Equine Quarterly Disease Surveillance Report

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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 UK.

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INTRODUCTION

Welcome to the equine disease surveillance report for the fourth quarter of 2023; produced by Equine Infectious Disease Surveillance (EIDS), based in the Department of Veterinary Medicine at the University of Cambridge.

National disease data are collated through multiple diagnostic laboratories and veterinary practices throughout the United Kingdom, providing a more focused insight into the occurrence of equine infectious disease. Due to the global mixing of the equine population through international trade and travel, collaboration on infectious disease surveillance between countries occurs on a frequent basis to inform and alert. Both national and international information will be summarised within this report.

Any comments and feedback on the report is welcomed and we encourage contributions on focus articles. To view previous reports, see www.equinesurveillance.org and to receive reports free of charge, via e-mail on a quarterly basis, please contact equinesurveillance@vet.cam.ac.uk

NEWS ARTICLES

Guidance available on the non-availability of Equip Artervac EVA vaccine

Equip Artervac EVA vaccine effectively went off the market in late March 2023 when it reached its expiry date and since then Zoetis has notified that new stocks will not be available until October 2024 at the earliest. Use of alternative EVA vaccines was investigated but this was not possible in the short time available and so it has not been possible to continue EVA vaccination of breeding stallions in Britain for the 2024 breeding season. Guidance has been developed on how seropositive stallions with lapsed vaccination records that under the EVA Order 1995 would require investigation to confirm that they are not positive for equine arteritis virus in their semen, might be cleared as safe to breed. Due to their legislative relevance to the EVA Order 1995, the industry clearance guidance also required Defra approval, which was provided in late December 2023 by Defra's Animal Disease Policy Group. The clearance guidance for the 2024 breeding season is posted on the EIDS website and has been promoted to the breeding industry and equine vets (https://equinesurveillance.org/landing/resources/eids2024EBSActionWithoutArtervac.pdf). An important element of the guidance is the decision tree that guides horse owners through the appropriate diagnostic options when testing and clearing lapsed Artervac vaccinated stallions.

The 12th International Equine Infectious Diseases Conference (IEIDCXII 2024)

The 12th International Equine Infectious Diseases Conference (IEIDCXII 2024) will take place in the beautiful seaside resort of Deauville, Normandy, France from 30 September to 4 October 2024. The previous meeting had to be held virtually due to Covid restrictions so this promises to be an amazing return to normality with an abundance of keynote reviews by international experts, research abstracts, a practitioners' day (Friday 4 October 2024) and convivial social events, all in the modern environment and environs of the Deauville International Conference Centre (CID; https://www.congres-deauville.com/en/professionalarea). The event is being sponsored and information on current sponsors can be found here https://ieidc.org/current-sponsors/

The CID is within easy walking distance of many hotels and importantly, la plage de Deauville. Please put the dates in your diary and think about presenting your data. Abstract submission opens on 17th March 2024. Details are here: https://ieidc.org/abstracts-proceedings/

The organising committee looks forward to hopefully seeing you there to talk about our favourite equine infectious diseases, in-person! Find further details on the IEIDC website (https://ieidc.org/)

International de Deauville (CID), Normandy, France: the host venue for IEIDC XII 30 September – 4 October 2024

Bluetongue and African horse sickness

Bluetongue is a notifiable disease in ruminants and camelids caused by a virus of the Orbivirus genus. The bluetongue virus (BTV) is transmitted between hosts by *Culicoides* biting midges, which become infective for life after feeding on an infected animal. The last known outbreak of bluetongue in the UK was in 2007. However, in early November 2023 BTV-3 was identified in an adult cow in Canterbury, Kent, and subsequently further cases were confirmed near Cantley, Broadland, Norfolk and as of 29 January 2024 there are 66 bluetongue cases in England on 41 premises across the two affected areas in Kent and East Anglia. Please see the following links for information on the first identified case at https://doi.org/10.1002/vetr.00100096 and updates on the latest situation at https://www.gov.uk/guidance/bluetongue#latest-situation.

Although BTV is not known to infect equids, its recent appearance in the UK again raises alarm bells for the equine community, as BTV and the virus which causes African horse sickness (AHS) are of the same genus and moreover, are spread by the same genus of biting midges. The presence of several recently confirmed cases of bluetongue, identified on different days both within and across holdings, may be due to the transmission of BTV-3 from *Culicoides* midges blown to the UK from mainland Europe. This again highlights the potential for AHS virus being brought to the UK from mainland Europe, should the virus emerge there. However, currently there is no evidence that BTV-3 is circulating in midges in Great Britain and surveillance is ongoing.

AHS is notifiable due to its high mortality and transmission rates, and as of today, there has never been an outbreak of it in the UK. It is currently endemic within sub-Saharan Africa (Figure 1).

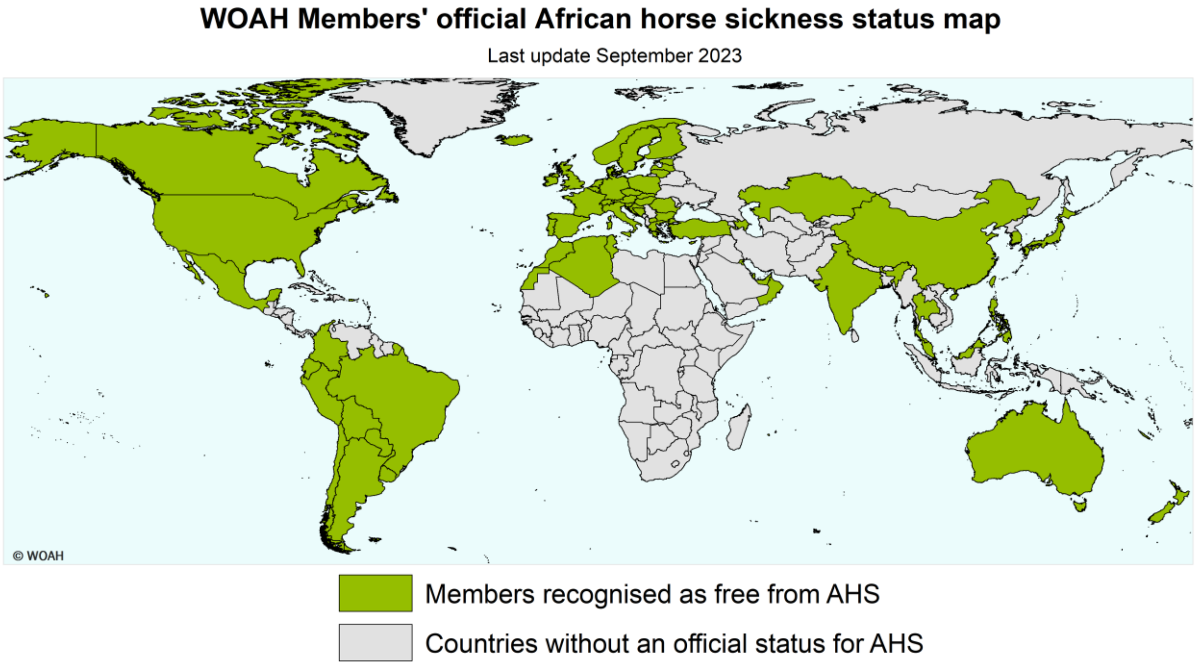


Figure 1: Screen shot of African horse sickness status map from the World Organisation for Animal Health (WOAH), showing which WOAH member countries are recognised as free from AHS.

AHS has pulmonary, cardiac and mixed forms, with the latter being a mixture of the first two forms (Figure 2). The mixed form is the more common presentation in South Africa, where both pulmonary and subcutaneous oedema are present, as well as 'horse sickness fever', which is a milder form of the disease, seen in zebras and donkeys.

There are several control measures for countries where AHS is endemic, but as GB is a country where there are currently no known cases, we should continue to practice strict biosecurity measures, remain vigilant for any clinical signs of the disease, and report any suspicions to the APHA immediately. The African Horse Sickness Control Strategy for Great Britain outlines how the relevant legislations (The African Horse Sickness (England) Regulations 2012, The African Horse Sickness (Scotland) Order 2012 and The African Horse Sickness (Wales) Regulations 2013) should be applied. (https://assets.publishing.service.gov.uk/media/5a7c5530e5274a1b004230f9/pb13831-ahs-control-strategy-20130923.pdf)

Potential sources of AHS virus include infected *Culicoides* midges, infected equids, and infected equipment, such as hypodermic needles, intravenous giving sets, and dental and obstetric equipment. The likelihood of AHS entering the UK via these sources is currently deemed very low, due to a range of measures in place to manage the risks, in particular restrictions on trade in equids from endemic regions, although vaccination and a variety of methods of vector control are important in endemic countries. The most recently conducted risk assessment by the Defra and APHA was conducting following AHS being confirmed in a country with WOAH official free status https://www.gov.uk/government/publications/african-horse-sickness-in-malaysia and the risk level was deemed very low for the UK. The only pathway for AHS virus into the UK that is not managed is the airborne transport of infected *Culicoides* midges. However, this is considered very unlikely to occur due to the large distance between the UK and any endemic country. There is also the small possibility of midges being brought into the country via vectors such as ships, cargo, or planes.

In summary, although the risk of introduction of AHS into Europe and the UK can never be considered zero, risk management measures have to date minimised it. The recent outbreak of bluetongue in northern Europe including the UK serve as a warning that *Culicoides* midges have likely entered the UK with BTV-3 and the next important phase is to assess whether the virus overwinters and re-emerges in 2024. The industry must stay vigilant for the presentation of clinical signs of AHS in UK horse populations, immediately reporting any suspicion of AHS to the APHA so that immediate investigations can be conducted and if necessary enact the African Horse Sickness Control Strategy.

A look at: African Horse Sickness (AHS)

Virus classification: Genus: orbivirus. Double-stranded RNA. 9 antigenically distinct serotypes

Transmission: Vector-borne disease (midges). No direct spread between animals.

Clinical signs: Four clinical syndromes; pulmonary, cardiac, mixed and subclinical. Signs include; pyrexia (up to 41°C), redness of conjunctivae, swelling of the face, neck and shoulders, frothing and discharge from nostrils, slow and heavy breathing, coughing. High mortality.

Diagnosis: ELISA/viral neutralization/PCR/viral isolation on tissues. PCR/viral isolation on blood. Serology on a blood sample (ELISA/complement fixation test)

Treatment: No specific treatment

Geographic distribution: There has never been an outbreak in the UK. Endemic countries include; sub-Saharan Africa. Outbreaks reported in Spain, Portugal and Morocco last reported between 1987-1990.

Prevention: In endemic countries; vaccination and management measures. There is a detailed prevention and control plan for Great Britain laid out in the 'African horse sickness control strategy for Great Britain' (https://www.gov.uk/government/publications/african-horse-sickness-control-strategy)

Notifiable in the UK: confirmed cases must be reported

Figure 2: Further information on African horse sickness (AHS)

With thanks to Amy Ling (5th year veterinary student at the University of Cambridge) for their help with this article, whilst spending a period of extra-mural study with EIDS.

