EQUINE INFECTIOUS ANAEMIA:

POTENTIAL RISK FACTORS FOR THE INTRODUCTION OF THE VIRUS TO THE UNITED KINGDOM FROM EU MEMBER STATES

An Update

Working Document

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<tr>
<td>1</td>
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<td>14/09/2006</td>
</tr>
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<td>2</td>
<td>Various updates throughout document, following increase in reported outbreaks in EU Member States, including the UK.</td>
<td>05/02/2010</td>
</tr>
<tr>
<td>3</td>
<td>Various updates throughout the document following further expert consultation and legislation and information received.</td>
<td>08/03/2010</td>
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2 Summary

EIA has been recently reported from some EU Member States. Historically, most of these Member States reported only a limited number of cases. In the recent past, there seems to be an increase in reported cases from Romania and Italy. The most recent report was from Belgium at the beginning of February 2010. This was first ever reported case from Belgium.

In this paper we consider several aspects of EIA in the EU and possible introduction to the UK in the context of recent epidemiological developments, monitoring and surveillance (e.g. evidence of absence), trade in equidae and equine products (both legal and illegal) and non-discriminatory post-movement checks for compliance purposes with certification. The paper also considers some aspects of further spread should the disease be introduced.

In terms of the epidemiological developments in the EU over the past few years, we consider overall it would be likely that EIA might be present, and undetected in some EU Member States, at a low level in the population of equidae not subject to close monitoring or testing. This would be likely to vary between Member States subject to the existence of national rules and the levels of monitoring and surveillance for EIA.

In terms of the UK, we consider that there would be a very low likelihood that EIA may be present and undetected in the UK equine population. We base this consideration on a large population of high value competition horses in the UK, which are normally subject to very close monitoring. Thus, a disease with even a low proportion of acute cases would be unlikely to remain undetected, particularly during the summer when horse flies are active and geographic spread can occur. Any chronic or acute disease would impact on performance of such horses and is likely be pursued to diagnosis.

In the context of monitoring and surveillance, the current EU rules do not require Member States to carry out active surveillance for EIA. This also may vary between Member States, which adds to the uncertainty about evidence of absence. For example, we currently understand that both Romania and Italy have active surveillance programmes in place for EIA (European Commission, 2009), while such surveillance does not exist in other EU Member States.

Overall, in terms of legal trade, EU and the UK national rules, and possible pathways for the introduction of EIA to the UK, we consider that:
a) There would be a low likelihood of the introduction of EIA via legal trade in live equidae. This is based on:

i. The current epidemiological developments,

ii. Uncertainty about the EIA status in the EU Member States;

iii. The level of movement of registered equidae (i.e. moving anywhere in the EU accompanied by a veterinary attestation stating absence of EIA on the holding of dispatch), equidae that come under the Tripartite Agreement (i.e. moving freely between France, Republic of Ireland and the UK without any attestation of the health status of the holding of dispatch), and unregistered equidae (i.e. requiring to move with health certification attesting the EIA absence on the holding of dispatch);

iv. Requirement for testing of live equidae to confirm disease freedom (two clear teats of all horses on the holding, 90 days apart) prior to movement from previously affected holdings, or

v. Specific animal health requirements under Romanian national legislation (European Commission, 2009) including chip-identification and compulsory testing for EIA in all equidae, including those leaving Romania for another Member State (including the UK), and veterinary certification of movements of equidae from Romania to other Member States.

vi. UK implementation of post-movement testing to confirm compliance with certification requirements and attestations (as permitted in EU law) is very likely to identify infected horses, thus significantly limiting potential for further spread by early detection of isolated cases from Romania;

b) There would be a low risk of virus being legally introduced to the UK in contaminated biological products. The use of such contaminated substances over a wide area would provide a multifocal means of introduction. However the production conditions for equine blood products have been reviewed recently and will take into account these risks.

c) We consider that the likelihood of introduction of the virus by equine germplasm would be negligible. This risk has also been further reduced in the case of donor mares used for collection of embryos following the amendment to the EU rules (92/65/EEC) in 2007 and
recently in 2010 (amendment 176/2010/EEC) (European Commission 2010). The use of stallions for natural mating or semen collection is not covered by EU rules, unless the semen is being collected to be traded between Member States in which case the semen has to be collected in an approved centre and rules to protect against EIA apply. If such semen is collected outside an approved centre and traded, this would be illegal and could pose a risk of transmitting EIA.

d) It is difficult to determine the level of risk of introducing disease via illegal movements of equidae or illegal use of contaminated biological products, or germplasm.

