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Equine Infectious Anaemia in Devon (case EIA 2010/03)

National Emergency Epidemiology Group Epidemiology Report

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National Emergency Epidemiology Group

EPIDEMIOLOGY REPORT

Equine Infectious Anaemia
Case EIA 2010/03
DEVON
SEPTEMBER 2010

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Executive summary

1. A private veterinarian investigating clinical disease reported suspicion of Equine Infectious Anaemia (EIA) to Animal Health on Tuesday 8th September 2010. Following an investigation by Animal Health, EIA was confirmed in an 8 year-old horse on a smallholding in mid-Devon. The affected horse, one of three horses on the premises, was humanely euthanased on 11 September 2010.

2. Disease was detected during a period when transmission by recognised vector species of biting flies was possible. The horse showed clinical signs, which were in accordance with those of infectious anaemia. However, there are no clinical signs that are specific to EIA and the disease picture was complicated by the fact that there was evidence of exposure to the blood parasite *Theileria equi*, which can cause similar clinical signs. EIA virus tends to be transmitted during periods of clinical disease, so if the clinical signs were not caused by EIA, the likelihood of transmission of EIA is reduced. The risk of the reported case being infectious prior to the clinical disease was assessed as being very low.

3. Four other equidae were assessed as potentially exposed to infection during the period of clinical disease in the infected horse, two horses on the same premises and two donkeys within 200m of the grazing area of the infected horse. Investigations revealed all four to be clinically healthy and initial tests for EIA were negative. These animals were restricted and retested in December, to allow for the potentially long incubation period for EIA. These tests were also negative for EIA.. Two further horses (D and E) had been on the premises but left before Horse A became ill on 3rd September and were therefore assessed as at negligible risk of infection.

4. The origin of the infection is unclear. The horse was imported from Belgium in 2008 but investigations suggest that it may have originated from Romania. It is considered most likely that the horse was infected before it was imported into Britain. An alternative hypothesis of infection in Britain has been investigated and rejected based on substantial evidence.

5. Numerous movements of horses, including the infected horse, are believed to have occurred within the South West and between there and other parts of Britain since 2008. There is a significant number of horses in the region, ranging from low value ponies to high value racing thoroughbreds. The infected horse was actively participating in horse gatherings during its time at the premises but the probability that these movements spread infection is considered negligible as it was most likely infectious for only 8 days (3-11 September), and infection was not transmitted to the four equidae most at risk.

6. Risk mitigation measures, following confirmation of disease, are assessed to have minimised the risk of spread of EIA virus beyond the infected premises (IP), to negligible.

Detection of disease

7. Suspicion of disease in a single horse was reported to Animal Health by a private veterinary surgeon (PVS) on 8th September 2010. Clinical signs included pale mucous membranes, tachycardia, pyrexia, weight loss, lethargy and ventral oedema. A haematological profile showed anaemia and thrombocytopenia. Following a disease investigation by Animal Health, disease was confirmed by positive serology using the EIA agar-gel immunodiffusion test (EIA AGIDT, Coggins test).

Numbers infected and at risk

8. The affected horse (horse A) was one of three horses grazing in a single group on the premises. It was an 8 year-old cob gelding purchased locally in June 2008 from a group of imported horses. The horse had a Belgian passport but anecdotal information indicates that it may have originated from Romania although there is no documentary evidence to confirm or refute this information. The two other horses (B and C) remained alive and under restriction on the IP until the final tests to assess the likelihood of spread of infection from the case were completed with negative results.

9. Two further horses (D and E) had been on the premises but left before Horse A became ill on 3rd September. and were therefore assessed as at negligible risk of infection. Contact was made with their owners to explain the situation, the clinical signs of EIA and to confirm that the horses were not ill. Following this confirmation they are not considered further.

Table 1: Horses on the Infected Premises

Horses	Arrival date on IP	Departure date from IP
Horse A (INFECTED HORSE)	27/06/2008	11/09/2010 (Euthanized)
Horse B	July 2008	Still present on IP
Horse C	Late August 2010	Still present on IP
Horse D	March 2010	July 2010
Horse E	Companion to Horse A on rides and shared a horsebox on occasions, all prior to 3 September 2010.	

