3	1 <sup>**</sup>	1
<b><u>Virus Detection</u></b>			
EHV-1/-4 PCR	18	0	2
EHV-2/-5 PCR	19	13	1
Influenza NP ELISA	29	0	3
Influenza Directigen	66	0	1
Influenza VI in eggs	0	0	1
EHV VI	83	4	1
EVA VI/PCR	0	0	1
AHVLA EVA VI/PCR	11	0	1
Rotavirus	194	56	8

ELISA = enzyme-linked immunosorbent assay, VN = virus neutralisation, VLA = Animal Health Veterinary Laboratories Agency, CF = complement fixation,

HI = haemagglutination inhibition, Coggins = agar gel immuno diffusion test, PCR = polymerase chain reaction, NP = nucleoprotein,

VI = virus isolation, EVA = equine viral arteritis, EHV = equine herpes virus, ERV = equine rhinitis virus, EIA = equine infectious anaemia  
# = Seropositives include vaccinated stallions, \* = Diagnosed positive on basis of seroconversion between paired sera \*\* = Seropositive due to vaccination



## **Virological Diagnoses for the Second Quarter of 2012**

### **Equine Influenza**

One outbreak of equine influenza (EI) was reported in this quarter and confirmed by the Animal Health Trust.

#### Outbreak description

On 27<sup>th</sup> April 2012 equine influenza was confirmed in an unvaccinated three year old Thoroughbred racehorse in Lancashire. The diagnosis was made on the basis of a positive result via PCR on a nasopharyngeal swab. The affected group consisted of three horses that showed clinical signs of intermittent nasal discharge and a cough. There were approximately thirty in-contact horses and one further unvaccinated Thoroughbred racehorse on the premises seroconverted to equine influenza at a later date.

### **Equine Herpes Virus-1**

Four outbreaks of equine herpes virus 1 (EHV-1) were confirmed and reported in this quarter.

#### Outbreak descriptions

On 24<sup>th</sup> April 2012 EHV-1 neurological disease was confirmed in a six-year-old Thoroughbred gelding on a multi-purpose premise in Wiltshire. A diagnosis was made on the basis of PCR on a nasopharyngeal swab from the affected horse that showed clinical signs consistent with the disease. Serological evidence of recent viral activity among adjacent horses in the absence of recent vaccination was also confirmed. No further clinical cases have been reported to date the outbreak has been declared as resolved.

An outbreak of EHV-1 respiratory disease was confirmed on 16<sup>th</sup> May 2012 among Thoroughbred racehorses in training in eastern England. Diagnoses were made on the basis of PCR on nasopharyngeal swabs collected from multiple horses aged between three- and five-years of age that were suffering various combinations of clinical signs that included pyrexia, inappetance, coughing, limb oedema and abnormal haematological parameters.

On 13<sup>th</sup> June 2012 a case of EHV-1 was reported in Shropshire. Sudden death was reported in a 30 hour old foal. It is not known if the dam had been vaccinated against EHV-1/4 and the foal had been clinically normal since birth. Post mortem examination revealed pleural effusion, pericardial effusion and multifocal necrosis of the lungs. A positive diagnosis was made by PCR of a mixed sample of tissue comprising lung, liver, thymus, spleen and kidney.

A case of EHV-1 respiratory disease was confirmed on 13<sup>th</sup> June 2012 in the South West of England. The affected animal was an eleven year old donkey gelding that was not vaccinated against EHV-1/4. The affected animal showed clinical signs of pyrexia, a unilateral nasal discharge and acute onset cough and a diagnosis was confirmed positive by PCR on a nasopharyngeal swab. No other in-contact animals have been affected.



## **Focus Article: Protection against Equine Influenza in 2012: a view from a practitioner's perspective**

**Andy Durham BSc. BVSc. CertEP DEIM DipECEIM MRCVS. RCVS and European Specialist in Equine Internal Medicine, The Liphook Equine Hospital, Hampshire, UK**

Although we encounter other serious equine infectious diseases more frequently than influenza, the disastrous spread of infection in largely unvaccinated horses in South Africa and Australia in recent years served as a reminder of why effective vaccination programmes are so important to maintain in the UK. Few infectious diseases spread as rapidly as influenza and although fatalities are rare they certainly occur in addition to necessarily prolonged convalescence which all translate into a highly unpleasant illness and severe disruption of equestrian activities. Our dual responsibilities as practitioners are firstly, to provide our clients with the most effective available vaccines, and secondly, to collect diagnostic samples from clinical cases so that we maintain awareness of currently circulating influenza strains that we should be targeting with vaccine products. It is fair to say that greater efforts could and should be made in both of these areas.