Should the virus be introduced to the UK via live equidae, we consider that the further spread would greatly depend on the following:

a) If infected equidae remain undetected, we consider that further iatrogenic spread may occur throughout the year if unhygienic practices (e.g. use of contaminated hypodermic needles and surgical equipment) take place, or if there are movements of infected equidae and any contacts that may subsequently become infected. This spread may be either limited, or result in disease being disseminated over larger geographic areas in the UK depending on the level of movement of infected horses and distances they travel.

b) Further spread may also be seasonal (e.g. during the summer season) if it is related to the presence of an infected equidae and the abundance of biting flies under favourable environmental conditions. Biting flies (e.g. stable and horse flies) are widely distributed and most active and abundant in the summer months. However, it is known that the spread of virus is only associated with interrupted feeding of such flies, which are thought to have relatively short flying times and the virus has a limited survival time in the mouth parts of those insects, thereby limiting the range of mechanical transmission to relatively confined areas.

3 Introduction

This qualitative risk assessment considers the likelihood of the introduction of equine infectious anaemia (EIA) virus via various pathways to the UK through intra-Community trade and the
likelihood of further spread through the British equine population. This is an update of our previous Qualitative Risk Assessment in 2006 (Defra, 2006) and preliminary outbreak assessments in 2009 and 2010 (Defra, 2009, Defra, 2010).

Unless otherwise stated, this document summarises official information received from the World Organisation for Animal Health, Paris, France (http://www.oie.int/eng/info/hebdo/A_INFO.HTM) and the European Commission, Brussels, Belgium (Animal Disease Notification System, Weekly Reports, CVO Emergency Notifications, SANCO Documents). It covers the period from January 2007 to present day.

Maps were produced using ESRI Data and maps CD – 2002 and are for visual purposes only. This document primarily addresses the likelihood of the introduction of EIA from the EU Member States to the UK equine population and possible consequences of disease introduction to the UK equine industry.

4 Hazard identification

EIA is a viral disease of equidae such as horses, mules and donkeys. The disease is also known as "swamp fever" because it occurs typically in low-lying swampy areas. EIA is a notifiable disease in the EU including the UK.

The EIA status of most of the equine population in the EU remains largely unknown and may vary considerably from state to state. This may not be the situation for registered equidae such as pedigree horses, and horses holding an International Equestrian Federation (FEI) passport in a few Member States that follow a voluntary Industry Code of Practice for EIA. These horses are normally very closely monitored for health, breeding and performance reasons, including occasional testing for EIA.

In the UK, prior to the recently detected outbreak in horses imported from Romania via Belgium, EIA was last confirmed in England in 1976 and in Northern Ireland in 2006. Since then, accumulated evidence suggests no presence of EIA in the UK equine population. This evidence is based on prompt investigation of suspected cases and statutory testing for import and export purposes (i.e.
scanning surveillance), rather than an active surveillance programme. This also applies to most Member States where active surveillance for EIA is not being applied. Scanning surveillance has been considered sufficient in a country with no EIA outbreaks.

In general, when a case of EIA is confirmed in EU, EU rules are clear about the regulation of movements and testing of equidae from such affected premises. By applying such rules, most historic cases of EIA in the EU Member States have been demonstrated to be of limited nature.

4.1 European Union

Several EU Member States have reported disease from January 2007 to date. Most of the cases have been reported from Romania and Italy. Sporadic cases were reported from some other EU Member States (e.g. France, Germany, Slovenia), however, these cases appear to have been effectively dealt with. For outbreaks earlier than 2007, please refer to our previous risk assessment (Defra, 2006). Most recently EIA has been reported for the first time ever in Belgium, in an imported horse from Romania.
Current outbreaks, as reported to the EU Animal Disease Notification System (ADNS), as of 2nd March 2010:

4.1.1 Belgium
Belgium has reported EIA for the first time ever, in a horse in West Flanders. The horse was part of a consignment from Romania which travelled to Belgium in October 2009. Part of the same consignment moved to the UK where EIA was detected following positive post-movement tests on two of these horses (Defra, 2010).

4.1.2 France
In 2009, France reported three outbreaks in the Var region and fourteen outbreaks in 2007-2008 in the Ardeche. The disease is notifiable to the OIE and under the Tripartite agreement (TPA) between France, Ireland and the UK, each country has agreed to notify the other in the event of an outbreak.

