EQUINE PIROPLASMOSIS

AETIOLOGY

Classification of the causative agent

Equine piroplasmosis (EP) is a tick-borne disease of equines caused by the intraerythrocytic protozoan parasites *Babesia caballi* and *Theileria equi* of the order *Piroplasmida*. *Theileria equi* was previously designated as *Babesia equi* but compelling evolutionary, morphological, biochemical, and genetic evidence supports its reclassification as a *Theileria*. In addition, unusual high sequence diversity of *T. equi* 18S rDNA and the recent discovery of a new *Theileria* species, *Theileria haneyi*, which was previously known as a *T. equi* genotytpe, strongly indicate that various cryptic species are now collectively referred to as *T. equi*.

Resistance to physical and chemical action

This agent does not survive outside its hosts and is transmitted mainly through a tick vector, therefore, parameters associated with resistance to physical and chemical actions (i.e. temperature, chemical/disinfectants, and environmental survival) are not meaningful. Efficacy of medicines and biologics are described under “Prevention and control.”

EPIDEMIOLOGY

This disease is a tick-transmitted disease of equids and its presence requires competent arthropod vectors. Infected animals may remain carriers of these blood parasites for long periods and act as sources of infection for other ticks. The introduction of carrier animals into areas where competent tick vectors are prevalent can lead to an epizootic spread of the disease.

Hosts

- Horses, mules, donkeys and zebra
- The infection has been reported in camels; however, the role of non-equid species in the epidemiology of the disease is unclear

Life cycle and transmission

- *Babesia* sporozoites invade red blood cells (RBCs) and transform into trophozoites, which grow and divide into two round, oval or pear-shaped merozoites which, in turn, are capable of infecting new RBCs and repeat the division process
- *Theileria equi* sporozoites inoculated into horses via a tick bite invade the lymphocytes and these intra-lymphocytic forms undergo development and eventually form *Theileria*-like schizonts; merozoites released from these schizonts invade RBCs and transform into trophozoites, which grow and divide into pear-shaped tetrad (‘Maltese cross’) merozoites
- Twelve species of ixodid ticks in the genera *Dermacentor*, *Rhipicephalus* and *Hyalomma* have been identified as transstadial vectors of *B. caballi* and *T. equi*, while eight of these species were also able to transmit *B. caballi* infections transovarially
    - *Babesia* spp. can be found in various organs of tick vectors and do transmit transovarially from egg to larva
    - *Theileria equi* develop in salivary glands of tick vector and not found in other tick organs; not transmitted transovarially from egg to larva
- Transmission is also possible through mechanical vectors and blood-contaminated instruments (e.g. contaminated needles)

Sources of infection

- Blood infected with causative parasites of piroplasmosis and associated vectors (i.e. ticks and mechanical vectors)
- Infected animals may remain carriers of these blood parasites for long periods and act as sources of infection for tick vectors

Occurrence

The parasites occur in Europe, countries of Central and Eastern Asia, Africa, Cuba, South and Central America, and certain parts of the southern United States of America. *Theileria equi* has also been reported from Australia (but, apparently never established itself in this region), and is now believed to have a wider general distribution than *B. caballi.*

For more recent, detailed information on the occurrence of this disease worldwide, see the OIE *World Animal Health Information Database* (WAHID) Interface [http://www.oie.int/wahis/public.php?page=home]

DIAGNOSIS

Incubation period of equine piroplasmosis associated with *T. equi* is 12 to 19 days and approximately 10 to 30 days when caused by *B. caballi.*

Clinical diagnosis

The clinical signs of equine piroplasmosis are often nonspecific, and the disease can easily be confused with other similar haemolytic conditions presenting fever, anaemia and jaundice. *Theileria equi* tends to cause more severe disease than *B. caballi*. Piroplasmosis can occur in peracute, acute, subacute and chronic forms. Documented case fatality rates vary from 10–50%. Most animals in endemic areas survive infection.