### **Current threat from specific influenza strains**

#### ***The Sentinel Practice Scheme***

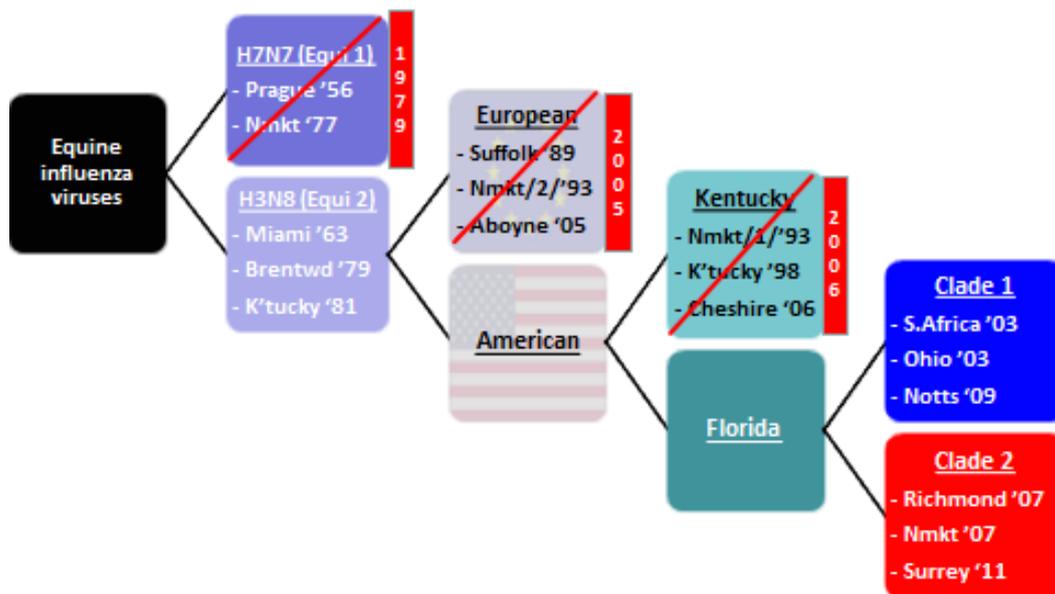
A prerequisite for formulation of effective vaccines is knowledge of the currently circulating equine influenza virus strains and subtypes. This is greatly facilitated by the Sentinel Practice Scheme<sup>1</sup> developed and run by the Animal Health Trust and funded by the Horserace Betting Levy Board. Registration is easily achieved online and participating practices are supplied with nasopharyngeal swabs and virus transport medium, and are asked to submit swabs taken from horses suspected of having influenza for testing at no cost to the owner. When influenza virus is detected, attempts are then made to grow the virus for precise characterisation of the virus strain. This information is vital for the Expert Surveillance Panel of the World Organisation for Animal Health (OIE) who then provide independent expert evidence-based advice on recommended vaccine strain updates. The veterinarians in the field, who submit samples via this free scheme, play a crucial role in surveillance of equine influenza and, ultimately, in ensuring that available vaccines contain the most appropriate strains. However, many of us would frequently not submit swabs from coughing horses, especially if disease is clinically mild and it is highly likely that many more outbreaks of equine influenza occur than are diagnosed. Greater awareness and participation in the Sentinel Practice Scheme should be encouraged to improve the accuracy of our awareness of the current threat.