4.1.3 Germany
In 2009, Germany reported four outbreaks of EIA in Wunsiedel, Zollernalkbreis and Kulmbach regions. In 2007-8 Germany reported 12 outbreaks to the EU ADNS and OIE in various regions.
Although the UK has no specific trade agreement with Germany, there are a lot of horse movements between the two countries.

4.1.4 Croatia
Croatia has only recently started to notify outbreaks of EIA to the EU ADNS. Although not yet an EU MS, Croatia are hoping to join the EU in the future and their current disease status will have a bearing on their membership. In 2009, there have been nine outbreaks in various regions. In 2008, 18 outbreaks and in 2007 thirty seven seven outbreaks.

4.1.5 Italy
In 2007, Italy reported 361 outbreaks to the EU ADNS; in 2008 334 outbreak and in 2009, 140 outbreaks. According to the Italian Authorities (personal communication), in 2007 seven horses originating in Romania were identified as positive for EIA during routine slaughterhouse surveillance. In 2009, that number was just three. Italy implements an active surveillance programme for EIA. Under UK national rules for post movement testing for compliance purposes, equidae that have spent a period of residency in Italy during the previous 12 months are tested for EIA.

4.1.6 Romania
Romania joined the European Union in 2007. During 2006, the Romanian authorities reported 22 outbreaks. In 2007, Romania reported 795 outbreaks, in 2008; 128 outbreaks and in 2009; 135 outbreaks. According to a recent FVO mission, serosurveillance however suggests that disease is more widely spread throughout the country than these results might indicate (European Commission, 2009). According to the European Commission FVO mission (2009) Romania also has an accelerated eradication system for EIA under which regular monitoring of all horses over six months of age takes place twice a year. Horses confirmed to be infected are isolated and slaughtered and the holding is placed under movement restrictions until two negative tests six months apart (European Commission, 2009). Under UK national rules for post movement testing for compliance purposes, equidae that have spent a period of residency in Romania during the previous 12 months are tested for EIA.
4.1.7 Republic of Ireland

In 2006, Ireland first reported an outbreak of EIA, in County Meath, followed by two more in Meath and Kildare. The following month, eleven more outbreaks were reported and fourteen more over the following five months.

Epidemiological investigations into the outbreaks suggested disease was transmitted in several cases by shared needles between horses, as used by veterinary surgeons attending. It was also believed that the source of the disease was contaminated plasma illegally imported from Italy for treating bacterial infection in foals (Cullinane and others, 2007; Quinlivan and others, 2006). It has been suggested that the virus in this illegal plasma product may have originated in Eastern Europe (Mooney and others, 2006).

Mandatory testing for thoroughbred sales during the summer of 2006 and the mandatory testing of all mares to be covered (two tests, one taken in the 1st January 2007 and the second within 28 days of transport to studs) was carried out. No further infected horses were detected after December 2006 (Cullinane and others, 2007).

4.1.8 United Kingdom

Northern Ireland also reported an outbreak in 2006, linked to the temporary residence in Northern Ireland of an infected mare and foal from the Republic (Menzies and others, 2006). A second foal in an adjacent field was also infected apparently by the bite of an infected Tabanid fly. There was no further spread outside the region.

In 2010, two positive horses in England were tested positive for EIA during routine post import tests for compliance with certification. See Defra website at http://www.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/eia/index.htm for more information.

In this document we will address the risk of introduction of Equine Infectious Anaemia to the UK through intra-Community trade only. We will only briefly consider EIA in Croatia given that they have recently started to report EIA to ADNS.
5 Risk Assessment

5.1 Definitions

For the purpose of the release assessment, the following definitions will apply:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equidae</td>
<td>Means wild or domesticated soliped mammals of all species within the genus Equus of the family Equidae, and their crosses (European Commission, 2008)</td>
</tr>
<tr>
<td>Trade</td>
<td>Means intra-Community trade between EU Member States</td>
</tr>
<tr>
<td>Importation</td>
<td>Means temporary admission, re-entry after temporary export, and imports from Third Countries to the EU (including the UK)</td>
</tr>
</tbody>
</table>

5.2 Terminology

For the purpose of the release assessment, the following terminology will apply (OIE, 2004; EFSA, 2006):