Peracute form

- Rare form of disease with only clinical observation being moribund or dead animals

Acute form

- Most common form of disease cases
- Characterised by fever that usually exceeds 40°C
- Reduced appetite and malaise
- Elevated respiratory and pulse rates
- Congestion of mucous membranes
- Production of a dark red urine; faecal balls that are smaller and drier than normal
- Affected animals may appear unthrifty; anaemic or icteric

Subacute form

- Similar to acute form but accompanied by weight loss in affected animals and intermittent fever
- Mucous membranes vary from pale pink to pink, or pale yellow to bright yellow; petechiae and/or ecchymoses may also be visible on the mucous membranes
- Normal bowel movements may be slightly depressed and the animals may show signs of mild colic

Chronic form

- Chronic cases usually present nonspecific clinical signs such as mild inappetence, poor performance and a drop in body mass

Lesions

- Lesions observed are those most often associated with an intravascular haemolytic condition
- Pale or icteric mucous membranes; blood may appear thin and watery
- Swollen liver with an orange-brown or paler coloration
- Enlarged, dark, friable spleen; palpable on rectal examination
- Kidneys may appear paler or darker than normal with possible petechial haemorrhages
- Subepicardial and subendocardial haemorrhages may be visible on cardiac tissue
- Mild oedematous swelling of the distal part of the limbs sometimes occurs in subacute forms
- Secondary infections may lead to various non-specific lesions including oedema, emphysema or pneumonic condition of lungs

Differential diagnosis

- Surra
- Equine infectious anaemia
- Dourine
- African horse sickness
- Purpura haemorrhagica
- Plant and chemical toxicities

Laboratory diagnosis

Samples

- Several thick and thin smears prepared with blood collected from superficial skin capillaries of live animals during the acute phase of the disease (appearance of fever); organ smears can be acquired at necropsy (cerebral cortex, kidney, liver, lung, bone marrow)
    - slides with blood or organ smears should be air-dried and then fixed in methanol
- Serum samples should also be collected

Procedures

Identification of the agent

- Microscopic examination of blood
    - demonstration of parasites in stained blood; using Giemsa staining method
    - thick blood smear technique also used in instances where the parasitemia is very low
    - as co-infections of *T. equi* and *B. caballi* occur, accurate identification of the species of parasite is sometimes desirable
        - Identification of equine piroplasmosis in carrier animals by means of blood smear examination is difficult, inaccurate and not practical on large-scale; serological methods are preferred
- Nucleic acid-based diagnostic assays
    - Polymerase chain reaction (PCR) assays with high sensitivity and specificity have been developed for detecting *B. caballi* and *T.equi*.

Serological tests

- Indirect fluorescent antibody test (IFAT)
    - IFAT has been successfully applied to the differential diagnosis of *T. equi* and *B. caballi* infections
    - recognition of a strong positive reaction is relatively simple, but any differentiation between weak positive and negative reactions requires considerable experience in interpretation
    - detailed description of the protocol of the IFAT is available from published sources and an example of an IFA protocol is provided in the *OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals*
- Enzyme-linked immunosorbent assay (ELISA)
    - indirect ELISA using recombinant *T. equi* and *B. caballi* proteins have shown high sensitivity and specificity in detecting antibodies in infected horses
    - a competitive inhibition ELISA (C-ELISA) using recombinant protein and a specific monoclonal antibody that defines merozoite surface protein epitope overcomes problems associated with antigen purity. However, the findings should be interpreted with caution, as the sequence heterogeneity exists within both *B. caballi* and *T. equi* could potentially impact the diagnostic results.
    - the IFAT and C-ELISA have replaced the CFT as the tests to certify the movement of animals

For more detailed information regarding laboratory diagnostic methodologies, please refer to Chapter 3.5.8 Equine piroplasmosis the latest edition of the *OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animal*s under the heading "Diagnostic Techniques".

PREVENTION AND CONTROL

Sanitary prophylaxis

- EP is most commonly introduced into an area by means of carrier animals or infected ticks
- Thus, movement of equids requires testing (by IFAT or ELISA as described above)
- Reducing exposure of equids to ticks
  - repellents, acaricides and regular inspection; animals and premises
  - control and eradication of the tick vector; including removal of nearby vegetation that could harbour ticks
- Any detected EP-positive animals should be quarantined from surrounding horses and vectors
- Special care in possible mechanical infection of horses with contaminated blood

Medical prophylaxis

- No biological products are available currently
- Antiprotozoal agents only temporarily clear *T. equi* from carriers

For more detailed information regarding safe international trade in terrestrial animals and their products, please refer to the latest edition of the OIE *Terrestrial Animal Health Code*.

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The OIE will periodically update the OIE Technical Disease Cards. Please send relevant new references and proposed modifications to the OIE Science Department (scientific.dept@oie.int). Last updated January 2021