#### ***Virus strain evolution***

Since the original identification of H7N7 equine influenza in 1956 (Prague '56) and H3N8 in 1963 (Miami '63), continual evolution and extinctions have occurred (Figure 1). No threat has arisen in the UK from H7N7 strains for over 30 years, leaving sole focus now on H3N8 strains. In the late 1980's notable divergence of H3N8 strains occurred into so-called "American" and "European" strains although the latter have not been isolated in the UK since 2005 (Aboyne '05) and are no longer considered a threat, leaving sole focus now on H3N8-American strains. Further divergence of H3N8-American strains also occurred to produce so called "Kentucky" and "Florida" strains with the former predominating through the 1990's (e.g. Newmarket/1/'93, Kentucky '98) and the latter predominating since the turn of the 21<sup>st</sup> century. No H3N8-American-Kentucky strains have been isolated in the UK



since 2006 (Cheshire '06) and are no longer considered a threat, leaving sole focus now on H3N8-American-Florida strains. The pattern of divergence continued in Florida strains which divided into clades 1 and 2 and both clades continue to present a current threat to horses in the UK to date, although there has been a gradual change in emphasis from Florida clade 1 strains (e.g. South Africa/4/'03, Ohio '03) to Florida clade 2 strains (e.g. Richmond/1/'07) as the major threat in the UK. Indeed, all isolates identified in UK since May 2010 have been H3N8-American-Florida-clade 2 strains although the continued predominance of Florida clade 1 strains in USA is one reason why we cannot yet discount these latter strains as a current threat<sup>2</sup>.



**Figure 1:** Evolution of equine influenza from 1956 to 2012. Note that H7N7, H3N8-European and H3N8-American-Kentucky strains are no longer circulating and are not deemed to pose a threat to horses in the UK. Only H3N8-American-Florida strains (clade 1 and, more especially, clade 2) represent a current threat.

### UK vaccine products – what we have versus what we would like

#### **Vaccine virus strains**

Antigenic similarity between currently circulating strains and strains included in vaccine products is a vital contributor to vaccine efficacy. The OIE Expert Surveillance Panel<sup>3</sup> meet annually to consider evidence of current international threat from equine influenza and recommend strains that should be incorporated into commercial vaccine products. Although strains continually evolve and present a moving target for vaccine manufacturers to follow, in this Olympic year where so many Brits have risen to the challenge the UK vaccine industry would not be deserving of a medal for their efforts and achievements! With relevance to current strains there have been 2 important update recommendations by the OIE Expert Surveillance Panel in recent years. Firstly, in 2004 following a major influenza outbreak in South Africa and vaccine breakdown in the UK, the panel recommended update of influenza vaccines to contain a Florida clade 1 virus similar to South Africa/4/'03 or Ohio '03. To date, 8 years on from that recommendation, 3 of the 4



UK equine influenza vaccines still have not complied (Duvaxyn IE plus, Equilis prequenza and Equip F), with only Proteq-flu containing the OIE recommended strain (Ohio '03). Secondly, in 2010 following recognition of increasing activity attributable to Florida clade 2 viruses, the panel updated their recommendation to include representatives of both Florida clade 1 (South Africa '03-like or Ohio '03-like) and Florida clade 2 viruses (Richmond '07-like). This recommendation was reconfirmed in 2011 and 2012<sup>3</sup>. Two years on from the 2010 recommendation no current UK vaccine product yet fully complies, although assurance of active research and forthcoming development of strain updates has been made unofficially by some manufacturers. Figure 2 details the content of UK licensed equine influenza vaccines<sup>4</sup> and shows only 1 out of 11 included influenza strains to be compliant with current OIE Expert Surveillance Panel recommendations.

	H7N7 Equi 1		H3N8 Equi 2		Vaccine format
	European		American		
			Kentucky	Florida	
<b>2012 OIE Recommendation</b>	-	-	-	SA '03/Ohio'03 & Richmond '07	n/a
<b>Duvaxyn IE plus (Elanco)</b>	Prague '56	Suffolk '89	Nwmkt/1 '93	-	Killed whole virus/Carbopol
<b>Equilis prequenza (MSD)</b>	Prague '56	Nwmkt/2 '93	Nwmkt/1 '93	-	ISCOM
<b>Equip F (Pfizer)</b>	Nwmkt '77	Borlange '91	Kentucky '98	-	ISCOM
<b>Proteq-flu (Merial)</b>	-	Nwmkt/2 '93	-	Ohio '03	Live vectored HA/Carbomer

**Figure 2:** Currently available equine influenza vaccine products in UK<sup>4</sup> compared with 2012 recommendation from OIE Expert Surveillance Panel<sup>3</sup>. Only Proteq-flu contains a recommended strain (Ohio '03) and none are fully compliant with current recommendations.