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible</td>
<td>So rare that it does not merit to be considered</td>
</tr>
<tr>
<td>Very low</td>
<td>Very rare but cannot be excluded</td>
</tr>
<tr>
<td>Low</td>
<td>Rare but does occur</td>
</tr>
<tr>
<td>Medium</td>
<td>Occurs regularly</td>
</tr>
<tr>
<td>High</td>
<td>Occurs very often</td>
</tr>
<tr>
<td>Very high</td>
<td>Events occur almost certainly</td>
</tr>
</tbody>
</table>

5.3 Starting assumption

Even when EU rules for trade are fully complied with, there is an inherent but very low risk that infectious live equidae or their products may be consigned in good faith from an EU Member State. For example, the possibility that equidae may be infected after they have been tested or that the test does not detect infection cannot be excluded. Also, the possibility of illegal movements of live equidae cannot be excluded.
The starting assumption in this risk assessment is that undisclosed infection may be present in live equidae or their products that may be imported to the UK (and other EU Member States) via legal trade or illegal movements.

Very broadly, the likelihood of the introduction of EIA into unaffected areas will depend on the prevalence of EIA in an EU Member State of origin. Favourable environmental conditions and presence of the virus in sufficient quantities to initiate infection are also required.

This risk assessment recognises that there are broadly two major streams of pathways (routes) by which the EIA can be introduced from an affected EU Member State to the UK (Fig. 1).

5.4 Release Assessment

5.4.1 Legal movements

5.4.1.1 Live horses

The scenario tree (Fig.2) outlines possible routes by which the virus may be introduced from an EU Member State (not Romania) to the UK.
The scenario tree for Romania (Fig 3), and possible routes of introduction of EIA to the UK:

- A horse in an EU Member State (not Romania)
  - Holding Free
    - Clinical Signs
      - Inapparent Infection
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
      - Not tested
        - Holding Free
        - Movement
          - No Movement
            - No Virus Introduced
          - Virus introduction
      - Not Inapparent Infection
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
    - Inapparent Infection
      - Not tested
        - Holding Free
        - Movement
          - No Movement
            - No Virus Introduced
          - Virus introduction
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
  - Holding Under Restriction
    - Clinical Signs
      - Inapparent Infection
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
      - Not tested
        - Holding Free
        - Movement
          - No Movement
            - No Virus Introduced
          - Virus introduction
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
    - Inapparent Infection
      - Not tested
        - Holding Free
        - Movement
          - No Movement
            - No Virus Introduced
          - Virus introduction
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
      - Not tested
        - Holding Free
        - Movement
          - No Movement
            - No Virus Introduced
          - Virus introduction
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
  - Horses from Romania
    - Clinical Signs
      - Inapparent Infection
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
      - Not tested
        - Holding Free
        - Movement
          - No Movement
            - No Virus Introduced
          - Virus introduction
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
    - Inapparent Infection
      - Not tested
        - Holding Free
        - Movement
          - No Movement
            - No VirusIntroduced
          - Virus introduction
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction
      - Not tested
        - Holding Free
        - Movement
          - No Movement
            - No Virus Introduced
          - Virus introduction
        - Not tested
          - Holding Free
          - Movement
            - No Movement
              - No Virus Introduced
            - Virus introduction
        - Tested
          - Detection of antibodies
            - NO
              - Holding Free
              - Movement
                - No Movement
                  - No Virus Introduced
                - Virus introduction
            - YES
              - Holding Restricted
              - Movement suspended
                - No Virus Introduced
              - Virus introduction

The movement of equidae within Member States of the European Union is subject to harmonized rules. These rules do not require any testing of equidae for EIA before movement from one EU Member State to another. The rules require all (i.e. registered and unregistered) equidae to be accompanied by a passport and a health document (private veterinary attestation for registered horses, official health certificate for unregistered horses and all horses from Romania) stating that the equidae come from a holding free of restrictions due to notifiable diseases of equidae and are clinically healthy at the time of examination. EIA is a disease officially notifiable in the EU. When infection with EIA is confirmed, under EU rules, a period of prohibition must be imposed to prevent movement of susceptible live equidae from affected premises. Infected equidae have to be slaughtered, then all remaining equidae on the premises must be subjected to two negative tests for EIA three months apart before being allowed to move from the premises. The Tripartite Agreement (TPA) between UK, Ireland and France applies to movement of horses between the three countries, under which each country is required to notify the others of confirmed cases of listed diseases, including EIA. Horses moving under the TPA must have passports but do not require health certificates.