UK Infectious Disease Reports

(1 Oct. to 31 Dec. 2023)

This section summarises **laboratory confirmed** infectious disease outbreaks reported in the United Kingdom during the fourth quarter of 2023. Each reported outbreak may involve more than one animal. To view current outbreak reports, see www.equinesurveillance.org/iccview/. No reported outbreaks in a region does not necessarily equate to the area being free from the disease. When a particular disease is reported as 'endemic', disease outbreaks are common and are at an expected level.

Notifiable Diseases

Notifiable disease

The APHA Veterinary Exotic Notifiable Disease Unit (VENDU) co-ordinates the investigation of suspected exotic notifiable disease in Great Britain on behalf of Defra, Welsh Government and Scottish Government. Further information about notifiable diseases is available on https://www.gov.uk/government/collections/notifiable-diseases-in-animals.

It should be noted that all information relating to equine notifiable disease investigations (including suspect cases that are subsequently negated) will appear in this section and are not broken down by system. APHA non-negative test results that are referred to below do not equate to confirmed positive cases and are therefore not included in quarterly laboratory results tables. Confirmed positive results are based on APHA investigations and follow confirmation on official samples. Non-notifiable diseases will appear in their relevant system section.

AHS

There was one non-negative ELISA result for African Horse Sickness reported following pre-export sampling. After an APHA investigation and blood sampling, the PCR was negative, and the ELISA was again positive. The horse was found to have originated from South Africa, so disease was negated as it was a presumed vaccinated horse.

WNV

There have been no 'test to exclude' (TTE) cases for WNV.

Non-notifiable Respiratory Diseases

EHV-4 Respiratory Infection

Table 1: Details of 12 EHV-4 respiratory infection outbreaks reported in the UK between 1 October to 31 December 2023

Date	County	Clinical signs	Signalment	Lab test	Confirming lab	In-contacts	Additional Information
8 Nov 2023	Glos.	Pyrexia, lethargy, lymphadenopathy, dry/harsh cough, ocular discharge and mucopurulent nasal discharge	Unvaccinated 6-month-old Dartmoor/ Shetland filly	PCR on NPS	Rainbow Equine Hospital	Five	The affected animal and one other had recently arrived on the premises.
9 Nov 2023	Lincs.	Lethargy, dry/harsh cough and serous nasal discharge	10-year-old Warmblood filly	PCR on NPS	Rossdales Laboratories	Six further animals on-site of which two are direct in-contacts	Affected animal had a co-infection of *Streptococcus zooepidemicus*. There had been recent movement on/off the premises.

21 Nov 2023	Stirling	Pyrexia, lethargy, ocular discharge, dry/harsh cough and mucoid nasal discharge	6-month-old Miniature Shetland gelding	LAMP	Forth Valley Vets	21 in-contacts, including three new arrivals one of which had clinical signs	Affected animal had a co-infection of *Streptococcus zooepidemicus*.
24 Nov 2023	Cheshire	Pyrexia, productive cough and serous nasal discharge	Unvaccinated 4-year-old Welsh Section D mare	PCR on NPS	Rossdales Laboratories	50 other unvaccinated animals on-site of which 20 are direct in-contacts	
27 Nov 23	Falkirk	Mild lethargy & lymphadenopathy and mucopurulent nasal discharge	Two unvaccinated 6-month-old Welsh X fillies	PCR on nasal swabs	Rossdales Laboratories	30 to 40 other animals on-site of which a minimum of 20 are in-contacts.	There had been recent movement on/off the premises.
11 Dec 2023	N. Yorks.	Pyrexia, inappetence, lethargy and a serous nasal discharge	Unvaccinated 6-year-old Connemara	PCR on NPS	Rainbow Equine Hospital	There were three close in-contacts and 20 animals in total on the premises	
13 Dec 2023	South Western England	None reported	Mare	PCR	BioTe	No further details available	
15 Dec 2023	Cheshire	Dry/harsh cough and serous nasal discharge	Unvaccinated 7-month-old Connemara filly	PCR on guttural pouch wash and nasal wash	Rainbow Equine Hospital	Five further animals on-site	
18 Dec 2023	W. Sussex	Pyrexia, profuse mucopurulent nasal discharge and lethargy	Non-Thoroughbred mare	PCR on NPS	Axiom Veterinary Laboratory	Five direct in-contacts	Affected animal had a co-infection of *Streptococcus zooepidemicus*
20 Dec 2023	Herts.	Pyrexia, dry/harsh cough, lethargy and mucopurulent nasal discharge	Partially vaccinated 8-month-old Thoroughbred	PCR on NPS	Rossdales Laboratories	There are a further 30 animals on site of which three are direct in-contacts presenting with clinical signs	There had been recent movement on/off site
20 Dec 2023	Cambs.	Lethargy, dry/harsh cough, and serous nasal discharge	8-month-old Warmblood filly	PCR on nasal swab	Rossdales Laboratories	Five in-contacts of which two have clinical signs	
22 Dec 2023	Wilts.	Pyrexia, inappetence lethargy, dry/harsh cough and mucopurulent nasal discharge	Two unvaccinated Thoroughbred filly foals	PCR on NPS	BioTe	Approx. 20 other mostly vaccinated animals on site of which three are direct in-contacts.	

NPS=nasopharyngeal swab; LAMP = loop-mediated isothermal amplification

Equine Influenza (EI)

EIDS were alerted to 7 outbreaks of EI during Q4 2023, but only received information regarding 4 of these

County location of EI occurrences during Q4 2023, disclosed to the ICC

60% of cases were unvaccinated (3/5*)

20% no vaccination status provided (1/5*)

20% of cases were vaccinated (1/5*)

75% of outbreaks reported that cases were new arrivals to the premises (3/4)

4 yo median age of cases (range 3 yo-14 yo)

100% of cases had clinical signs including: pyrexia, cough, nasal discharge, lymphadenopathy and lethargy

*3 outbreaks involved 1 confirmed case
1 outbreak involved 2 confirmed cases

Table 2: Details of four equine influenza (EI) outbreaks reported in the UK between 1 October to 31 December 2023

Date	County	Clinical signs	Signalment	Lab test	Confirming lab	In-contacts	Additional Information
4 Oct 2023	Staffs.	Lethargy, ocular discharge and initially serous and then mucoid nasal discharge	Unvaccinated 4-year-old Irish Sports Horse filly	PCR on NPS	Rossdales Laboratories	15 other vaccinated animals on site, none of which presented with clinical signs	None
20 Oct 2023	Cambs.	Pyrexia, inappetence, lethargy, ocular discharge, lymphadenopathy and mucopurulent nasal discharge	Vaccinated 4-year-old Warmblood gelding	PCR on NPS	Rossdales Laboratories	Approx. 10-12 other animals on site of which two are direct in-contacts	There had been recent movement on/off site including new arrivals
20 Nov 2023	Northumb.	Pyrexia, productive cough and mucopurulent nasal discharge	Two unvaccinated animals: 10-year-old Highland gelding and a 3-year-old Irish Draught X gelding	PCR on NPS	Axiom Veterinary Laboratories	There are two further animals on site, which are being kept separately from this group	None
15 Dec 2023	Norfolk	Dry harsh cough, mucopurulent nasal discharge, lethargy and inappetence	14-year-old Fell pony mare	PCR on NPS	Liphook Equine Hospital	Approx. 120 other animals on site – the majority of which are vaccinated	The confirmed case is in a group of 26 animals that all arrive on the premises in early December having been held together elsewhere since 25 November.

							The majority of the group are reported to have clinical signs of coughing and mucopurulent nasal discharge.

NPS=nasopharyngeal swab

HBLB Surveillance Scheme
The Horserace Betting Levy Board (HBLB) funded equine influenza (EI) surveillance scheme provides free of charge PCR testing for suspected cases of equine flu in the UK. The laboratory testing is conducted on behalf of EIDS and HBLB by Rossdales Laboratories for samples submitted with an appropriately completed scheme submission form. To register your vet practice on the scheme go to https://equinesurveillance.org/fluenrol/

Tell-Tail Text Message Alert Scheme
In the case of an outbreak, notification will be reported by the text alert service (Tell-Tail) for UK equine practitioners sponsored by Boehringer Ingelheim. This free of charge service alerts practitioners to outbreaks of equine influenza, equine herpes abortion, neonatal infection and neurological disease and equine notifiable diseases in the UK via text message. Sign up to receive alerts at www.telltail.co.uk

SURVEILLANCE OF EQUINE STRANGLES

(1 Oct. to 31 Dec. 2023)

The Surveillance of Equine Strangles network enables the ongoing assessment of the disease's true welfare impact, with data available since 5th January 2015, which highlight trends over time and different geographical areas across the UK. The SES network is comprised of ten diagnostic laboratories based across the UK.

A total of 36 positive diagnoses of *S. equi* were reported by SES during Q4 2023 from samples submitted by 27 veterinary practices in the UK (Figure 3). Information regarding reported samples is summarised in Table 3.

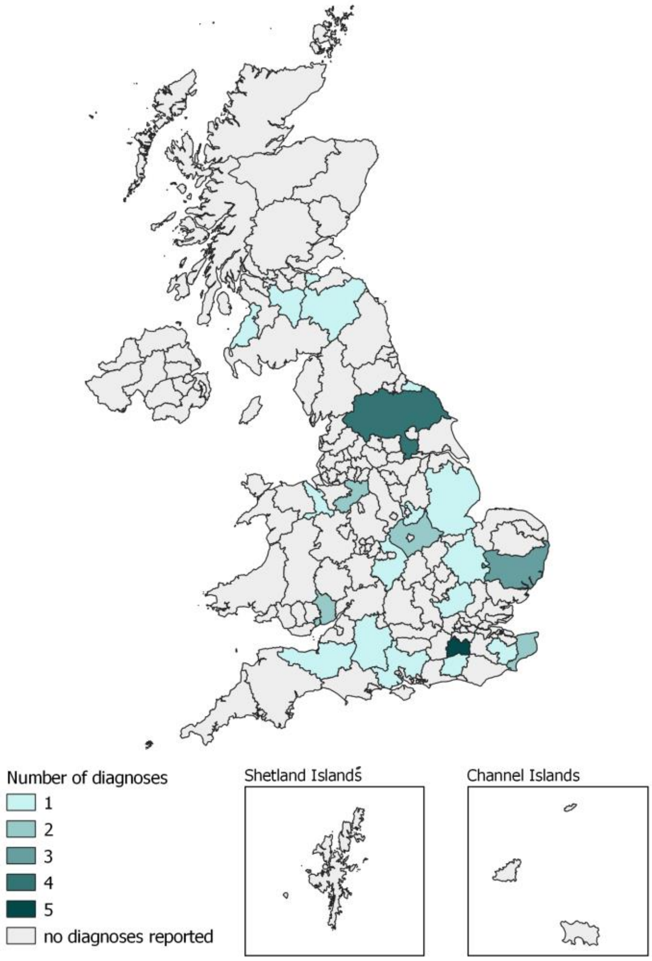


Figure 3: Frequency of reported laboratory diagnoses of *S. equi* across divisions of the UK from SES Laboratory during 2023 Q4. Diagnoses are mapped by submitting vet practice