Overview of Infected premises

10. The IP was a smallholding of about 18.2 hectares (45 acres). The land comprised about 50% broadleaf woodland and 50% permanent pasture that included some poorly drained marshy areas. A stream ran along the eastern boundary with marshland with areas of standing water adjacent to it. The horses were used for

leisure riding and carriage driving trials and were managed in a traditional manner with paddock grazing over the summer. A stable block was used for housing over winter and occasional stabling over the summer. Supplementary feeding was with hay and proprietary equine concentrate feed. A path and bridleway along the eastern boundary of the premises was used sporadically by local riders.

Estimated date of infection or introduction to premises

11. There is some uncertainty surrounding the origin of infection and therefore the estimated date of infection. Two hypotheses were considered:

a) The affected horse may have been infected before it was imported from Belgium in 2008.

12. Whilst investigations by the relevant authorities in the UK have not yielded any firm evidence as to the original source of the infected horse, recently emerging evidence of a network of links between certain horse dealers, transporters and premises involved in other outbreaks of EIA within the EU, means that the possibility of this horse having been previously consigned out of Romania, where EIA is considered to be endemic, cannot be excluded. Investigations have failed to identify any previous testing of samples from the horse for EIA.

b) The alternative hypothesis is that of more recent exposure to virus.

13. This second hypothesis seems less likely because the two other horses (horses B & C) on the premises are EIA sero-negative and can be considered to be sentinels for the active transmission of infection. Although one of these horses was introduced on 21st August 2010, only 22 days before to being sampled and so had a much shorter period of potential exposure time to virus and therefore for seroconversion at the time of detection, it has also given negative results to the 90 day test.

14. In the majority of cases of EIA, antibodies are detectable by ELISA from day 35 after infection and by AGID from day 44. Further surveillance serology on two donkeys on contiguous premises within 200 m was also negative. On day 90 the two horses on the IP and the donkeys were still negative, which supported the assessment that the second hypothesis was the less likely of the two.

Potential and probability of spread

15. The spread of infection depends on the successful transmission of the virus from an infectious animal to a susceptible animal.

16. EIA is a blood borne labile lentivirus for which the primary route of infection is via mechanical transmission from viraemic horses by biting flies (*Stomoxys calcitrans and* Tabanidae) as a result of interrupted feeding.

17. The incubation period (time from infection to onset of clinical disease) for EIA typically varies between fourteen and forty two days (with a minimum of five days) although it may be considerably longer. In some cases of EIA, horses may not demonstrate any overt clinical signs of disease at all.

18. The time from first infection to the onset of infectivity to other horses is at least seven days but can be considerably longer. In the absence of clinical signs of disease horses appear to be non-viraemic and experimentally infection has not been transmitted even with as much as 250 ml of blood. In such cases most tests will fail to detect the presence of virus in the blood unless a horse shows clinical signs.

19. Horses with no clinical signs are not considered to be infectious under normal circumstances and to pose little threat for spread of disease to other equines. The infected horse showed no clinical signs suggestive of EIA until 3rd September 2010 so the probability that it was infectious before this was considered to be very low.

20. The evidence supporting this conclusion is that the owners of the horse were diligent in their daily observations and called their private veterinary surgeon even for what appear to have been minor problems. The private veterinary practice records are detailed and only described one episode of illness dated 23rd June 2010 with clinical signs that were <u>not</u> typical of EIA. A respiratory condition with muco-purulent nasal discharge and cough was described. The two other horses with horse A at that time, horses B & C, were reported to have recovered from a ‘mild cough’ with clear nasal discharge, indicating a shared infection. No anaemia was present during this clinical incident.

21. Evidence was found of exposure to infection with *Theileria equi*. In addition to a positive AGIDT result on the blood sample taken from horse A on 9th September, a positive result to the ELISA test for antibodies to *T. equi* was reported by the

Veterinary Laboratories Agency. Clinical signs are often non-specific and infected animals can remain infected for long periods of time. The similarity of clinical signs between T.*equi* and EIA makes it very difficult to differentiate between the two (or other diseases) as possible causes of the clinical signs described. Thus, uncertainty remains as to whether the horse ever had sufficient amounts of EIA in its blood to transmit the virus.