The movement of horses from Romania is an exception from the harmonised rules. In addition to the normal trade conditions for EIA in an EU Member State, equidae in Romania are also subject to the safeguard Decision 2007/269/EC, which was brought in when Romania signed the Accession Treaty to the EU to mitigate against the EIA situation in Romania, where disease is endemic (European Commission 2007). Under the Safeguard Decision, horses from Romania must fulfil the following conditions:

- Horses should be certified using Model C (so all Traces notified) (with additional wording – Equidae in accordance with Commission Decision 2007/269/EC);
- Horses should be subjected to one Coggins test (at least 30 days before departure) before leaving Romania (Decision 2007/269/EC);
- The Coggins test and result must be entered in Section VI of the passport.

Currently, the British authorities conduct checks on live animals consigned for intra-Community trade for compliance purposes. In line with EU Decision 90/452/EC, the following applies:
• Routine checks by AH on notified equidae from MSs would be random. Where checked, this could include random testing for any scheduled equine disease. The equidae would not be restricted.

• Checks by AH on notified horses direct from Romania would be scored ‘Very high Impact’ and checked and in accordance with the specific requirements of national rules, all horses would be tested for EIA (only). They would not be restricted.

• Horses coming from any MS with a deficiency in the certification would be detained until the certification is corrected and if not done so by 7 days could be destroyed or sent back

• Horses coming from a MS with non compliance under a safeguard measure, with suspicion of disease may be restricted, tested, slaughtered or sent back (if health considerations permit).

Table 1: Summarising the categories of movements of equidae around the EU Member States (After Fuessel, 2005)

<table>
<thead>
<tr>
<th>Category of equidae</th>
<th>Veterinary Inspection</th>
<th>Traceability</th>
<th>Veterinary Certification</th>
<th>Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered equidae (studbook FEI)</td>
<td>At place of origin 48 hours prior to loading</td>
<td>Non-discriminatory checks at destination</td>
<td>none</td>
<td>No official certificate required, private veterinary attestation confirming health check and absence of signs of EIA only</td>
</tr>
<tr>
<td>Equidae for breeding and production</td>
<td>At place of origin 48 hours prior to loading</td>
<td>Non-discriminatory checks at destination</td>
<td>Not necessarily</td>
<td>Annex B to 90/426/EC</td>
</tr>
<tr>
<td>Equidae for slaughter</td>
<td>At place of origin 48 hours prior to loading</td>
<td>Non-discriminatory checks at destination</td>
<td>Yes - TRACES</td>
<td>Annex C to 90/426/EC</td>
</tr>
<tr>
<td>TPA</td>
<td>No, unless for welfare</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Compared to the existing rules for the movement of other domestic animals within the EU, the movement of equidae is subjected to limited measures, mainly premises freedom from certain equine diseases. With regard to EIA, the only standstill on movement is that put in place if a case has been confirmed on the premises. Any other horses on such premises will have to be tested twice, three months apart, following the destruction of an infected horse(s).

5.4.1.2 Voluntary EIA control guidelines applicable in the UK

The Horserace Betting Levy Board (HBLB) annually issues the Codes of Practice (CoP) for the prevention and control of certain diseases of horses, including EIA, along with other important equine infectious diseases (HBLB, 2010). The CoP sets out voluntary recommendations to help breeders, in conjunction with their veterinary surgeons, to prevent and control EIA and other diseases in all breeds of horse and pony.

The HBLB Code on EIA was introduced in 2007, after the EIA outbreak in Ireland in 2006. It provides recommendations on prevention, diagnosis, and control of infection. The CoPs are reviewed and updated annually by a specialist committee convened by the HBLB. The committee includes scientists and epidemiologists in the field of equine infectious diseases, veterinary surgeons who specialise in equines, Defra officials and representatives of the Thoroughbred and non-Thoroughbred sectors.

Each year 11,500 copies of the CoP are printed and distributed to all members of the Thoroughbred Breeders Association (TBA), who comprise the vast majority of thoroughbred horse breeders in Great Britain, and all equine veterinary practices that have horse and pony owners among their clients. The CoPs are also distributed widely in the non-Thoroughbred sector. They also receive good publicity in equine literature. Levels of awareness and compliance among breeders and veterinary surgeons are therefore high. The recommendations within the CoP are also commonly used in France, Ireland, Germany, and Italy.