Table 3: *S. equi* samples reported 1 October to 31 December 2023

	n	%
Total horses sampled	36	100%
Sample type*	39	
Swab	11	28%
Nasopharyngeal	11	100%
Abscess material	0	0%
Nasal	0	0%
Guttural pouch lavage	23	59%
Other	5	13%
Diagnostic tests		
PCR only requested	32	89%
PCR and culture requested	3	8%
Culture only requested	0	0%
iiPCR	1	2%
Signalment		
Sex of horse indicated	28	78%
Female	10	36%
Male	18	64%
Breed of horse	25	69%
Native UK pony	11	44%
Native UK horse	3	12%
Sports horse	10	40%
Non-UK native horse/pony	1	4%
Crossbreed	0	0%
Age of Horse	24	67%
Range	6 months - 24 years	
IQR	3 - 11 years	
Median	6	
Clinical signs reported***	25	
Nasal discharge	9	36%
Pyrexia	6	24%
Abscess	3	12%
Coughing	3	12%
Glandular swelling	2	8%
Guttural pouch empyema	1	4%
Chondroids	1	4%
Reason for sampling reported	24	67%
Total reasons*	25	
Post infection screening	6	24%
Clinically ill horse	5	20%
Strangles suspected	5	20%
Post seropositive ELISA	4	17%
In contact	2	8%
Other	2	8%
Pre-post movement	1	4%

**can include multiple entries per submission*

****From 13 diagnoses*

EQUINE GRASS SICKNESS

(1 Oct. to 31 Dec. 2023)

An equine grass sickness (EGS) surveillance scheme was established in spring 2008 to facilitate the investigation of changes in geographical distribution and incidence of the disease in Great Britain. Data gathered by this scheme is collated in a strictly confidential database. Having up to date reports from across the country will help provide an accurate representation of numbers of EGS cases nationwide and is vital to help continue epidemiological research into the disease. Reporting cases of EGS to the Equine Grass Sickness Fund (EGSF) can be done by either the attending veterinary surgeon or the owner, at https://moredungroup.onlinesurveys.ac.uk/equine-grass-sickness-biobank-owner-questionnaire. Please note that figures for EGS contained in the laboratory report may differ to the number of cases reported here, which are reported by both owners and veterinary surgeons.

For the period October to December 2023, there was one case of EGS reported to the Equine Grass Sickness Fund, with details in Table 4. This was an acute case which did not survive. Positive diagnosis was confirmed by post-mortem examination. The premises history noted that the animal was grazing 24/7 with a recent change of field and had co-grazed with a 20-year-old donkey gelding and a nine-year-old Connemara gelding for three years.

Table 4: Equine grass sickness cases reported in UK during Q4 2023 including data for one case in Q2 2023 and one case in Q3 2023

Case date	Location	Signalment	Presentation	Diagnosis	Outcome	Premises History	Additional Information
1 June 2023	West Lothian	7-year-old Welsh Section A mare	Acute	Clinical signs by vet	Non-survivor	1 day (holiday venue)	24/7 grazing
24 Sept. 2023	Lincolnshire	9-year-old Gypsy cob gelding	Acute	Clinical signs by vet	Non-survivor	6 years on/off the same paddock	24/7 grazing/supplemental grass, hay & straw
20 Oct. 2023	Perthshire	21-month-old Connemara colt	Acute	Post-mortem with ganglia	Non-survivor	12 months on the same premises	Recent change of field/supplemental hay

Virology

The results of virological testing for October to December 2023 are summarised in Table 5. Please note, APHA's sample population is different to the other contributing laboratories as their tests are principally in relation to international trade.

Table 5: Results of virological testing, October to December 2023

	Samples tested (n)	Positive (n)	CL (n)
Serological Tests			
Reproductive/Systemic diseases			
EVA ELISA	1754	8	6
EVA VN	12	5*	2
EVA VN (APHA)	1093	11*	1
EIA ELISA	218	0	7
EIA Coggins	6	0	3
EIA ELISA (APHA)	0	0	1
EIA Coggins (APHA)	4217	0	1
EHV-3 VN	0	0	1
Reproductive/Respiratory/Neurological diseases			
EHV-1/-4 CFT	261	7╫	1
EHV-1/-4 CFT (APHA)	1	0	1
EHV-1/-4 VN (SNT)	0	0	1
EHV-1/-4 IFAT	1	1	1
Respiratory diseases			
ERV-A/B CFT	43	0	1
Influenza HI	64	0	1
Gastrointestinal disease			
Adenovirus LFT	0	0	1
Rotavirus Antigen ELISA/Strip test/Lateral Flow	3	0	4
Rotavirus ELISA	0	0	1
Neurological disease			
WNV IgM ELISA (APHA)	8	0	1
WNV IgG (APHA)	0	0	1
Virus Detection			
Reproductive diseases			
EHV-3 PCR	2	1	2
EHV-3 VI	1	0	1
EVA VI (APHA)	0	0	1
EVA PCR	0	0	1
EVA PCR (APHA)	0	0	1
Papilloma virus PCR	5	1	1
Reproductive/Respiratory/Neurological diseases			
EHV-1 PCR	792	1	8
EHV-1 LAMP	17	0	3
EHV-1 VI	1	0	1
EHV-4 LAMP	17	1	3
EHV-4 PCR	792	39	8

EHV-4 VI	1	0	1
EHV-8 PCR	2	0	3
Respiratory diseases			
EHV-2 PCR	19	2	2
EHV-2 LAMP	3	1	1
EHV-5 PCR	19	0	2
EHV-5 LAMP	3	0	1
ERV PCR	1	0	1
Influenza PCR	469	7	8
Influenza PCR (APHA)	299	0	1
Influenza LAMP	18	0	3
Gastrointestinal disease			
Coronavirus PCR	96	4	1
Rotavirus PCR	0	0	1
Rotavirus-A PCR	12	2	3
Rotavirus-B PCR	12	0	3
Hepacivirus PCR	24	0	1
Parvovirus PCR	24	0	1
Neurological disease			
WNV (APHA) PCR	0	0	1

CFT Complement fixation test, CLs Contributing laboratories, EHV Equine herpes virus, EIA Equine infectious anaemia, ERV Equine rhinitis virus, EVA Equine viral arteritis, HI Haemagglutination inhibition, IFAT Immunofluorescence antibody/antigen test, VI Virus isolation, VN Virus neutralisation, WNV West Nile virus, LAMP loop mediated isothermal amplification
*Seropositives include vaccinated stallions, ⁺APHA now provides testing for West Nile Virus as part of clinical work up of neurological cases, to exclude infection on specific request, provided the local regional APHA office has been informed, ╫rising titre on paired sample consistent with vaccination history

Bacteriology

A summary of the diagnostic bacteriology testing undertaken by different contributing laboratories is presented in Table 6. The BEVA laboratory registering scheme is for the testing of CEM (*Taylorella equigenitalis)*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. Granting and maintenance of approval depends on a laboratory achieving correct results in quality assurance tests and reporting data to this report. BEVA publishes a list of approved laboratories annually. All 15 of the BEVA approved laboratories in the UK contributed data to this report.

Table 6: Results of bacteriological testing, October to December 2023

	Samples tested (n)	Positive (n)	CL (n)
Reproductive diseases			
CEMO *Taylorella equigenitalis/asinigenitalis* (BEVA) culture^	1226∞	0	16
CEMO *Taylorella equigenitalis* (BEVA) PCR	427	0	7
CEMO *Taylorella equigenitalis* culture (APHA)	2397	0	1
CEMO *Taylorella equigenitalis* PCR (APHA)	105	0	1
Taylorella asinigenitalis PCR	0	0	3
Taylorella asinigenitalis culture (APHA)	2397	0	1
Taylorella asinigenitalis PCR (APHA)	105	0	1
Klebsiella pneumoniae culture*	1229	8	16
Klebsiella pneumoniae PCR*	445	4	9
Klebsiella pneumoniae culture (APHA)*	69	0	1
Klebsiella pneumoniae capsule type-1 PCR	8	0	2
Klebsiella pneumoniae capsule type-2 PCR	8	0	2
Klebsiella pneumoniae capsule type-5 PCR	8	0	2

Pseudomonas aeruginosa culture*	1237	3	16
Pseudomonas aeruginosa PCR*	437	0	9
Pseudomonas aeruginosa culture (APHA)*	69	0	1
Respiratory diseases			
Streptococcus equi culture	1586	13	15
Streptococcus equi PCR	2258	103	9
Streptococcus equi LAMP	75	18	3
Streptococcus equi ELISA Antigen A/C (ISL) §	3888	446	5
Streptococcus equi ELISA M-protein (IDVET)§	569	67	2
Streptococcus zooepidemicus culture	1304	106	7
Streptococcus zooepidemicus PCR	739	161	4
Streptococcus zooepidemicus LAMP	0	0	1
Rhodococcus equi culture	680	2	7
Rhodococcus equi VapA PCR	21	1	1
Rhodococcus equi VapA ELISA#	8	3	1
Gastrointestinal disease			
Campylobacter culture	34	5	6
Clostridium perfringens PCR	17	2	1
Clostridium perfringens toxin ELISA	281	1	3
Clostridium perfringens Lateral Flow	61	6	3
Clostridium difficile PCR	26	0	2
Clostridium difficile toxin ELISA	211	17	3
Clostridium difficile Rapid test	64	3	6
Lawsonia intracellularis PCR **	105	15	4
Lawsonia intracellularis IPMA	68	31	2
Salmonella typhimurum culture	245	3	6
Salmonella typhimurum PCR	170	0	3
Salmonella typhimurum (APHA)	13	5	1
Salmonella spp culture¶	404	13	9
Salmonella spp PCR¶	157	4	5
Salmonella spp (APHA)	13	8	1
Enterobacter culture	1768	168	7
E. coli culture	1770	201	7
Miscellaneous			
MRSA culture	798	4	14
Borrelia burgdorferi PCR	5	0	2
Borrelia burgdorferi Lateral Flow	1	0	1
Borrelia burgdorferi ELISA	55	13	4
Burkholderia mallei (Glanders) CFT (APHA)	997	0	1
Leptospira ELISA	0	0	1
Leptospira PCR	4	0	2
Anaplasma ELISA	56	14	4
Anaplasma PCR	1	0	3

BEVA British Equine Veterinary Association approved laboratories, CEM contagious equine metritis (*Taylorella equigenitalis*), CFT complement fixation test, CLs Contributing laboratories, ICT immunochromatography, IPMA immunoperoxidase monolayer assay, LAMP loop mediated isothermal amplification, LF lateral flow, MRSA methicillin resistant *Staphylococcus aureus* †capsule type 1,2,5, ^*Taylorella asinigenitalis* and *Taylorella equigenitalis* are morphologically indistinguishable by culture and therefore if a sample is positive by culture, it should be screened for both species by multiplex PCR, *reproductive tract samples only, **§**seropositivity may be attributed to disease exposure, vaccination, infection or carrier states, #seropositives include exposure to the virulent form of *R equi* or the presence of maternally derived antibodies, **identified using PCR applied to faeces, ¶Under the Zoonoses Order 1989, it is a statutory requirement to report and serotype positive cases for *Salmonella spp*. A positive case may have repeat samples taken.™ All positives from same animal ∞The difference in numbers for *Taylorella equigenitalis/asinigentalis, Klebsiella* *pneumoniae, Pseudomonas aeruginosa* culture is due to the inclusion of general breeding endometrial swab samples that required aerobic culture only

APHA *Salmonella* results

Under the Zoonoses Order 1989 (as amended), it is a statutory requirement for laboratories to report suspect positive cases of *Salmonella* spp. identified in Great Britain to APHA. APHA will request material for testing at the National Reference Laboratory from anyone reporting a positive case in an equine. In some circumstances that may mean repeat samples will need to be taken.