### Vaccine technology

In addition to strain selection, vaccine products also differ with respect to the means by which the influenza antigen is presented to the horse's immune system. Mimicking of natural virus infection and simulation of naturally occurring immunity represents the "holy grail" for vaccine technology. Given that equine influenza is primarily a local infection of the respiratory epithelium, effective clinical protection and elimination of viral shedding is likely to be best achieved via opsonisation of virus by mucosal antibody (mainly IgE) and, probably more importantly, by targeting of virus-infected respiratory cells by cytotoxic T lymphocytes (cell-mediated immunity, CMI) (Paillot *et al* 2006). Although, under limited circumstances, systemic IgG concentrations may correlate with clinical protection, there is less obvious direct benefit of a strong systemic IgG response given the non-viraemic nature of equine influenza infection. The most basic means of antigen presentation comprises killed virus combined with an immunostimulant adjuvant such as carbopol (e.g. Duvaxyn IE Plus). Although likely to provoke a strong systemic IgG response via the "exogenous pathway" (Gildea *et al* 2011), the ability of such vaccines to produce effective mucosal IgE and CMI responses is dubious (Paillot *et al* 2006). The desirable stimulation of CMI depends on the "endogenous pathway" which is classically stimulated by virus antigen that is synthesised within respiratory epithelial cells as seen in natural infection. The live canary-pox vector technology seen in Proteq-flu is the only UK vaccine product that truly achieves intracellular antigen synthesis although there is evidence that the immune-stimulating complex (ISCOM) technology seen in Equilis Prequenza and Equip F also stimulates CMI (Paillot *et al* 2006, 2008; Paillot & Prowse 2012).



### The sorry state of current affairs

It is estimated that less than 40% of the horses in the UK are vaccinated against equine influenza and even those that are vaccinated do not receive a Florida clade 2 vaccine strain which represents the major current threat in the UK. Furthermore, in 3 out of 4 instances the vaccine products used do not even comply with OIE expert surveillance panel recommendations from 8 years ago and contain strains 14 to 19 years old as the most up-to-date vaccine components! (Figure 2). Given the current range of outdated vaccine products available, it is unsurprising that vaccine breakdown has been seen during the last year in several countries including USA, France, Germany and UK. This is not a record of which we can be proud and, although vaccine strain selection is the primary responsibility of the four vaccine manufacturers (Elanco Animal Health, Merial Animal Health, MSD Animal Health, Pfizer Animal Health), it is ourselves as veterinary practitioners who choose which products to purchase and supply to our clients and we cannot be absolved of complicity in the currently unacceptable situation. It is inevitable that continued and progressive vaccine breakdown will be seen in the UK until vaccine products are, at last, updated in accordance with OIE Expert Surveillance Panel recommendations. It is evident that most vaccine manufacturers have not taken it upon themselves to voluntarily update their products appropriately. Some have disappointingly placed greater reliance on trying to excuse their inactivity by attempting to convince us of continued efficacy of their outdated products despite independent expert evidence and opinion to the contrary.

### The way forward?

Many lessons should have been learned from the dreadful experiences of other nations such as Australia in 2007. It is important to note that the infamous Australian outbreak did not originate through lack of vaccination. Indeed the index cases in Eastern Creek Quarantine Station were fully vaccinated, although not in accordance with OIE Expert Surveillance Panel recommendations current at that time. Had appropriate vaccines been used at the time (3 years after the ESP had recommended them) then this multi-million dollar disaster would not have occurred. It was recommended by the subsequent judicial inquiry that ***“If there are commercially available vaccines that contain representatives of currently circulating strains, the import conditions should specify that the horses be vaccinated using that vaccine or one of those vaccines”***<sup>5</sup>. This statement represents an important landmark whereby regulations not only specify compulsory vaccination but actually stipulate which particular vaccine products should be used. Similar action via regulatory bodies with UK jurisdiction such as the British Horseracing Authority, Fédération Equestre Internationale and Department for the Environment, Food and Rural Affairs could only be in the interests of UK equine health and, no doubt, would finally provoke the vaccine manufacturers into long-overdue action. However, in the current absence of regulatory enforcement in the UK, it is perhaps time for practitioners to exert more influence on the market by choosing vaccine products that are compliant with OIE Expert Surveillance Panel recommendations.