5.4.1.3 Germplasm

As stated in our previous risk assessment (Defra, 2006) EU rules for intra-Community trade in ova and embryos of the equine species are harmonised and subject to health certification. These rules require that at the time of collection of the ova or embryos, donor mares are not on premises that
are subject to restrictions due to EIA as required under the rules for trade in live equidae and that donor mares are free from infectious and contagious diseases. The rules for intra-Community trade now require testing of donor mares for EIA.

EU rules for intra-Community trade in semen of the equine species or semen for the production of embryos for intra-Community trade are harmonised and subject to a health certificate. These rules require that donor stallions entering an approved semen collection centre meet the requirements for the movement of equidae between Member States, including the requirements for holding freedom from EIA. The rules also require that donor stallions are free from infectious and contagious diseases at the time of semen collection and are tested negative for EIA. New EU rules adopted on the 2nd March 2010 (European Commission 2010) provide for more comprehensive testing of donor stallions and donor mares for EIA both prior to and during the collection period.

5.4.1.4 Use of authorised biological products not known to be contaminated

As stated in our previous risk assessment (Defra, 2006), “Epizootics of EIA due to the use of sera or vaccines produced from inapparently infected horses have been recorded in the past (Cvetnic, 1983). The disease has also been considered to be present on certain horse urine production farms in Alberta (Darcel, 1996)”.

5.4.2 Illegal activities

5.4.2.1 Use of contaminated unauthorised biological products

The import and use of substances to be administered to horses is subject to EU rules. Nevertheless, a possibility of illegal use of unauthorised substances cannot be ruled out. In addition, the outbreak in Ireland in 2006 was believed to be caused by the use of contaminated plasma from Italy (Quinlivan and others, 2006; Mooney and others, 2006; see Section 2.1.6).

5.4.2.2 Illegal movements of horses

Random checks at the UK border periodically reveal documentary deficiencies. Our data suggest that significant non-compliance with the EU movement rules is a rare event.
5.4.3 The disease

It is considered that EIA is a classical blood-borne infection. Investigation of other possible routes of transmission suggested that bodily fluids other than blood (i.e. nasal, buccal, genital and conjunctival) did not play a role in the transmission of the disease in subclinically infected horses. However, some of these bodily fluids (i.e. buccal and genital) did play a role in transmission during clinical manifestation of the disease (Quinlivan and others, 2007). Evidence for transplacental transmission has infrequently been documented.

5.4.4 The virus

EIA virus is a Lentivirus that belongs to the family *Retroviridae*. Other animal lentiviruses include maedi-visna (sheep and goats), ovine progressive pneumonia or maedi (sheep) and bovine and feline lentiviruses (Dawson, 1988).

5.4.5 The host

EIA infects equidae only, which then remain infected for life. There is no evidence that other animals are susceptible to infection with EIA. There is no risk to public health.

Horses naturally infected with EIA develop a persistent infection (Hammond and others, 2000). It is estimated that more than 30% (Issel and others, 1985) to more than 90% of these horses remain clinically healthy (i.e. latent carriers) and show no signs of the disease (Issel and others, 1982, Issel and others, 1988). Persistent infection results from the ability of the virus to undergo antigenic variation and avoid the host immune responses (Cullinane and others, 2006).

Persistently infected horses are considered to have a lower level of the virus in their blood than during viraemia (Oaks and others, 1998). Some persistently infected horses may develop the acute form of the disease (Issel and others, 1982) and, in this event, most are likely to die. In the acute form of the disease, horses frequently have very high levels of the virus during viraemia (Issel and others, 1988).
The initial *peracute* stage of infection can last 2 to 3 days and may consist of colic followed by sudden death. Horses infected with EIA typically develop acute disease within the first month of infection (usually 10-15 days, although as long as 3 months). In this phase, clinical signs include fever, diarrhoea, lethargy, restlessness, colic, rapid breathing, nasal and ocular discharge, emaciation, oedema, paralysis of the hindquarters, anaemia and high levels of circulating virus (Cvetnic, 1983).

Horses with the acute form of the disease are considered to be the most likely donors of the virus for mechanical transmission by biting flies (Issel and others, 1988). Infected horses need to carry at least $10^6$ infective doses of the virus per ml of their blood in order for biting flies to successfully infect other horses (Issel and others, 1990). Persistently infected horses only have $1/250^{th}$ of this dose level, but horses in the acute phase of the disease may exceed the required infective dose level (Issel and others, 1990).

