

LOUPING ILL IN HORSES

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Summary

Louping ill is an acute encephalitis caused by a tick-borne flavivirus. The disease is seen in certain areas of England, Scotland, Wales and Ireland, and affects mainly sheep, but can rarely affect horses. The natural vector of the virus is the castor bean tick (sheep tick) (*Ixodes ricinus*). Common clinical signs include inappetence, pyrexia, ataxia, gait abnormalities, muscle tremors of the neck and facial areas, altered head carriage, opisthotonus, depression and avoidance of bright light. Abnormal behaviour, including constant exaggerated chewing, is common. Severely affected cases become recumbent and may die or require euthanasia, but the majority of affected horses recover following symptomatic and supportive therapy.

Introduction

Louping ill (also known as infectious encephalomyelitis of sheep) is an acute encephalitis caused by a tick-borne flavivirus. It gets its name from the peculiar leaping gait of the ataxic animals. The disease is seen in moorland areas of England, Scotland, Wales and Ireland, and affects mainly sheep, although it is recognised less commonly in cattle. Infection in other domestic species, including the horse, is rare. There are closely related (possibly identical) viruses that cause encephalomyelitis of sheep in Norway, Spain, Turkey and Bulgaria (Swanepoel and Laurenson 2004). The disease is not known to occur in the southern hemisphere.

Aetiology and epidemiology

Louping ill virus belongs to the Russian spring-summer encephalitis (RSSE) complex of flaviviruses.

The natural vector of the virus is the castor bean tick (sheep tick) (*Ixodes ricinus*) (McLeod and Gordon 1932). The larval tick, feeding on infected sheep, conveys the infection to new hosts when it next feeds as a nymph; or if the tick becomes infected as a nymph, it conveys the disease to a new host as an adult (Timoney *et al.* 1988). The disease is prevalent in the early summer, subsides during midsummer, and reappears in early autumn. These periods correspond to the seasons of tick activity in the area. Within endemic areas, isolation of virus and serological assays demonstrate that louping ill virus infection occurs in sheep, cattle, horses, pigs, deer, dogs and man (Swanepoel and Laurenson 2004; Hyde

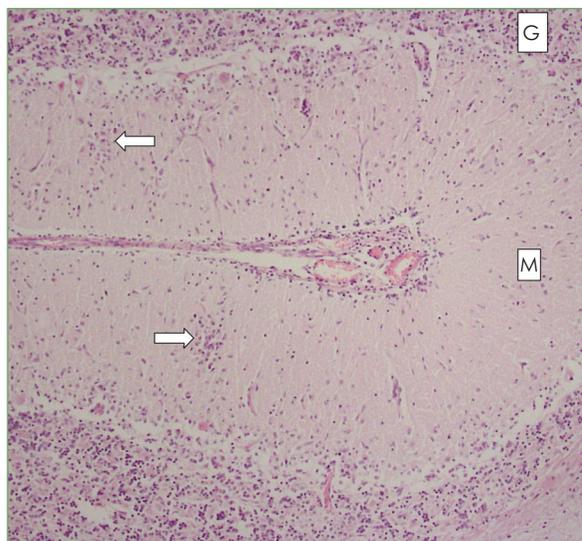


FIGURE 1: Photomicrograph of cerebellum, sheep brain affected by louping ill encephalitis. There is a reduced number of Purkinje cells between the molecular (M) and granular cell (G) layers. Gliosis of the molecular layer (arrows). Haematoxylin and eosin.

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et al. 2007). However, clinical disease, associated with acute encephalitis (**Fig 1**), is most common in sheep.

A serological survey of horses in Ireland revealed positive antibody titres in 10.6% of 601 mixed breed horses but only 0.7% in 302 Thoroughbred horses (Timoney 1976). This difference was believed to be due to differences in exposure to *Ixodes ricinus*. A limited serological survey carried out in the county of Devon in southwest England revealed positive antibody titres in 5 of 68 horses (Hyde *et al.* 2007); 2 of these 5 positive horses had a history of previous neurological disease.

Clinical signs

In sheep, the incubation period is generally 2–5 days. Typically, there is a biphasic fever with hyperpnoea, serous nasal discharge, and depression. Specific neurological signs develop with the second phase of fever, and include nystagmus, head tilt, twitching and licking of the lips, mild tremors of the head and forequarters, and hyperaesthesia. The trembling worsens and the animal develops involuntary jerking movements and stamping of the limbs. Cerebellar ataxia develops, with torticollis and a high-stepping gait. The animal becomes paretic, and more depressed. Recumbency usually ensues with worsening dyspnoea and death in 9–14 days. Animals that do not die are frequently left with permanent neurological dysfunction.

The disease resembles human poliomyelitis in that it always begins as a generalised infection, which may or may not be followed by an invasion of the central nervous system. If only generalised or viraemic changes occur, the death rate is practically nil (Timoney *et al.* 1988). In the highly infected areas of the British Isles sheep aged >1 year seldom develop the disease; they are immune as a result of unrecognised infections. The clinical disease is most commonly seen in lambs (Timoney *et al.* 1988).

There have only been a limited number of documented cases of louping ill in horses (Fletcher 1937; Timoney *et al.* 1974, 1976; Hyde *et al.* 2007), but the clinical signs broadly resemble those seen in sheep. There does not appear to be any breed, sex or age predisposition. Common clinical signs include inappetence, pyrexia, ataxia, gait abnormalities, muscle tremors of the neck and facial areas, altered head carriage, opisthotonus, depression and avoidance

of bright light. Abnormal behaviour, including constant exaggerated chewing, is common. Severely affected cases become recumbent and may die or require euthanasia, but the majority of affected horses recover following symptomatic and supportive therapy. One case described by Fletcher (1937) made an uneventful recovery after an illness of 12 days. The death rates in other affected outbreaks were 2/4 (Timoney *et al.* 1976), and 1/7 (Hyde *et al.* 2007). Some recovered cases are described as having altered demeanour and behaviour patterns (Hyde *et al.* 2007).

Following experimental infection of ponies, a febrile reaction was noted 3–4 days after infection (Timoney 1980). No gross behavioural changes were observed in any animal. Every pony was viraemic for 6–7 days after inoculation, with maximal titres of virus present on Days 1 and 3. Decline and cessation of viraemia was associated with the appearance and rapid increase in titres of circulating antibodies. The results of this study confirmed the susceptibility of horses to the louping ill virus. Moreover, most of the ponies developed viraemia of sufficient intensity for 2–3 days after challenge potentially to infect *Ixodes ricinus* nymphs.

Diagnosis

The diagnosis is achieved by the recognition of suspicious clinical signs in a horse living within an endemic area for louping ill virus. Serological assays include the serum neutralisation assay, complement fixation assay and haemagglutination inhibition test (Reid and Doherty 1971; Timoney *et al.* 1976). The microscopical lesions of fatally ill animals are typical viral encephalomyelitis and meningitis; there are no typical gross lesions. Histological lesions in the central nervous system include neuronal degeneration (particularly the Purkinje cells of the cerebellum), focal gliosis and perivascular lymphoid infiltration (**Fig 1**). The presence of louping ill virus should be established in neurological tissues obtained *post mortem* by standard virus isolation, immunohistochemistry or reverse transcriptase PCR.

Public health risk

Human infection with louping ill was first reported in 1934 (Davidson *et al.* 1991). Four clinical syndromes are seen, an influenza-like illness, a bi-phase encephalitis, a poliomyelitis-like illness and

a haemorrhagic fever. Certain occupational groups, e.g. laboratory personnel working with the virus and those who kill infected sheep, are at increased risk of acquiring louping ill infection.

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