When vaccine breakdown occurs in our clients' horses, could we honestly claim as a profession to have acted in accordance with best practice and the horses' best interests to try to avoid the situation?



## References, further reading and resources

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<sup>1</sup>Information and registration for the Sentinel Practice Scheme is available at [www.aht.org.uk/cms-display/equiflunet\\_vsent.html](http://www.aht.org.uk/cms-display/equiflunet_vsent.html).

<sup>2</sup>Current UK and international equine influenza activity is easily monitored via several updated resources including websites ([www.equiflunet.org.uk](http://www.equiflunet.org.uk); [www.aht.org.uk/equine\\_disease.html](http://www.aht.org.uk/equine_disease.html)), text messaging ([www.ewagroup.com/merial/alertservice](http://www.ewagroup.com/merial/alertservice)) and twitter (@equiflunet).

<sup>3</sup>OIE Expert Surveillance Panel recommendations are available free online in the 2<sup>nd</sup> quarterly bulletin each year published by the OIE ([www.OIE.int](http://www.OIE.int)). The current (2012) recommendation is available on p45-46:

[www.oie.int/fileadmin/Home/eng/Publications\\_&\\_Documentation/docs/pdf/bulletin/BullANG2012-2.pdf](http://www.oie.int/fileadmin/Home/eng/Publications_&_Documentation/docs/pdf/bulletin/BullANG2012-2.pdf)).

<sup>4</sup>Current details and particulars of equine influenza vaccine products licensed in UK are available online on the websites of the National Office of Animal Health ([www.noahcompendium.co.uk](http://www.noahcompendium.co.uk)), the Veterinary Medicines Directorate ([www.vmd.defra.gov.uk](http://www.vmd.defra.gov.uk)) or The European Medicines Agency ([www.ema.europa.eu/ema](http://www.ema.europa.eu/ema)).

<sup>5</sup>Details of Commissioner's report on the 2007 Australian Equine Influenza outbreak are available at [www.equineinfluenzainquiry.gov.au/](http://www.equineinfluenzainquiry.gov.au/)



## **Bacteriology Disease Report for the Second Quarter 2012**

A summary of the diagnostic bacteriology testing undertaken by different contributing laboratories is presented in Table 2. For contagious equine metritis (CEM) all 29 HBLB approved laboratories in the UK contributed data.

### AHVLA CEMO Data for the period April to June 2012

We are again pleased to include data relating to CEM testing from the Animal Health Veterinary Laboratories Agency (AHVLA), in this quarterly report. The sample population for the AHVLA is different from that for the other contributing laboratories as the AHVLA tests are principally in relation to international trade and/or outbreak investigations.

### Strangles

Strangles remains endemic in the UK, especially among parts of the non-Thoroughbred horse population. Diagnoses are confirmed in the UK based on traditional culture of *S. equi* and qPCR on respiratory samples and/or seroconversion using a serological ELISA.

**Table 2: Diagnostic bacteriology sample throughput and positive results for the second quarter 2012**

	Number of Samples Tested	Number Positive	Number of Contributing Laboratories
<b>CEMO (HBLB)</b>	5986	1	29
<b>CEMO (AHVLA)</b>	1149	4	1
<b><i>Klebsiella pneumoniae</i><sup>#</sup></b>	6310 <sup>1</sup>	1	29
<b><i>Pseudomonas aeruginosa</i></b>	6310 <sup>1</sup>	26	29
<b>Strangles*culture</b>	2318	167	17
<b>Strangles PCR</b>	1726	219	3
<b>Strangles ELISA</b>	2260	379 <sup>2</sup>	1
<b>Salmonellosis</b>	364	19	17
<b>MRSA</b>	588	0	10
<b><i>Clostridium perfringens</i></b>	212	10	7
<b><i>Clostridium difficile</i> (toxin by ELISA or immunochromatography)</b>	207	12	8
<b>Borrelia (by ELISA)</b>	29	5	1
<b><i>Rhodococcus equi</i> culture/PCR</b>	734	12	10
<b><i>Lawsonia intracellularis</i>**culture/PCR</b>	28	4	4

CEMO = contagious equine metritis organism (*Taylorella equigenitalis*); HBLB = HBLB accredited laboratories; <sup>#</sup> =capsule type 1,2,5; AHVLA = AHVLA reference laboratory; \**Streptococcus equi* subsp. *equi*; MRSA = methicillin resistant *Staphylococcus aureus*. \*\**Lawsonia intracellularis* identified using PCR applied to faeces; <sup>1</sup> reproductive tract samples only; <sup>2</sup> seropositivity may be attributed to disease exposure, vaccination, infection and carrier states.