While most horses with the acute form of the disease are likely to die, some may survive. The available literature does not provide any data on the proportion of horses that survive. The survivors may also develop a chronic form of the disease with periodic febrile episodes or remain as inapparent carriers (Issel and others, 1982) with persistent pyrexia. In either cases, such horses remain carriers of the virus for life. The time between these clinical phases is variable, as is the severity, however appearance can be brought on by stress, pregnancy, use of steroids, racing and hard work (Cvetnic, 1983).

A retrospective study of EIA based on the Canadian Control programme showed that the mean age of infected horses varied between 7 and 8.5 years. However, positive reactors have been detected among horses of all ages. The rate of infection in female horses compared to male horses was approximately 2:1. The infection rate in geldings compared to stallions was approximately 2:1. No significant differences were noticed from year to year, although in the later years of the study reactors tended to be slightly older (Paquette, 1985). This study may reflect difference in husbandry practices, including housing and exposure to vectors between stallions and geldings.

One study showed that most of the infected horses will develop antibodies that can be detected by the Coggin’s test (agar-gel immunodiffusion test – AGID) on average up to 24 days after infection. However, in some experiments it took 45 days for one of the naturally infected horses to develop detectable antibodies using AGID test (Issel and others, 1982). It is also considered that it might take longer (up to 3 months or more) before antibodies can be detected in at least a few infected
horses (Steinbach, F., VLA, Weybridge, UK – personal communication to M. Sabirovic, August 2006)

Using the AGID test, one study found that detectable immunity to EIA virus in colostrum was present for 25 to 195 days, with a mean of 124 days. While colostral immunity may protect against infection with a homologous strain for a period, it is unlikely that this protection will be effective against infection with a heterologous strain of the virus (Issel and others, 1985). This is not surprising given that the EIA virus is known to be prone to antigenic drift (Cvetnic, 1983).

5.4.6 The environment

Foil and others (1983) consider that biting insects, such as horse flies, deer flies, and stable flies rather than mosquitoes, play the primary role in mechanical transmission of the EIA virus. The female horse flies are persistent blood feeders. Their bite is painful because of cutting/slashing action of their mouthparts (Issel and Foil, 1984), thus, their feeding is often interrupted by the reaction of a horse (Kemen and others, 1978). In the UK, horse flies (Tabanus sp.) are active during the summer (May to September) while the larvae overwinter in the ground and incubate for one or more years before pupating. Trans-ovarial transmission is not known to occur – the virus is transmitted mechanically and does not survive in the blood meal for more than four hours (Ontario Ministry of Agriculture and Rural Affairs, 1995). The transmission cycle is shown in Figure 4.
Experimental studies (Issel and others, 1982) demonstrated that horses in the acute phase of the disease and already febrile are most likely to serve as a source of the virus for transmission to other susceptible horses. The virus may also be transmitted at a low rate from inapparently infected horses to susceptible horses (Issel and Coggins, 1979), however, this is unlikely to result in the generation of epizootics of the disease unless conditions are optimal (Issel and others, 1982).

Under optimal conditions, such as when infected horses, particularly those in acute phase of the disease, are mixed with susceptible horses during seasons when biting insects are abundant, will create the potential for EIAV transmission (Foil and others (1983). Therefore, infected horses may introduce the virus into a naïve population resulting in generation or selection of the virus strain that is more virulent (Issel and others, 1982). However, mechanical transmission by flies in natural conditions is considered to be random. This level of randomness is increased with higher population levels of the biting insects (Issel and Foil, 1984).
One study demonstrated that the efficiency rate in mechanical transmission by groups of horseflies that have been isolated for 3, 10 and 30 minutes after feeding on infected horses before re-feeding on susceptible horses was around 15% (1 successful transmission in 7 trials) (Hawkins and others, 1976). In another experimental study the transmission rate by deer flies and stable flies that were immediately transferred to susceptible horses was much higher (approx. 75%) (Foil and others, 1983). The home range of horseflies has been estimated to be around 4 miles. Some authors consider that the segregation of infected horses at the distance of at least 200 yards from susceptible horses may not be an adequate safeguard measure, particularly in areas where these flies are abundant (Hawkins and others, 1976). Issel and Foil (1984) extrapolated 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 feet. Therefore, a 200 yard distance between infected and susceptible horses is considered to adequately reduce the potential for transmission of EIA virus by horseflies.