Thirteen samples were submitted this quarter to the Animal and Plant Health Agency (APHA) and all were positive for *Salmonella*. From the incidents involving isolates typed by the APHA, the serovars/phagetypes reported were *S.* Typhimurium (5 isolates; 2 x DT75, 2 x DT99 and 1 x DT105) and single incidents of *S.* 4,5,12:b, *S.* Anatum, *S.* Braenderup, *S.* Fulica, *S.* Kingston, *S.* Kottbus, *S.* Newport and *S.* Paratyphi B variant Java.

S. Typhimurium DT105 primarily found in cattle and sheep whereas *S.* Typhimurium DT99 is usually associated with wild birds, as is *S.* Anatum. *S.* Newport and *S.* Kottbus are found in badgers and *S.* 4,5,12:b:-, *S.* Kingston and *S.* Paratyphi B variant Java may be associated with feed contamination. This wide range of associations highlights the zoonotic potential of *Salmonella* infections which is particularly important in companion animals such as horses.

For more information from APHA about *Salmonella* in Great Britain, please see the newly published 2022 *Salmonella* in animals and feed surveillance report
https://www.gov.uk/government/publications/salmonella-in-animals-and-feed-in-great-britain

Table 7: Results of toxicosis testing, October to December 2023

	Samples tested (n)	Positive (n)	CLs (n)
Equine Grass Sickness*	15	3	1
Atypical myopathy	1	1	1
Hepatic toxicosis - Ragwort	44	4	3
Hepatic toxicosis - Tyzzer's Disease	0	0	1
Hepatic Lipidosis	4	0	2
Hepatic Encephalopathy	2	1	2

*Please note that figures for EGS contained in the EGSF Report may differ to the number of cases reported here, which are laboratory reported cases only. The EGSF Report contains owner and veterinary surgeon reported cases.

Parasitology

A summary of parasitology testing undertaken by contributing laboratories is presented in Table 8 and Table 9.

Table 8: Results of endoparasitology, October to December 2023

	Samples tested (n)	Positive (n)	CLs (n)
Endoparasites			
Ascarids (flotation)	27636	133	16
Strongyles (Large/Small) (flotation)	27927	5946	17
Strongyloides (flotation)	27497	32	15
Anoplocephala perfoliate (Tapeworm) (flotation)	30212	86	14
Anoplocephala perfoliate (Tapeworm) (saliva ELISA)	18532	7328	1
Anoplocephala perfoliate (Tapeworm) (serum ELISA)	1351	313	1
Oxyuris equi (Pin worm) (flotation)	27769	2	10
Oxyuris equi (Pin worm) Tape strip	647	22	10
Fasciola hepatica (Liver fluke) (flotation)	28	2	8

Fasciola hepatica (Liver fluke) (sedimentation)	46	2	5
Fasciola hepatica (Liver fluke) (serum ELISA)	0	0	1
Dictyocaulus arnfieldi (Lung worm) Baermans	39	0	8
Cryptosporidia (flotation)	7	1	4
Cryptosporidia Snap test	9	0	6
Cryptosporidia PCR	0	0	2
Cryptosporida mZn	0	0	2
Giardia (flotation)	0	0	1
Giardia Snap test	5	0	5
Coccidia (flotation)	1858	1	10
Faecal egg count reduction test[é]	17	17	1
Theileria equi cELISA	22	1	1
Theileria equi (APHA) cELISA	778	4	1
Theileria equi (APHA) CFT	122	0	1
Theileria equi (APHA) IFAT	824	3	1
Babesia caballi cELISA	22	2	1
Babesia caballi (APHA) cELISA	778	1	1
Babesia caballi (APHA) CFT	122	2	1
Babesia caballi (APHA) IFAT	824	3	1
Dourine (APHA) CFT*	916	5	1
Dourine (APHA) IFAT	7	0	1

* CFT suspect/positive samples are then tested by IFAT and all were negative, CFT Complement fixation test, CLs Contributing laboratories, IFAT Immunofluorescent antibody test**,** mZn modified Ziehl-Neelsen stain, [é] <90% reduction

Table 9: Results of ectoparasitology testing and skin testing, October to December 2023

	Samples tested (n)	Positive (n)	CLs (n)
Ectoparasites			
Mange *Sarcoptes* scabiei	256	0	14
Mange *Chorioptes spp*	197	5	12
Mange *Trombicula spp*	256	0	14
Mange *Demodex equi*	256	0	13
Mange (other)	0	0	3
Lice *Damalinia equi*	186	6	11
Lice *Haematopinus asini*	207	1	11
Ringworm/Dermatophyte culture	80	8	10
Ringworm/Dermatophyte PCR	144	23	3
Ringworm/Dermatophyte microscopy	202	24	14
Dermatophilus culture	97	0	6
Dermatophilus microscopy	98	11	7
Candida *spp* culture	51	2	5
Candida *spp* microscopy	25	2	3
Habronema spp	0	0	1

International Collating Centre: Summary Report

(1 Oct. to 31 Dec. 2023)

The International Collating Centre (ICC), is overseen by Equine Infectious Disease Surveillance (EIDS) and is generously supported by contributions from Fédération Equestre Internationale (FEI), International Thoroughbred Breeders' Federation (ITBF) members, Japanese Racing Association and Lanwades Stud.

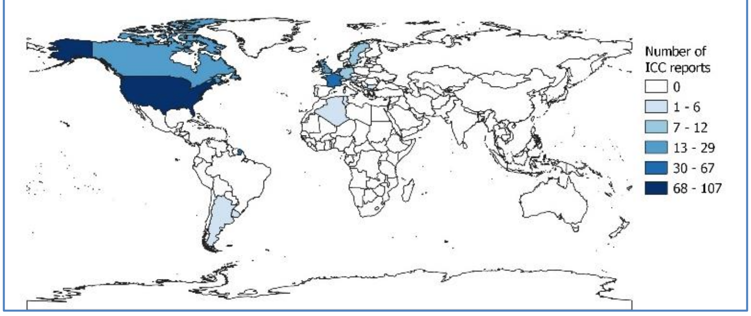
National and international equine disease outbreaks are reported on a daily basis by the ICC, through email alerts. Please contact equinesurveillance@vet.cam.ac.uk to receive these. There is also a website available that provides an interactive interface of these infectious disease reports and can be used to view current outbreak reports, https://equinesurveillance.org/iccview/.

This article provides a summary of international disease outbreaks during the fourth quarter of 2023. It should also be noted that additional summary reports were kindly received that included further information on disease occurrence for that country, but which had not been reported in previous real-time ICC reports. This additional information is identified by # in the tables and text, where relevant, throughout this report.

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 and subsequently reported. Consequently, these data do not necessarily reflect true infectious disease frequency within the international equine population. A country with no reported outbreaks of a disease does not necessarily equate to the disease not being present in that country. Each table below summarises the number of disease outbreaks reported by a country. Each reported outbreak may involve more than one animal.

During Q4 2023, the ICC shared 303 interim outbreak reports obtained from 16 countries (shaded on the map). Of specific diseases/infections reported, strangles (n=85), West Nile virus (n=62) and Equine Herpes virus-4 (n=51) had the highest number of reports

Country based locations of infectious disease occurrences reported by ICC during Q4 2023



Reproductive Diseases

Country	CEM	EHV-1
Germany	1	-
Japan	-	#3
Netherlands	-	2
South Africa	-	#1

#some cases reported by ICC after the quarter end

Contagious Equine Metritis (CEM)

Germany

One case of CEM was reported in an Icelandic stallion on a premises in North Rhine-Westphalia. Positive diagnosis was confirmed by PCR on genital swabs (glandular fossa, urethral sinus and surface of prepuce).

Equine Herpes Virus-1 (EHV-1) abortion

Japan

#Three outbreaks of EHV-1 abortion with single cases in vaccinated animals were reported after the quarter end. Positive diagnoses were confirmed by LAMP on fetal tissue.

South Africa

#One case of EHV-1 abortion was reported on a premises in the Western Cape, after the quarter end.

Netherlands

Two outbreaks of EHV-1 abortion with single cases in each were reported on premises in Friesland and North Holland, with the premises in North Holland having multiple resident pregnant mares. Positive diagnoses were confirmed by PCR.

Respiratory Diseases

Country	EHV	EHV-1	EHV-4	Influenza	*R. equi*	Strangles
Canada	-	-	-	1	-	9
France	-	-	18	1	2	11
Germany	-	-	1	-	-	-
Netherlands	-	-	17	4	-	29
South Africa	-	#5	#2	-	-	-
Sweden	-	#6	-	2	-	2
Switzerland	-	-	1	-	-	2
UK	-	-	13	4	-	-
USA	1	-	-	2	-	35

#some cases reported to ICC after the quarter end

Equine Herpes Virus (EHV) Respiratory Infection

United States of America

One case of EHV respiratory infection (type not provided) was reported on a premises in Bedford County, Tennessee. Control measures including voluntary quarantine were put in place.

Equine Herpes Virus-1 (EHV-1) Respiratory Infection

Sweden

Six outbreaks of EHV-1 respiratory infection were reported. One outbreak involved a single case on a premises in Östergötland County, one outbreak with two cases on a premises in Västra Götaland County and one outbreak with the number of cases not reported on a premises in, Vasternorrland County. Clinical signs included: cough, pyrexia and unilateral nasal discharge. Positive diagnoses in two of the cases were confirmed by PCR on nasal swabs. #Three outbreaks with single cases in each were reported after the quarter end on separate premises in Västmanland County and Västra Götaland County. Positive diagnoses were confirmed by PCR on nasal swabs.

South Africa

#Five cases of EHV-1 infection were reported in the following provinces: Gautent (three cases), Kwa-Zulu Natal (one case) and North West Province (one case), after the quarter end.

Equine Herpes Virus (EHV-4) Respiratory Infection

France

Eighteen outbreaks of EHV-4 respiratory infection were reported. Fifteen of the outbreaks involved single cases on premises in Calvados, Cote-d'Or, Haute-Garonne, Loire-Atlantique, Manche, Mayenne, Morbihan, Orne, Puy-de-Dome and Yvelines. Three of the outbreaks involved two cases on premises in: Aveyron and Calvados. Clinical signs included: cough, lymphadenopathy, nasal discharge and pyrexia. Positive diagnoses were confirmed in the majority by PCR on nasophayrngeal swabs.

Germany

One case of EHV-4 respiratory infection was reported in a six-year-old gelding on a premises in North Rhine-Westphalia. Clinical signs included: pyrexia and ataxia. Positive diagnosis was confirmed by PCR on a nasal swab.

Netherlands

Seventeen outbreaks of EHV-4 respiratory infection were reported with single cases in the majority on premises as follows: Gelderland, Friesland, Limburg, North Brabant, North Holland, South Holland, Overijssel and Utrecht. Positive diagnoses were confirmed by PCR.