### CEMO (HBLB) results

The positive case reported for CEM relates to the first identification of the index case of the CEM outbreak in Gloucestershire.

### AHVLA *Salmonella* results

From the incidents involving strains typed by the AHVLA the serovars/phagetypes reported were *S. Typhimurium* DT104 (2 samples), *S. Typhimurium* DT126 (3 samples) and *S. Typhimurium* DT8 (2 samples). DT126 appears to be more likely related to horses than any other species. DT104 is predominantly found in cattle and DT8 in ducks.

For more information from Defra about *Salmonella* in the UK, please visit

[http://vla.defra.gov.uk/reports/rep\\_salm\\_rep07.htm](http://vla.defra.gov.uk/reports/rep_salm_rep07.htm).



## Toxic and Parasitic Disease Report for the Second Quarter 2012

A summary of diagnostic toxicosis and parasitology testing undertaken by contributing laboratories is presented in Tables 3 and 4 respectively. Results for toxicosis are based on histopathologically confirmed evidence of disease only (where applicable).

**Table 3: Diagnostic toxicosis sample throughput and positive results for the second quarter 2012**

	Number of Samples Tested	Number Positive	Number of Contributing Laboratories
Grass Sickness	30	19	4
Hepatic toxicoses	18	2	2
Atypical myopathy	1	1	2
Tetanus	0	0	0

**Table 4: Diagnostic parasitology sample throughput and positive results for the second quarter 2012**

	Number of Samples Tested	Number Positive	Number of Contributing Laboratories
<b><u>Endoparasites</u></b>			
Ascarids	2964	44	18
Cyathostomes	2503	433	16
Dictyocaulus	930	15	12
Strongyles	4276	1185	23
Tapeworms (ELISA based testing)	42	28	7
Tapeworms (Faecal exam)	1955	17	11
Trichostrongylus	36	4	1
Strongyloides	2815	476	18
<i>Oxyuris equi</i>	181	1	4
Fasciola	141	8	3
Coccidia	37	1	2
Cryptosporidia	22	1	1
AHVLA <i>Theileria equi</i> (CFT)*	25	0	1
AHVLA <i>Theileria equi</i> (IFAT)**	211	9	1
AHVLA <i>Theileria equi</i> (cELISA)***	132	15	1
AHVLA <i>Babesia caballi</i> (CFT)*	25	0	1
AHVLA <i>Babesia caballi</i> (IFAT)**	211	10	1
AHVLA <i>Babesia caballi</i> (cELISA)***	133	1	1
<b><u>Ectoparasites</u></b>			
Mites	10	0	1
Lice	297	4	14
Ringworm	506	59	20
Dermatophilus	300	1	11
Candida	40	0	2

\*Complement Fixation Test; CFT suspect/positive samples are tested in IFAT test

\*\*Indirect Fluorescent Antibody Test; \*\*\*competitive Enzyme-linked immunosorbent assay; positive cELISA results are not undergoing confirmatory testing



Grass sickness surveillance data ([www.equinegrasssickness.co.uk](http://www.equinegrasssickness.co.uk))

A total of 28 cases of equine grass sickness (EGS) have been reported during the second quarter of 2012 (April - June), of which 75% occurred in England (n=21), 11% occurred in Scotland (n=3), and location was not reported for 14% of cases (n=4). These cases comprised 43% mares/fillies (n=12), 43% geldings (n=12) and sex was not reported for four cases. The median age of affected animals was 5.46 years (range 1.92 – 22 years). The majority of affected animals (71%, n=20) were purebreds, predominantly British native pony breeds (n=7) and Cobs (n=6) and 29% (n=8) were crossbreeds.

Fifty-seven percent of cases (n=16) were reported to have acute EGS, 14% (n=4) were reported to have sub-acute EGS and 29% (n=8) were diagnosed with chronic EGS. Of the eight cases of chronic EGS, 50% (n=4) were reported to have survived to date.