22. We considered the following potential transmission routes:

Spread by biting flies

23. The adult forms of the biting flies responsible for the potential transmission of the virus are active between May and October. It is considered that approximately 99% of horse flies would be expected to return to their original host to feed again after interruption of feeding if they were released when alternative hosts were at a distance of up to 160 metres. Therefore, a distance of 200 metres between infected and susceptible horses is generally accepted to adequately reduce the potential for transmission of EIA virus by horseflies.

24. Investigations were carried out into whether any other equidae were located within 200m of the location of the infected horse since 3rd September. Two were found which showed no clinical signs and which were sampled for EIA with negative results both during the outbreak investigation and again 90 days later.

25. The close contact horses (B and C) on the premises were also negative for EIA both during the incident and after 90 days.

Reproductive Infection

26. Reproductive infection through natural or artificial service or via the transplacental route is possible, but has rarely been demonstrated outside experimental conditions. There has been no reported breeding activity on the infected premises since horse A arrived.

Mechanical Transmission

27. Mechanical transmission of EIA virus by iatrogenic means or management practices that may facilitate the contact of infected blood with exposed mucosa and/or broken skin of susceptible horses (e.g. shared use of hypodermic needles or syringes) also constitute a potential risk, although there is no evidence that normal standards of good practice in cleaning and disinfection were not followed in relation to this case and therefore the likelihood is negligible. Incidents of injury have been investigated and none were reported to have involved open wounds or bleeding. Transmission may occur by means of the administration of contaminated blood or plasma products or hyperimmune serum. There are no reports of the use of such products in this case and the risk attributable to this route is negligible.

28. The affected horse had no direct contact with equidae on adjacent properties and there are no identified routes of transmission from the premises by fomites or shared equine or veterinary equipment. There have been some veterinary and regular farriery visits to the premises with very low risk of iatrogenic transmission to other horses on the premises and negligible risk to equines on other premises.

29. The infected horse had sporadic short term contact with numerous other horses at many different locations on an occasional basis since its arrival at the premises in 2008 and more prolonged contact with a few horses. In many cases these contacts will have been in environments and during periods when suitable vectors would be active. However, the risk of virus transmission during these periods from a clinically healthy, non-viraemic horse would be considered to be very low. The risk period for virus spread is considered to be from 3rd September 2010 when the first signs of weakness that may be associated with the onset of clinical disease were identified. There has been no contact with equidae other than those on the IP after that date.

Assessment of spread risk

30. The premises was in rural mid-Devon which consists predominantly of livestock farms with a high density of cattle, both beef and dairy, and sheep. There is also a large equine population in the region. Many horses are kept for leisure riding but there are larger stables of high value eventing and racing horses and stud farms within the region. There are horse racing tracks at Exeter and Newton Abbot. Hunting, pony club and point-to point events take place in the region. There are also horse sales, including annual autumn Dartmoor pony sales at Tavistock and Chagford.

31. This means there was a significant equine population in the region and many movements both within the region and to and from others throughout the year that could result in the spread of infection by an infected horse. However, this equine population is subject to monitoring by veterinary practitioners and therefore symptoms suggestive of EIA infection are likely to have been detected if the infection was widespread. Since the case horse never previously showed clinical signs of infectious anaemia and would have been unlikely to participate in these gatherings if ill, the risk of spread to other via these activities is considered negligible.

Surveillance strategy and summary of results

32. Tracing and surveillance was assessed to be required on any premises with equidae within 200 m of where horse A had been kept since clinical disease started on 3rd September 2010. All other contacts, contiguous premises and areas at risk of potential exposure to virus were assessed as either being after

the time Horse A was most likely to have been infectious or having negligible risk of disease transmission from the infected horse.

Table 2: Summary of EIA surveillance activity

Surveillance target	**Clinical inspections**	**EIA AGIDT - immediate**	**EIA AGIDT – 90 day**
On IP – One infected horse	**Disease suspected**	**Positive**	Not applicable
On IP- Two in-contact horses	Disease not suspected, monitored for 90 days.	Negative	Negative
200m surveillance zone– two donkeys	Disease not suspected, monitored for 90 days.	Negative	Negative
Other potentially at risk horses at IP: Movements on / off after 3rd September 2010	None identified; no further action.		