Broadly, according to Issel and others (1990) the likelihood that a susceptible horse will become infected with EIA would depend on:

a) The proximity to an infected horse,

b) The quantity of the virus in the blood of the infected horse,

c) A possibility of vector feeding on an infected horses being interrupted and subsequently feeding on an uninfected horse,

d) The volume of infected blood mechanically transmitted by the vector to an uninfected horse,

e) The quantity of the virus which remains infective after the time interval before transmission.

Historically, other potential routes of transmission have also been considered. They may include transplacental transmission (documented infrequently) and venereal transmission by semen of stallions with acute clinical signs (a theoretical possibility) (Issel and others, 1990). Direct contact is highly unlikely to play a role in the transmission of the virus although the virus may be present in secretions and excretions of infected horses (Umphenour and others, 1974, Issel and Coggins, 1979) as well as blood.
The potential for iatrogenic spread through mechanical transmission of infected blood by hypodermic needles and syringes is simply eliminated by the adoption of simple hygiene procedures eg the practice of ‘one needle - one horse’ and the testing for EIA before horses are used as blood donors (Issel and others, 1990).

6 Conclusions

Equine infectious anaemia (EIA) is a disease that affects equidae (such as horses, mules and donkeys) only. Historical data shows that sporadic cases of EIA have been detected in several EU Member States. However, most of these cases appear to have involved a limited number of infected horses and rarely resulted in lateral transmission to susceptible horses. An exception would be the cases in Ireland in 2006, which resulted from mainly iatrogenic transmission and a limited amount of vector transmission (More and others, 2008).

While historic episodes or incidents appear to have been effectively controlled at the time and did not result in a major epizootic in the affected EU Member State, currently, this does not appear to be the case in Romania and Italy, where reporting EIA is a regular occurrence.

EU rules do not require countries to carry out active surveillance for EIA. Many EU Member States do not have surveillance plans, except for example, Italy. Therefore, the EIA status of most of the horse population in the EU remains largely unknown. This excludes registered equidae (i.e. pedigree horses and horses with an FEI passport) in a few Member States that are subject to the voluntary Industry Code of Practice and are closely monitored for health, breeding and performance reasons, and occasionally tested for EIA.

It is therefore likely that EIA may be present at a low level in the population of horses that are not usually closely monitored or tested but are only clinically examined and declared healthy prior to movement. There is no standstill period applying to these horses, unless there has been a previous case of EIA confirmed at the premises of origin. It is unknown to what extent horses with inapparent infection (i.e. showing no clinical signs) may be examined, assessed as clinically healthy, and then be issued a health certificate and move between Member States. Such horses may become a source of infection to other susceptible horses under optimal conditions. On this basis, we consider that the likelihood of introducing the virus into the horse population into the UK remains uncertain.
and difficult to assess. EU rules do, however, allow for a certain proportion of such consignments to be tested post-movement to confirm compliance with certification requirements. The case of post-movement testing of two horses resulting in positive findings in England confirms the value of such testing.

The requirement for health certificates and testing for EIA prior to movement only applies to the movement of horses from Romania. However, due to uncertainties about the EIA status of other horse populations in the EU, there is a low likelihood that some of horses under the Tripartite Agreement (TPA) may become inadvertently infected and may introduce the virus to the UK through movement from other Member States. Horses under the TPA do not require health certification or pre-movement health checks and are not subject to post-movement testing for compliance purposes. This highlights the importance of the industry applying appropriate management practices and biosecurity (i.e. voluntary Industry Code of Practice) in order to mitigate any possible exposure of horses to other horses with unchecked health status.

There is a low likelihood of virus being legally introduced to the UK by the use of contaminated biological products. The use of such contaminated substances over a wide area would provide a multifocal means of introduction. We consider that the likelihood of introduction of the virus by equine germplasm would be negligible.

The risk of illegal activities resulting in the introduction of EIA to the UK is present and not possible to assess.

It is likely that the introduction of the virus to the UK could result in further dissemination. This dissemination, either local or wider, could happen throughout the year due to:

a) unhygienic practices (e.g. use of contaminated hypodermic needles and surgical equipment), and/or

b) movements of an infected horse and those in-contact horses that may have become infected.

On the other hand, this dissemination could be limited to a summer season if it is only related to the abundance of biting flies under favourable environmental conditions. Biting flies (e.g. stable and horse flies, are widely distributed in the UK and most active and abundant in the summer months. It
is known that the virus is only associated with interrupted feeding of such flies, which are thought to have relatively short flying times, thereby limiting the range of mechanical transmission.

7 References


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