South Africa

#Two cases of EHV-4 respiratory infection were reported on premies in Gauteng after the quarter end.

Switzerland

One case of EHV-4 respiratory infection was reported on a premises in the Canton of Geneva. The case had no clinical signs. Positive diagnosis was confirmed by PCR.

UK

Thirteen outbreaks of EHV-4 respiratory infection were reported with single cases in 11 of the outbreaks on premises in Cambridgeshire, Cheshire, Gloucestershire, Hertfordshire, Lincolnshire, North Yorkshire, South Western England, Stirling, West Sussex and Wiltshire and two outbreaks with two cases in each on premises in: Falkirk and Wiltshire. Clinial signs included: dry/harsh cough, inappetence, lethargy, lymphadenopathy, mucopurulent nasal discharge, ocular discharge and serous nasal discharge. Three outbreaks had cases with a co-infection of *Streptococcus zooepidemicus.* Ten outbreaks were confirmed by PCR on nasopharyngeal or nasal swabs, one outbreak was confirmed by PCR on guttural pouch and nasal washes and one outbreak was confirmed by LAMP (Loop-mediated isothermal amplification) on a nasopharyngeal swab.

Equine Influenza (EI)

Canada

One case of EI was reported on premises in the Regionaly Municipality of Durham, Ontario. Clinical signs included: persistent cough, mucopurulent nasal discharge and pyrexia. Several other animals on the premises had clinical signs consistent with viral respiratory infection.

France

One case of EI was reported on a premises in Mayenne. Clinical signs included: pyrexia; cough and nasal discharge. Positive diagnosis was confirmed by PCR on a nasal swab.

Netherlands

Four outbreaks of EI were reported with single cases in each on premises in Drenthe, North Brabant and Overijssel. Positive diagnoses were confirmed by PCR.

Sweden

Two outbreaks of EI were reported on premises in Skane County and Vastermanland County. The outbreak in Vastermanland County involved an unvaccinated animal recently imported from the UK.

UK

Four outbreaks of EI were reported. Three with single cases on premises in Norfolk, Lincolnshire and Staffordshire. One outbreak had two cases with both affected animals having a co-infection with *Streptococcus zooepidemicus* on a premises in Northumberland. Clinical signs included: cough, inappetence, lethargy, lymphadenopathy, nasal discharge, pyrexia and ocular discharge. Positive diagnoses were confirmed by PCR on nasopharyngeal swabs.

USA

Two outbreaks of EI were reported with single cases in each on premises in Tennessee and Washington.

Rhodococcus equi

France

Two outbreaks of *Rhodococcus equi* were reported with single cases in each on premises in Manche and Rhone. Positive diagnoses were confirmed by PCR on trachael wash in one case.

Strangles

Canada

Nine outbreaks of strangles were reported. Six outbreaks had single cases, two outbreaks had two cases and one outbreak had five cases and all outbreaks were on premises in Ontario. Clinical signs included: nasal discharge, pyrexia, submandibular abscesses and one case had pupura hemorrhagica.

France

Eleven outbreaks of strangles were reported. Nine outbreaks involved single cases on separate premises in Ain, Correze, Haute-Garonne, Haute-Savoie, Isere, Pas-de-Calais, Rhone and Sarthe. Two outbreaks involved two cases on premises in: Charente-Maritime and Cote-d'Or. Clinial signs included: cough, pyrexia, lymphadenopathy and nasal discharge. Positive diagnoses were confirmed by PCR on nasopahryngeal swabs/swabs/guttural pouch washes.

Netherlands

Twenty-nine outbreaks of strangles were reported on premises in Drenthe, North Brabant, North Holland, Overijssel, South Holland, Utrecht and Zeeland. Positive diagnoses were confirmed by PCR.

Sweden

Two outbreaks of strangles were reported on premises in Skane County and Sodermanland County.

Switzerland

Two outbreaks of strangles involving single cases were reported on separate premises in the Canton of Lucerne. Clinical signs included: lymphadenopathy, myopathy, pyrexia, respiratory tract signs and submandibular lymphadenopathy. Positive diagnoses were confirmed by PCR.

USA

Thirty-five outbreaks of strangles were reported, 32 of which involved single cases on premises in California, Florida, Kansas, Michigan, Mississippi, Tennessee, Washington and Wisconsin. Two outbreaks involved two cases on premises in Michigan and Washington and one outbreak involved three cases on a premises in Pennsylvania. Clinical signs included: difficulty swallowing, intermandibular abscess, lethargy, nasal discharge, ocular discharge, pyrexia, severe nasal discharge, swelling under jaw, submandibular abscess and submandibular lymphadenopathy.

Gastrointestinal Conditions

Country	Equine Coronavirus	Rotavirus	*Salmonellosis*
Argentina	-	1	-
Canada	-	-	2
Netherlands	3	-	7
USA	-	-	1

Equine Coronavirus

Netherlands

Three outbreaks of Coronavirus were reported on premises in Friesland, Overijssel and Utrecht. Positive diagnoses was confirmed by PCR.

Rotavirus

Argentina

One outbreak of Rotavirus A foal diarrhoea was reported in two vaccinated animals on a premises in Argentina. Positive diagnoses were confirmed by PCR.

Salmonellosis

Canada

Two outbreaks of salmonellosis with single cases in each were reported on premises in Quebec. Clinical signs included: pyrexia and diarrhoea.

Netherlands

Seven outbreaks of salmonellosis were reported on premises in Friesland, Utrecht and Overijssel. Positive diagnoses were confirmed by PCR.

USA

One case of salmonellosis was reported on a premises in Maryland. Clinical signs included: diarrhoea and pyrexia.

Neurological Diseases

Country	Borna	EEE	EHV-1	EHV-4	Rabies	WEE	WNV
Algeria	-	-	-	-	-	-	5
Argentina	-	-	-	-	-	[#]Multiple	-
Austria	-	-	-	-	-	-	1
Canada	-	7	5	-	-	-	5
France	-	-	-	-	-	-	24
Germany	-	-	-	-	-	-	[#]7
Netherlands	-	-	3	-	-	-	-
South Africa	-	-	[#]1	-	-	-	-
Sweden	-	-	1	-	-	-	-
Switzerland	1	-	-	-	-	-	-
Tunisia	-	-	-	-	-	-	1
USA	-	14	7	1	1	-	46
Uruguay	-	-	-	-	-	1	-

[#]some cases reported by ICC after the quarter end

Borna

Switzerland

One case of Borna disease was reported on a premises in the Canton of Braubunden. Non-specified central nervous system signs (CNS) were reported and positive diagnosis was confirmed at post-mortem through the identification of Borna disease viral DNA in CNS tissue.

Eastern Equine Encephalitis (EEE)

Canada

Seven outbreaks of EEE, each involving single cases, were reported on separate premises in Ontario, and Quebec. Clinical signs included: ataxia, depression, dullness, elevated respiratory rate, icteric mucous membranes, inappetence, neurological signs, pyrexia, respiratory signs and recumbency and inability to rise, seizing and staggering.

USA

Fourteen outbreaks of EEE, each involving single cases, were reported on separate premises in Arizona, Connecticut, Florida, Maine, New Jersey and New York. Clinical signs included: ataxia affecting fore and hindlimbs, cerebral signs, depression, disorientation, facial paralysis, falling, head pressing and incoordination.

Equine Herpes Virus-1 (EHV-1) Neurological Disease

Canada

Five outbreaks of EHV-1 neurological disease, each involving single cases, were reported on separate premises in Nova Scotia and Ontario. Clinical signs included: ataxia, dysuria, neurological signs nystagmus and recumbency.

Netherlands

Three outbreaks of EHV-1 neurological disease were reported on premises in Gelderland, North Holland and North Brabant. Clinical signs included: ataxia, colic, difficulty urinating, hypotonia of the tail, leg oedema and pyrexia. Positive diagnoses were confirmed by PCR.

South Africa

#One case of EHV-1 neurological disease was reported on a premises in Gauteng after the quarter end.

Sweden

One case of EHV-1 neurological disease was reported on a premises in Skane County. The premises contained approximately 30 horses of different breeds that were stabled indoors and free ranging outdoors, including pregnant mares. Most horses kept indoors presented with pyrexia during a 1-2 week period, but none of the free ranging horses outdoors were affected. No samples were submitted during this period. One week later a horse with pyrexia developed neurological signs of ataxia and sensitivity to stimuli and EHV-1 was confirmed with a positive PCR on EDTA blood, but a nasal swab was PCR-negative.

USA

Seven outbreaks of EHV-1 neurological disease were reported. Four outbreaks involved single cases on premises in; Maine, Missouri, Nevada and Pennsylvania. Two outbreaks involved two cases on premises in; Illinois and Oregon and one case involved three cases on a premises in Virginia. Clinical signs included: ataxia, cough, decreased coordination, encephalopathy, inability to stand, inappetence, lethargy, limb weakness, neurological signs, paresis, pyexia, recumbency, ventral oedema and urinary incontinence.

Equine Herpes Virus-1 (EHV-1) Neurological Disease

USA

One case of EHV-4 neurological disease was reported on a premises in California. Clinical signs included: anorexia, hindlimb ataxia, other neurological signs and pyrexia.

Rabies

USA

One case of rabies was reported on a premises in Tennessee.

Western Equine Encephalitis (WEE)

Argentina

#Multiple outbreaks of WEE were reported after the quarter end. This is a recurrence of an eradicated disease (not seen in the region since 1988). Clinical signs included: weakness, incoordination and drooping head. Samples were taken and sent for diagnosis, confirming the presence of an alphavirus. Specific additional laboratory tests confirmed equine encephalomyelitis (Western). To date, there have been approximately 1690 cases and 438 deaths. Positive diagnoses were confirmed by nested RT PCR and RT PCR.

Uruguay

DSA Technicians attended suspicious cases of WEE on several rural premises in Uruguay. Samples were taken and on 1 December 2023 and a case of WEE was confirmed on a premises in Salto. Clinical included: nervousness, convulsions, lateral recumbency, hypersensitivity, pyrexia, tachypnoea and tachycardia. The DILAVE continued to process samples and several areas were reporting animals with clinical signs.

West Nile Virus (WNV)

Algeria

Five outbreaks of WNV were reported with four outbreaks involving single cases on premises in: Barika, Doucen, El hadjab and Sisi Amrane and one outbreak involving two cases on a premises in Djamaa. Positive diagnoses were confirmed by ELISA.

Austria

One case of WNV was reported on a premises in Burgenland, Austria.

Canada

Five outbreaks of WNV were reported with single cases in each on premises in Ontario and Quebec. Clinical signs included: acute neurological signs, altered mental state, ataxia, facial paresis, head tilt, Horner's syndrome, hypersalivation, localised sweating, muscular fasciculations, nystagmus, stiffness and weight loss.

France

Twenty-four outbreaks of WNV were reported. Twenty-two outbreaks involved single cases on premises in; Bouches-du-Rhone, Charente-Maritime, Haute-Corse, Gers and Gironde, with two of the cases having a co-infection with piroplasmosis. One outbreak had two cases and one outbreak had eight cases, both on premises in Gironde. Clinical signs included: ataxia, difficulty moving, exhaustion, fatigue, inability to rise, neurological signs, paresis, pyrexia, recumbency and tremors. In the majority positive, diagnoses were confirmed by ELISA.