Diagnostic information was available for 82% of cases (n=23); of these, the majority were diagnosed based on clinical signs alone (78%; n=18). Four animals underwent surgery with diagnostic confirmation obtained by biopsy, and three animals that underwent surgery also had a subsequent post-mortem examination with histological examination of autonomic ganglia. A post-mortem examination was performed in one further case, where confirmation of diagnosis was obtained by histopathology of autonomic ganglia.

It should be noted that the grass sickness surveillance scheme receives data from a wider population in comparison to the data presented in Table 3 and different diagnostic criteria were used.



## **Report on Post-mortem Examinations for the Second Quarter 2012**

### **East Anglia**

*A total of 39 cases were examined including 17 aborted fetuses and one placenta.*

Of the aborted fetuses examined this quarter, there were 7 cases of placentitis, 2 cases of hypoxia, 2 cases of meconium aspiration, 2 cases asphyxiation, one case of premature placental separation, one case of twins, an umbilical cord torsion and a cause of abortion could not be identified in one case. One placenta was examined and placental insufficiency was determined as the cause of abortion.

Seven neonates were examined this quarter. Three had suffered sepsis, one died due to dystocia and one sustained a femoral fracture during parturition. One animal suffered head trauma and a *Rhodococcus equi* infection was identified in the final case.

Seven horses were examined following gastrointestinal disease. Two cases of grass sickness were identified along with single cases of colonic torsion, intestinal strangulation cause by a pedunculated lipoma, caecal impaction, duodenal perforation and cyathostomiasis.

One respiratory case was reported and found to have pulmonary fibrosis.

Two musculoskeletal cases were reported in this quarter. The first case involved a 20 year old mare that suffered post-anaesthetic myopathy and neuronal spinal cord damage following orthopaedic surgery. The second case involved a 3 year old filly that had become recumbent in starting stalls. Examination revealed three fractured lumbar vertebrae and spinal instability.

One welfare case was reported. The mare had suffered encephalopathy and had been euthanased. Post mortem examination revealed ragwort toxicity and cyathostomiasis.

Four other cases were examined. Two cases of sudden death were reported, the first of which occurred during exercise and a cause of death was undetermined. The second case comprised a seven year old cob gelding that suffered alkaloid toxicity after ingestion of yew. Another horse was found dead after having trapped a foreleg in stable fixtures. Examination revealed renal failure as a complication of rhabdomyolysis associated with myoglobinuria. The final case comprised a yearling that had shown clinical signs of swollen muzzle, lips and limbs. The cause of death was determined to be sepsis of unknown source.

### **Home Counties**

*Thirteen cases were examined in this quarter.*

Two neurological cases were reported in this quarter that were both euthanased following hind limb ataxia. The first case comprised a 4 year old pony found to have mild motor neurone degeneration and loss. The cause of ataxia in the second case could not be established.



Five cases of gastrointestinal disease were reported. One horse suffered colic and was euthanased. Post mortem examination revealed caecal displacement and entrapment however it is unclear if this was clinically relevant or a post-mortem artefact. One gastrointestinal case suffered a small intestinal volvulus and was euthanased following post operative ileus. Three further cases of colic were examined following euthanasia. One horse suffered grass sickness and a gastric rupture, the second horse was identified to have an ovarian haematoma and strangulation of the colon and the final case suffered peritonitis due to abdominal wall and intestinal perforation.

Two cases of neoplasia were reported this quarter. One horse suffered lymphoma and the second presented with colic and was found to have a squamous cell carcinoma of the prepuce.

One case of hepatic disease was identified in a horse that had been euthanased. Post mortem examination revealed a cholelith and hepatic encephalopathy.

One welfare case was examined which identified gastro-intestinal parasitism.

Two other cases were reported this quarter. The first case comprised of a horse with an aortic haematoma. The second case involved a horse with an arrhythmia that had died suddenly. Post mortem examination revealed mesenteric haemorrhage

### **South West**

*Seventeen cases were examined in this quarter.*

A case of neurological disease was reported and examination revealed a bilateral recurrent laryngeal neuropathy.