Table 3: Risk mitigation measures

Risk factor	**Risk source/target**	**Mitigation measures**
Transmission of virus by insect vector or direct contact.	Infected premises**:** EIA positive horse A Horses B & C	 Destruction & disposal of EIA antibody positive horse A. Restrictions on premises on movements of horses B and C. Horses B & C blood sampled with negative results to the EIA AGIDT and show no clinical signs of EIA. Owner obligation to report any clinical suspicion of disease to Animal Health. Insecticide treatment applied to horses B & C and their accommodation.
Indirect transmission	Infected Premises	Controlled disposal of carcase with cleaning & disinfection of stable.

of virus by fomites or mechanical means.		
Vector transmission from IP.	Equidae resident within 200m of horse A during the period of clinical illness.	All equidae within 200m identified, clinically inspected, restrictions served and blood sampled for AGID testing. (two donkeys only)
Vector transmission from IP.	Equidae passing within 200m of horse A during the period of clinical illness.	Voluntary closure of public bridleway during the time of vector activity.

Remaining uncertainties

33. The origin of the infection remains uncertain as does the origin of the infected horse. Further investigation is unlikely to resolve either. However, the likelihood of this being within Romania is high as questioning of the owner and previous keeper and importer of the horse consistently suggested the possibility of Romanian origins.

34. Whilst investigations by the relevant authorities in the UK have not yielded any firm evidence as to the original source of the infected horse, recently emerging evidence of a network of links between certain horse dealers, transporters and premises involved in other outbreaks of EIA within the EU means that the possibility of this horse having been previously consigned out of Romania, where EIA is considered to be endemic, cannot be excluded. Investigations have failed to identify any previous testing of samples from the horse for EIA.

35. There is a period of about two months between arrival in the UK and being bought by the current owners where it has not been possible to fully investigate for possible episodes of clinical illness attributable to EIA. The owner of the stables where the horse was kept recalled that the horse had ringworm but was otherwise well. It is not clear whether the clinical disease which started on 3rd September 2010 in the infected horse was attributable to EIA, T.*equi* infection, a combination of either infections, or some other pathological process.

Assessment of extent of spread beyond the IP

36. The risk of spread of disease beyond the infected premises is considered to be negligible based on the absence of clinical signs of disease before 3rd September, the limited number of equidae identified as being at risk during between 3rd and 11th September 2010, the absence of positive serology among the highest risk contacts, the risk mitigation measures put in place and the results of field epidemiological investigations,.

37. Restrictions on the IP were lifted on 21st December 2010.

National Emergency Epidemiology Group

December 2010

Appendices

A. Hypotheses for the source of infection

Rank	Possible source	Evidence	Uncertainty	Retain / reject
1.	Infection acquired whilst in Europe, probably Romania, prior to importation into Belgium & UK.	Circumstantial only. Consistent hearsay evidence. Consistent with horse originating in an EIA endemic region.	No definitive proof of origin of horse. No corroborating documentation.	Retained as most plausible source in the absence of proof of alternative.
2	Infected (in UK)from other horses via flies	None, no evidence of disease in the local or regional equine population. Potential vectors are common.	Limited surveillance for EIA in the general equine population. Possibility of undetected infection remains.	Rejected because no evidence to support and substantially less likely than (1).
3	Infected (in UK) from other horses via fomites such as blood/secretions – e.g. teeth rasping, horse bites	None.	Some relating to farrier biosecurity.	Rejected because no evidence to support and substantially less likely than (1), & appropriate biosecurity measures are in place.

Most likely source: Circumstantial evidence points to horse A originating from Romania, where EIA is endemic, prior to importation into UK via Belgium and currently there is a lack of evidence to support the alternative hypotheses.