Germany

Seven outbreaks of WNV were reported with single cases in each on premises in Brandenburg, Lower Saxony, Saxony and Saxony-Anhalt Positive diagnoses were confirmed in two cases by ELISA. #Two of these cases were reported after the quarter end.

Tunisa

One outbreak of WNV was reported on a premises in Ariana. Clinical signs included: convulsions and paralysis. Positive diagnosis was confirmed by PCR.

United States of America

Forty-six outbreaks of WNV were reported with single cases on premises in California, Delaware, Florida, Kentucky, Maine, Michigan, Mississippi, New York, Oklahoma, South Carolina, Tennessee, Texas, Utah, Washington and Wisconsin. Clinical signs included: anorexia, ataxia, blindness, cranial nerve deficits, choke, convulsions, depression, head shaking, hypersensitivity, incoordination, muscle fasciculations, nasal discharge, proprioceptive deficits in front limbs, pyrexia, trembling and weakness in hindlimbs.

Miscellaneous Diseases

Country	AHS	Atypical myopathy	EIA	Glanders	Piroplas-mosis	Pigeon fever	VS
Armenia	-	-	-	1		-	-
Belgium	-	31	-	-	-	-	-
Bulgaria	-	-	1	-	-	-	-
Canada	-	-	2	-	-	-	-
France	-	68	-	-	-	-	-
Germany	-	1	-	-	-	-	-
Netherlands	-	1	-	-	-	-	-
South Africa	#4	-			#64		
Switzerland	-	1	-	-	-	-	-
USA	-	-	11	-	-	1	Multiple

#some cases reported by ICC after the quarter end

African Horse Sickness (AHS)

South Africa

#Four cases of AHS were reported on premises in Gauteng, after the quarter end. It was noted that AHS is endemic in South Africa except in the AHS controlled areas in the Western Cape Province.

Atypical Myopathy

Belgium

Thirty-one cases of atypical myopathy were reported on premises in Belgium. These cases were declared through the University of Liege's atypical myopathy surveillance network.

France

Sixty-eight cases of atypical myopathy were reported on premises in France. These cases were declared through the Universit of Liege's atypical myopathy surveillance network.

Germany

One case of atypical myopathy was reported on on the Swiss/Germany border. Positive diagnosis was confirmed by clinical diagnosis.

Netherlands

One case of atypical myopathy was reported in the Netherlands. This case was declared through the University of Liege's atypical myopathy surveillance network.

Switzerland

One case of atypical myopathy was reported on a premises in Switzerland. This case was declared through the University of Liege's atypical myopathy surveillance network.

Equine Infectious Anaemia (EIA)

Bulgaria

One case of EIA was reported on a premises in Valchedram. Positive diagnosis was confirmed by ELISA.

Canada

Two outbreaks of EIA were reported. One outbreak involved a single case on a premises in Thompson-Nicola Subdivision B.British Columbia and one outbreak involved two cases on premises in Grandview County, Manitoba.

USA

Eleven outbreaks of EIA were reported. Nine outbreaks involved single cases on premises in California, Georgia, Oklahoma and Texas. Two outbreaks involved two cases on premises in California and Texas. In three outbreaks, the affected animals were euthanased.

Glanders

Armenia

One case of Glanders was reported on a premises in Kotayk Region. Positive diagnosis was confirmed by bacterial culture.

Pigeon Fever

USA

One case of Pigeon Fever was reported on a premises in Snohomish County, Washington.

Piroplasmosis

South Africa

[#]Sixty-four cases of piroplasmosis, which is regarded as endemic in South Africa, were reported from seven of the nine provinces, after the quarter end, as follows: *B.caballi* cases: Gauteng (five cases), Western Cape (one case) and Limpopo (one case) – *T. equi* cases: Gauteng (27 cases), Kwa-Zulu Natal (one case), Mpumalanga (12 cases), Northern Cape (one case), North West Province (one case), Western Cape (14 cases), and Limpopo (one case).

Vesicular Stomatitis

USA

Since the start of the outbreak 317 VSV-affected premises have been identified (97 confirmed positive, 220 suspect) in three states, California, Nevada, and Texas. Three hundred and seven of these premises have had only equine species clinically affected, seven premises had only clinically affected cattle (Fresno County, San Diego County, and Santa Barbara County, California), two premises had both equine and cattle clinically affected (Fresno County and Mariposa County, California), and one premises had clinically affected rhinoceros (San Diego County, California). Texas identified two affected premises (two confirmed positive) in two counties (Maverick and Shackelford Counties). Nevada identified one affected premises (one confirmed positive) in one county (White Pine County, Nevada). Of the 317 total VSV-affected premises, 312 premises have completed the quarantine period with no new clinical cases and have been released from quarantine. Five (5) premises remain quarantined in California.

Update on emerging multidrug-resistant *Rhodococcus equi*

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Like any other bacterial pathogen, *Rhodococcus equi* (*R. equi*) does not escape the laws of natural selection and has developed resistance to the antimicrobials used in the treatment of rhodococcal foal pneumonia, aka foal rhodococcosis. Here we present a brief summary of the main aspects surrounding the recently identified multidrug-resistant *R. equi* (MDR-RE) that emerged in the US and the actions being taken to tackle the problem with support from the UK's Horserace Betting Levy Board (HBLB). The purpose of this brief update is to raise awareness of the impending risk of MDR-RE spreading to the UK, other European countries and further afield internationally.

What may signify that you are dealing with a macrolide (multidrug)-resistant *R. equi* and how to contribute to surveillance?

Clinical non-response: Lack of improvement or worsening of clinical signs despite appropriate antibiotic treatment.

Culture and sensitivity testing: Cultured *R. equi* strains show resistance to macrolides, rifampicin and multiple other antibiotics.

It's important to note that monitoring and testing of clinical cases by veterinary surgeons is crucial to promptly identify and address antimicrobial resistance issues. Additionally, the development of resistance underscores the need for ongoing research and the exploration of alternative treatment options, as well as the development of a potential vaccine. Surveillance contributions are essential for the success of these endeavours.

If during your work as a veterinary practitioner, laboratory scientist or horse breeder you identify or suspect you are dealing with a macrolide-resistant *R. equi*, please urgently get in touch with us at jvbgroup@ed.ac.uk.

Challenges in the treatment of rhodococcosis

R. equi is a soil-dwelling aerobic actinomycete that causes chronic pyogranulomatous infections in different animal species including humans. Young foals are particularly susceptible to *R. equi* and develop a life-threatening purulent bronchopneumonia with frequent intestinal involvement (1,2). Attack rates in affected farms may reach 10-20% or higher and a larger proportion of foals can be subclinically infected. Older foals and adult horses do not develop the disease but can carry *R. equi* in the intestine, where it can multiply (3). This is thought to be a major contributing factor to the dissemination of virulent (equine virulence plasmid pVAPA-positive) pools of the pathogen and farm endemicity (1-4). No effective vaccine is currently available (2,5). This is compounded by the fact that only few antibiotics have proven clinical efficacy against *R. equi* in foals (5,6). Consequently, the treatment of foal rhodococcosis has consistently relied since 1987 on the same antimicrobial therapy, a combination of a macrolide (erythromycin, later clarithromycin or azithromycin) and rifampicin (7,8). Resistance to this therapy was always likely to develop, and indeed it has.

Emergence and spread of macrolide-resistant *R. equi* in the USA

High-level macrolide resistance began to be detected in the late 1990's/early 2000's on horse farms in the USA where ultrasonographic screening of *R. equi* infection and mass antibioprophylaxis was the mainstay therapy that was practiced (8-12). The macrolide resistant isolates were also highly resistant to rifampicin. Although it was shown that most subclinical cases spontaneously cure even without antibiotic treatment (6,14), antibioprophylaxis continued to be practiced at many endemic stud farms, driving the spread of macrolide-rifampicin resistant *R. equi* among horse breeding farms across different US states (15).

Characterisation of macrolide (multidrug)-resistant *R. equi* (MDR-RE)

Research in Edinburgh in collaboration with US colleagues determined that the emerging macrolide resistance was mediated by a novel rRNA methylase gene, *erm*(46) conferring cross-resistance to lincosamides and type B streptogramins (the so-called MLSB phenotype) (16). *erm*(46) is carried on an 87-Kb conjugative plasmid, pRErm46 (17), transferable at high frequency (up to $10^{-2/-3}$/recipient) between *R. equi* strains and to other related actinomycetes (17, 18). The *erm*(46) resistance determinant is part of a 6.9-kb transposon, Tn*RErm46*, which can actively transpose onto the host genome. This has important consequences, because in this manner the *erm*(46) gene gets stabilized in *R. equi* (17). Moreover, since in every transposition round the original Tn*RErm46* copy remains in place, an increasing number of Tn*RErm46* elements can potentially accumulate in the *R. equi* genome. Together, this predicts a situation of considerable durability of the *erm*(46)-determined macrolide resistance even in the absence of antibiotic pressure. Tn*RErm46* can also transpose to the pVAPA equine virulence plasmid, thus physically linking two essential traits required for the colonization of a macrolide-treated equine host (17). This also has important implications because it means that the ability to both infect horses and to resist the treatment of foal pneumonia can be potentially transferred to environmental, non-virulent (pVAPA plasmid-devoid) *R. equi* strains all in one go.

Interestingly, despite the high horizontal transferability of pRErm46, the vast majority of the macrolide resistant *R. equi* isolates belong to the same strain, a specific clonal subpopulation named MDR-RE "2287" (after the designation of the prototype isolate kept in our laboratory in Edinburgh, PAM2287) (15, 17, 19, 20) (Figure 4). The presence in the MDR-RE 2287 isolates of a unique chromosomal *rpoB*S531F mutation conferring high-level resistance to rifampicin (17) explains this paradox. Under the dual macrolide-rifampicin selective pressure exerted by the combination therapy, the *rpoB*S531F mutation and the macrolide resistance determinant *erm*(46) are evidently co-selected, limiting the horizontal spread of the latter (and its pRErm46 plasmid vehicle) and effectively confining it to the chromosomal background of the *R. equi* 2287 strain (17) Thus, a veterinary pathogen and an equine infection have provided valuable clues that illuminate the causes and mechanisms underlying the emergence and expansion of the pandemic human pathogenic MDR clones (17). We have now detected pRErm46 in other *R. equi* genomotypes (either associated with different *rpoB* mutations – e.g. S531L, S531Y–, or without them), indicating that the pRErm46 plasmid has begun to spill across the equine-associated *R. equi* population (15, 21). pRErm46 plasmid loss with macrolide resistance linked to transposition of Tn*RErm46* onto the host genome has also been detected in some MDR-RE 2287 sublineages (15, 20) (Figure 4).