Three gastrointestinal cases were reported. One horse suffered a caecal tear and peritonitis, a second horse suffered acute fibrinous peritonitis secondary to ileocaecostomy and the final case was found to have a diaphragmatic hernia with intrathoracic displacement of abdominal viscera.

Two respiratory cases were examined. The first horse was found to have severe fibrinous pleuropneumonia with pyothorax and pericarditis. Equine multinodular pulmonary fibrosis was identified in the second case.

One cardiac case was reported. Post mortem examination revealed chronic vasculopathy at the aortic root.

A case of hepatic disease was examined which suffered severe hepatopathy with subcutaneous, intestinal and abdominal haemorrhage.

Five welfare cases were reported. The first case was emaciated and had overgrown hooves. Post mortem examination revealed tongue ulceration, gastric ulceration and endoparasitism comprising cyathostomiasis and a tapeworm infection. The second horse was also emaciated, had pediculosis, multiple cutaneous abrasions and ulcers and endoparasitism comprising *Gasterophilus*, cyathostome and tapeworm infections. Examination of the third horse revealed haemorrhage and bruising of the neck which was the result of a strangulation injury. The fourth horse suffered a caecal intussusception with



secondary purulent peritonitis. Cyathostomiasis, rib fractures, subcutaneous abscessation, cutaneous abrasions and ulceration were also found. Severe post-mortem changes in the final case resulted in a cause of death not being reached.

Four other cases were reported. One horse suffered a urinary bladder rupture and the cause of death could not be identified in the second horse. Two donkeys were examined both of which were euthanased. One donkey suffered sarcoidosis and mild gastric ulceration. The second suffered arthritis, laminitis and spinal exostoses and post mortem examination revealed cyathostomiasis, renal and ovarian cysts, gastric ulceration and unilateral pituitary hyperplasia.

### **Northern England**

*Three cases were examined in this quarter.*

One neonate was examined that had died from hypoxic ischemic encephalopathy.

One gastrointestinal case was reported involving a horse with an oesophageal mass.

One musculoskeletal case was examined and found to have a fractured humerus.

### **West Midlands**

*Two cases were examined in this quarter.*

One neonate was examined and post mortem examination revealed a stenosed pylorus with oedematous intestines and serosal haemorrhage.

One gastrointestinal case was examined in this quarter and was found to have haemoperitoneum.

### **Scotland**

*Seven cases were examined in this quarter.*

One aborted fetus was examined of which bacterial placentitis was determined as the cause of death.

One neonate was examined and found to have neonatal polyarthritis.

Five gastrointestinal cases were examined. Three cases suffered grass sickness confirmed by histopathology. One horse was found to have a duodenal-jejunal intussusception and gastric rupture and the final case suffered colic of unknown cause.

### **Northern Ireland**

*Four post-mortem examinations were carried out in this quarter.*

One aborted fetus was examined. The mare aborted in the 9<sup>th</sup> month of gestation due to an umbilical cord torsion. The fetus tested negative for herpes virus and leptospirosis.



Three neonates were examined this quarter. The first case comprised a five week old colt that had died following several days of lameness. Post mortem examination revealed an extensive bilateral degenerative myopathy of the muscles of the thighs, gluteals and caudal lumbar muscles. Vitamin E levels were tested and were found to be within normal limits. The foal was also found to have a strongyloides infection. A cause of death was not established.

The second case involved a six week old filly that had died following two days of illness. Post mortem examination revealed a perforated gastric ulcer resulting in peritonitis.

The final case comprised a four week old male foal that had died suddenly. The foal was found to have an omental tear through which a portion of the small intestine became strangulated.



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Dechra Laboratories  
Endell Veterinary Group Equine Hospital  
Hampden Veterinary Hospital  
Hampton Veterinary Group Laboratory  
IDEXX Laboratories  
JSC Equine Laboratory  
Lab Services Ltd  
Liphook Equine Hospital  
Minster Equine Veterinary Clinic  
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**We would welcome feedback including contributions on focus articles  
and / or case reports to the following address:**

Animal Health Trust  
Lanwades Park, Kentford, Newmarket, Suffolk, CB8 7UU  
Telephone: 01638 750659  
Fax: 01638 555659  
E-mail: [equinesurveillance@aht.org.uk](mailto:equinesurveillance@aht.org.uk)  
Website: <http://www.aht.org.uk/>