B. Detailed Chronology of Events

Date	Event	Significance
2002	Birth year, according to veterinary assessment.	Approximation based on dentition (at this age this should be accurate to within one year).
05/04/2004	Birth date, according to passport – issued 14/04/2008.	This birth date is not reliable – see below.
unknown	Suspected export from Romania, - believed to be one of a batch of 18 horses?	Source of infection? But not possible to verify.
14/04/2008	Passport issued in Belgium.	No reliable birth details.
16/04/2008	Export certificate issued from Belgium & imported on the same day to dealer premises in South Devon. Two ITAHC documents correspond to a batch of 18 horses (all cob breed) consigned by the same exporter.	No post-import checks done.
27/06/2008	Purchased from the dealer at a premises in N Devon. Resident at these premises for approximately 3 weeks.	No significant illness or health concern at this time, though keeper recalled ringworm infection.
01/07/2008	Introduction of Horse B imported from Netherlands and purchased out with Hatherleigh Horse Sales	
13/01/2009	Horse A -Injury on withers treated by private vet. Open wound but outside vector period.	Very low risk of spread.
11/03/2009	Horse A-Teeth rasped by private vet. Routine cleansing and disinfection procedures.	Very low risk of spread.
19/10/2009	Overnight 'sweats' – outside & rugged. Conversation with private vet (telephone call) & advice sought.	No significant illness or health concern at this time.
01/05/2010	Teeth rasped by private vet – as above.	Very low risk of spread.

23/06/2010	Cough & purulent nasal discharge. No pyrexia. Private vet examination & blood sample. Symptomatic treatment only. History of cough in other horses on IP (horses B & D).	Mild upper respiratory tract infection of short duration. Low risk of association with EIA viraemia.
26/06/2010	Blood sample report – no anaemia.	
21/08/2010	Introduction of horse on loan (horse C) 13 days prior to clinical signs started in horse A.	Very low risk of being source of virus.
03/09/2010	Horse A stumbled on ride to village 3-4 km away. Some superficial damage to skin but no blood loss. Found difficulty keeping up with other horses. All three horses (A, B & C) stabled overnight and turned out following morning.	Most probably the first signs of illness and increased risk of viraemia although other tests had revealed an alternative explanation for the anaemia. (piroplasmosis).
07/09/2010	Owner noticed oedema of prepuce. Immediately called PVS who visited & blood sample taken.	Initiation of disease investigations.
08/09/2010	Private veterinary laboratory blood sample report. VO report case, restrictions served.	Anaemia & thrombocytopenia
09/09/2010	VO report case second visit. Clinical examination and blood samples taken.	Extensive ventral oedema, tachycardia & anaemia noted.
11/09/2010	EIA confirmed by CVO on positive EIA serology. Horse A euthanased. In contacts, horses B & C, blood sampled.	Notice to slaughter served.
12/09/2010	Horse A carcase transported and PME at VLA Weybridge.	Contained removal of infected horse.
13/09/2010	Serology results for two in-contacts (B & C) were negative.	No indication of spread to the in-contact animals .
15/09/2010	Two donkeys on at risk contiguous premises within 200m inspected and blood sampled.	Risk based surveillance for local spread of infection.
17/09/2010	Serology results for two donkeys negative.	Reduced risk of viraemic case and spread of virus.
15/12/2010	Horses B and C resampled after 90 days	Equidae assessed as at risk restricted for 90

16/12/2010	Two donkeys resampled after 90 days	days to be sure that they will have sero-converted if infected
20/12/2010	4 re-samples tested with negative results	No spread of virus to equidae at highest risk of infection (on IP or within 200m surveillance zone)
21/12/2010	Restrictions lifted	No further risk of spread from this incident

C. Risk terminology used in this report (EFSA, 2006)

'Risk' in this report follows the epidemiological definition of likelihood or probability, and does not include the impact or consequences of infection. References to levels of risk in this report refer to probability outcomes, and follow this terminology:

Negligible	So rare that it does not merit to be considered
Very low	Very rare but cannot be excluded
Low	Rare but does occur
Medium	Occurs regularly
High	Occurs very often
Very high	Events occur almost certainly

D. Abbreviations / glossary

AGIDT	Agar Gel Immunodiffusion Test
Coggins' test	Specific AGIDT for EIA
EIA	Equine Infectious Anaemia
ELISA	Enzyme-Linked Immunosorbent Assay
IP	Infected Premises
PVS	Private Veterinary Surgeon
WBC	White Blood cell Count