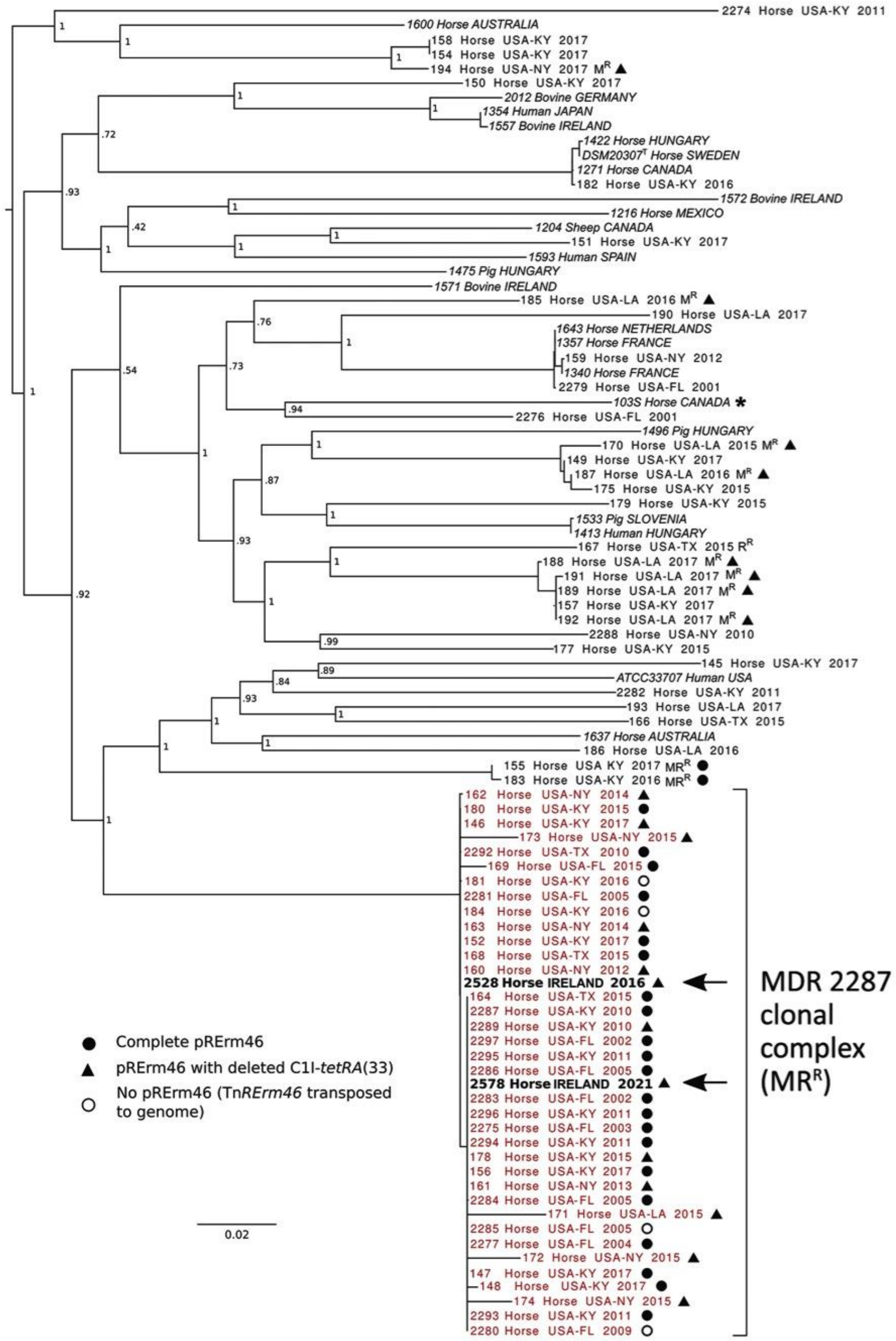

Figure 4. **Phylogenomic analysis of MDR-RE**. Core-genome Maximum Likelihood (ML) tree of 92 *R. equi* strains including 68 clinical isolates from the US and 23 global strains from a reference *R. equi* diversity set. Macrolide-resistant isolates include 36 members of the MDR-RE 2287 clonal complex (red labels) as well as isolates representing spillages of the pRErm46 plasmid to other *R. equi* genotypes. Resistance phenotype of the isolates is indicated with "M^R" for only macrolides and "MR^R" for macrolides and rifampicin. The symbols indicate the pRErm46 status of the strains (as per inset legend). Arrows point to two of the three MDR-RE 2287 isolates recently identified from Ireland. (Taken from ref. 21.)

Resistance / susceptibility spectrum of MDR-RE

Besides the macrolide resistance gene *erm*(46), pRErm46 also harbours a class I integron (C1I) specifying resistance to streptomycin and spectinomycin (*aadA9* cassette) and sulfonamides (*sul1* cassette) (21). An adjacent *tetRA*(33) element confers resistance to tetracycline and low-level resistance (but potentially clinically relevant for foals due to poor oral availability in foals) to doxycycline (15, 21), considered as a potential alternative to treat foal rhododoccosis (6). In addition, the genomic background of MDR-RE 2287 shows intrinsic resistance to chloramphenicol, meaning that the prototypic MDR-RE is resistant to at least eight antibiotics. However, about 30% of the MDR-RE isolates harbour pRErm46 variants with spontaneous deletions in the C1I and/or adjacent *tetRA*(33) locus, with loss of the corresponding resistances (sulfonamides-streptomycin-spectinomycin and/or tetracycline-doxycycline) (15, 20, 21). In a preliminary effort to identify clinically applicable antimicrobials to treat MDR-RE infections, a panel of 15 drugs against rapidly growing mycobacteria (RGM) and nocardiae and other aerobic actinomycetes (NAA) was used. MDR-RE isolates were found to be generally susceptible to linezolid, minocycline, tigecycline, amikacin and tobramycin according to *S. aureus* interpretive criteria (in the absence of specific guidelines for *R. equi*), plus imipenem, cefoxitin and ceftriaxone according to RGM/NAA interpretive criteria (21). Susceptibility to ciprofloxacin and moxifloxacin was borderline according to European Committee on Antimicrobial Susceptibility (EUCAST) criteria (21). Clinical efficacy studies are urgently needed to identify suitable alternatives to macrolides and rifampicin for the treatment of MDR-RE *R. equi* infection in foals.

Detection of MDR-RE 2287 outside the USA

Three *erm*(46)-positive isolates collected in 2015, 2021 and 2023 in Ireland and submitted to our laboratory for investigation have been recently confirmed as members of the MDR-RE 2287 clone (20), unpublished data) (Figures 5 and 6). Phylogenomic and microevolution marker analyses (pRErm46 deletions, see above) showed they are related to a specific MDR-RE 2287 subclonal lineage that likely originated in Kentucky and was also circulating in equine farms in New York state. This finding highlights the risk of global dissemination of MDR-RE with horse movements.

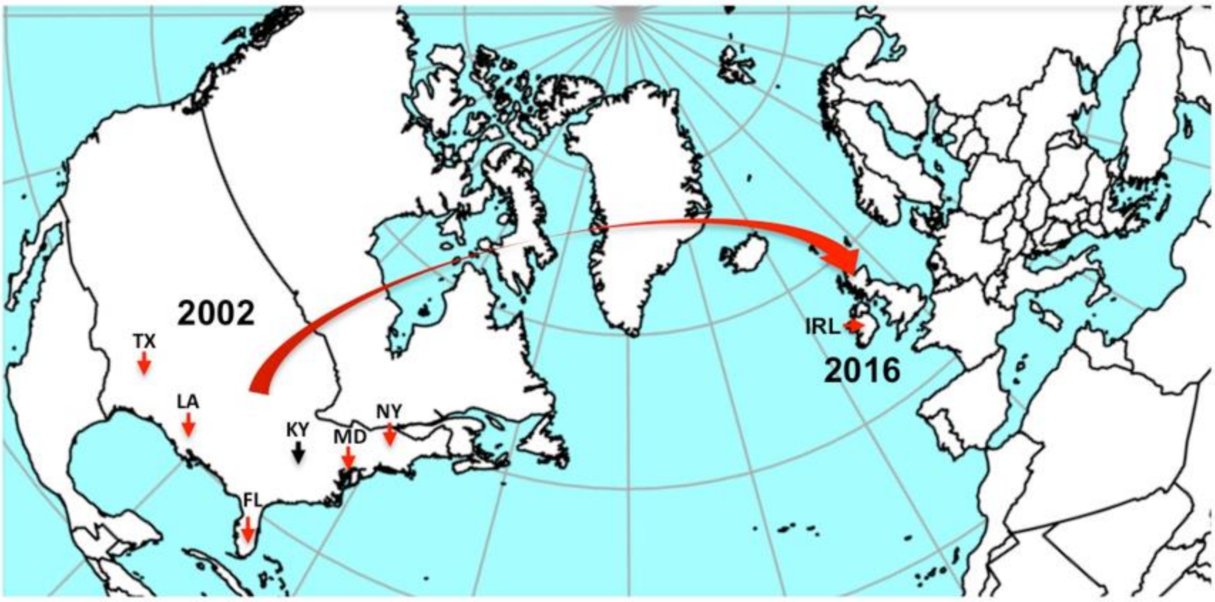

Figure 5. Transcontinental spread of MDR-RE. The geographical locations with genomically characterized MDR-RE isolations (as per refs. 16 and 21 and unpublished data) are indicated with red arrows; the black arrow points to Kentucky where the MDR-RE 2287 clone likely emerged. The indicated years correspond to the date of isolation of the earliest genomically documented members of the MDR-RE 2287 clone in the US and Europe (Ireland). Map modified from https://simple.wikipedia.org/wiki/Northern_Hemisphere

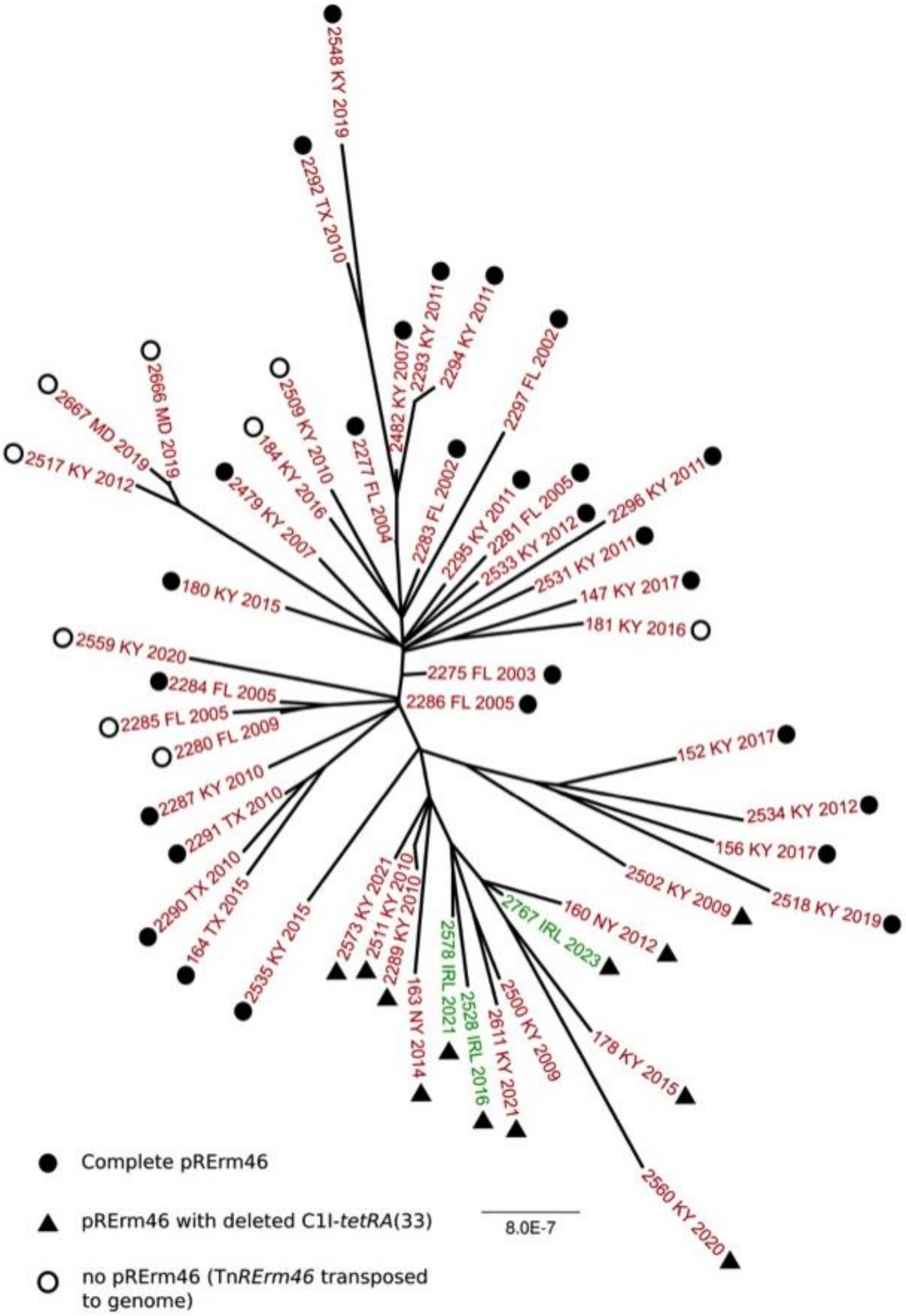

Figure 6. Clonal radiation of the MDR-RE 2287 population. Whole-genome phylogeny inferred from parsimony-informative sites using IQ-tree for tree reconstruction. The MDR-RE 2287 isolates only differ in a handful of DNA base pair changes (single nucleotide polymorphisms, SNPs) out of 5 millions base pairs (average difference between unrelated strains around 30,000 SNPs). The three isolates from Ireland (green text) belong to a distinct subclonal lineage with members identified in Kentucky (KY) and New York (NY), all characterized by carrying a pRErm46 plasmid with a deleted class I integron and associated *tetRA*(33) locus (indicated by a solid triangle).

A threat to Thoroughbred breeding requiring robust coordinated action

The emergence and spread of MDR-RE is a concerning, albeit expected development. MDR-RE renders the only clinically proven antimicrobial therapy against rhododoccal foal pneumonia largely ineffective, complicating the clinical management of this difficult-to-treat equine infectious disease. Once present in a country, eradication of MDR-RE is likely to be challenging given the horizontal transferability of the *erm*(46) genetic determinant and stabilization of the Tn*RErm46* transposon in the *R. equi* genome. Our genomic studies show that specific *R. equi* genomovars found in equine isolates are globally disseminated, likely reflecting international exchanges. Human pathogenic MDR clones become pandemic within only a few months after their emergence in a given country (22). Although at a much slower pace compared to the human pathogenic MDR clones because of the relatively smaller scale of horse travel, MDR-RE will unavoidably become globally disseminated if active international surveillance is not implemented immediately and measures identified to prevent its spread.

To this end and with the backing of the HBLB, an MDR-RE detection programme is currently being established involving an international network of laboratories adopting harmonised, cross-validated molecular detection tests, with the University of Edinburgh ensuring reference laboratory support. Please contact v.boland@ed.ac.uk or jvbgroup@ed.ac.uk for more details on joining the MDR-RE surveillance initiative.

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Details about post-mortem examinations were reported by six UK Veterinary Schools and three other contributing laboratories. Data from each laboratory is organised by the laboratories' regional locations. There may be more than one laboratory reporting information for each region.

East and South East of England

There were 41 abortions examined as follows:

- There were 31 umbilical cord torsions. Thirteen of these were a probable rather than definitive diagnosis. One case also had palatoschisis (cleft palate). One case also had a probable allantoic vascular infarction and one case had concurrent moderate urachal dilatations.
- One case was confirmed to be a result of twins.
- One case had increased cord length and early ischaemic necrosis of the cervical pole and palatoschisis.
- One case had ischaemic necrosis of the cervical pole.
- One case had staphylococcal placentitis, with the distribution suggestive of haematogenous route of infection.
- Six fetuses were examined with inconclusive diagnoses. Three were scavenged, one had a possible umbilical cord torsion, one was possibly due to maternal factors and one had no cause identifiable.

Three **cardiovascular** cases were examined as follows:

- One case was found to have aortic regurgitation and congestive heart failure.
- One case had suspected arrhythmogenic right ventricular cardiomyopathy.
- One case was found to have marked polyphasic myocardial necrosis, possibly secondary to sepsis.

Thirteen **gastrointestinal** cases were examined as follows:

- One case with pedunculated lipoma that had entrapped a segment of jejunum.
- One case of lymphoma affecting the small intestine.
- One case of idiopathic duodenal perforation and septic peritonitis.
- One case with a small colon impaction and perforation and was also found to have poor dentition with multiple diastemas.
- One case of acute colonic perforation, that was suspected to be secondary to distension/impaction.
- Three cases of caecocolic intussusception. One case had caecal inversion and concurrent severe necrohaemorrhagic typhlitis and within the caecal contents were numerous adult ascarids and encysted within the mucosal surface of the proximal colon were moderate numbers of larval cyathostomins. Both of the other intussusception cases were confirmed to be secondary to cyathostominosis.
- Three cases of typhlocolitis were reported. One case was associated with salmonellosis, cyathostomes, ascaridiasis, multifocal necrotising hepatitis (likely thromboembolic) and a miliary fungal pneumonia. One case had no specific aetiology identified. The third case also had marked multifocal eosinophilic enteritis and the cause of typhlocolitis was idiopathic.
- One case of colon volvulus.
- One case with a history of weight loss and protein losing enteropathy was examined. Gross post-mortem examination confirmed the presence of multiple white foci in the caecal serosa which extended into the muscular layer, thickening of the mid to distal jejunum with mucoid content and admixed yellow material, and enlarged mesenteric lymph nodes. The caecum was found to have a neutrophilic, histiocytic and eosinophilic submucosal typhylitis and myositis, vasculitis, and serositis, with abundant intralesional bacteria. An inflammatory and/or parasitic process was the most likely diagnosis but a neoplastic process could not be ruled out due to autolytic changes affecting the exam.

There were eight **musculoskeletal** cases examined as follows:

- Two cases with vertebral fractures. One case had an acute traumatic vertebral fractures of T3-4. One case had a chronic C1 fracture, with mild cervical spinal Wallerian degeneration.
- One case of laminitis.
- Three pelvic fractures were examined. One case had an acute ischial fracture leading to vestibulovaginal laceration and extensive blood loss. One case had a complex comminuted pelvic fracture, leading to haemabdomen and hypovolaemic shock. One case had a catastrophic pelvic fracture, with associated pre-existing stress fractures/periosteal new bone.
- One case with chronic pelvic osteomyelitis and abscessation confirmed to be caused by infection with *Streptococcus zooepidemicus*.
- One case had acute bilateral proximal femoral fractures (trochanteric) and sudden death associated with a suspected adverse drug reaction.

One **neurological** case was examined and found to have cervical vertebral compressive myelopathy.

One **respiratory/neurological** case was examined and found to have sphenopalatine sinusitis and peri-optic nerve microabscessation, leading to clinical signs of blindness.

One case of **sudden death** was examined and no definitive cause was identified.

Two **welfare** cases were examined. One was found to be emaciated, infected with tapeworm and cyathostomes, multiple oral diastemas/diastemata and lice. Faecal contents grew *Salmonella enterica* and *Campylobacter jejuni.* One case had mild to moderate larval cyathostominosis and emaciation.

Scotland

Three **gastrointestinal** cases were examined as follows:

- One case had an impaction of the large colon (right ventral and part of the left ventral colon). The case had a history of colic and equine grass sickness was not excluded as a diagnosis.
- One case had a pedunculated lipoma resulting in focal strangulation of the descending colon.
- One case of equine grass sickness, confirmed by histopathology.

Two **musculoskeletal** cases were examined as follows:

- A foal with a history of lameness had chondronecrosis of the trochlear ridge of the right talus with an intra-articular blood clot and an intra-lesional cartilage fragment with mineralisation within the right tarsocrural joint space. The case was also found to have oedema of the right superficial digital flexor tendon.
- One case that had died suddenly when exercising had a comminuted pelvic fracture with haemoabdomen and haemothorax..

One case of **neoplasia** was examined and confirmed to have an undifferentiated carcinoma of the mandible.

South West

Two **cardiovascular** cases were examined as follows:

- One case had a high septal defect.
- One case had verminous arteritis and a suspected pulmonary thromboembolism. The case had very poor bodyweight and marked endoparasitism.

One **gastrointestinal** case was examined as follows:

- This case was confirmed to have typhylocolitis and potentially enteritis too. The colon had a moderate to marked submucosal oedema and occasional thrombosis and microscopically there was a diffuse neutrophilic, eosinophilic and lymphoplasmacytic infiltrate. Faeces were positive for *Clostridium perfringens* by PCR and positive for *Escherichia coli* and *Enterococcus faecalis* by culture.

Five **musculoskeletal** cases were examined as follows:

- One case of polysaccharide storage myopathy-1 that had been diagnosed ante-mortem.
- Two cases of laminitis and chronic osteoarthritis.
- One case with overriding dorsal spinous processes and osteoarthritis of the hocks and coffin joints.
- One case had neck trauma with bruising around the brain and cervical spinal cord.

One case of **neoplasia** that was found to have an obliterating nasal tumour and mild aspiration pneumonia, histopathology results were pending.

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All laboratories contributing to this report operate Quality Assurance schemes. These schemes differ between laboratories however all the contagious equine metritis testing reported was accredited by BEVA with the exception of the APHA, which acts as the reference laboratory.

Agri-Food and Biosciences Institute of Northern Ireland
Animal and Plant Health Agency
Austin Davis Biologics Ltd
Axiom Veterinary Laboratories Ltd
Biobest Laboratories Ltd
BioTe
The Donkey Sanctuary
Donnington Grove Veterinary Group
Forth Valley Vets
Hampden Veterinary Hospital
IDEXX Laboratories
Liphook Equine Hospital
MBM Veterinary Group
NationWide Laboratories
Newmarket Equine Hospital
Oakham Veterinary Hospital
Rainbow Equine Hospital
Rossdales Laboratories
Royal Veterinary College
Sussex Equine Hospital
Three Counties Equine Hospital
University of Bristol
University of Cambridge
University of Edinburgh
University of Glasgow
University of Liverpool
Valley Equine Hospital
VPG (Veterinary Pathology Group) Exeter
VPG (Veterinary Pathology Group) Leeds
Westgate Laboratories Ltd

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We would welcome feedback including contributions on focus articles to the following address:
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