Donkey hoof disorders and their treatment

Alex Thiemann and Karen Rickards

Disorders of the hoof have important health and welfare implications in donkeys. Clinical conditions that affect the donkey hoof include laminitis, which is one of the most common causes of lameness in donkeys in the UK, as well as white line disease/abscess, and chronic conditions such as overlong hooves. This article reviews the normal anatomy and function of the donkey’s foot, before discussing in more detail the diseases that can arise and their treatment.

DISEASES of the hoof capsule and associated internal structures represent a significant health concern in both pet and working donkeys. Degenerative conditions of the foot are very common in the UK donkey population, with laminitis accounting for 13 per cent of the cases euthanased at The Donkey Sanctuary each year. Before discussing these diseases in more detail, it is important to understand the normal anatomy and function of the donkey foot, as they differ considerably from those of the horse in several respects.

Normal anatomy

When compared to a horse, the donkey has a more upright hoof pastern axis and consequently the dorsal hoof wall tends to be more vertical. Fowler (1995) reported that the dorsal hoof wall is 5° to 10° more upright in the donkey. When looking at the solar surface, the frog tends to be more developed but the apex does not extend as far towards the toe (Fig 1). This has implications for the positioning of foot supports in the management of laminitis, and will be discussed in more detail later. The sole is a ‘U’ shape that is slightly flared at the heels compared to the rounder shape of a horse’s hoof. When viewed from the dorsal aspect, the hoof capsule is cylindrical compared with the conical shape of the horse (Fig 2). This difference in shape means that the heels appear narrow and contracted in the normal animal. In contrast to the horse, when viewed from the solar surface, the thickness of the hoof wall is relatively constant from the toe to the heels (Reilly 1997). The sole is also reported to be thicker (Hopegood 2002).

The structural composition of the hoof wall and sole is also different. While the stratum medium does have a zonal pattern to tubule density, in the donkey this can be divided into three zones, whereas the horse has a four-zoned pattern (Hopegood 2002). The anatomical differences in shape and angle of...
the hoof between the two species may explain the differences in tubule organisation and may result in a different movement of the donkey capsule during weight bearing. The density of tubules also differs, with the donkey having a lower density of tubules. This may also be linked to differences in the structure and function of the donkey hoof and may explain why the donkey’s hoof is more resistant to wear.

The moisture content of hoof horn is known to influence its mechanical properties and an inverse relationship exists between hydration of hoof horn and its stiffness (Collins and others 1998). Interestingly, donkey horn has a higher moisture content than that of the horse, which reflects the more elastic nature of the donkey’s hoof and might be an adaptation to its natural environment. The higher moisture content may, however, predispose the donkey to certain pathological conditions when living in a wetter climate such as the UK.

Radiographic anatomy

The normal donkey foot displays a parallel relationship between the dorsal hoof wall and the distal phalanx; however, a broken forward hoof pastern axis can be considered normal. This means that when calculating the phalangeal rotation angle, a negative value is obtained in the normal donkey (phalangeal rotation is the angular difference between the dorsal aspect of the distal phalanx and the long axis of the proximal phalanx). The angle of the solar surface of the distal phalanx to the ground is similar to that reported for the horse, but several key diagnostic values are different. The distal phalanx is positioned more distally within the donkey hoof capsule, resulting in a greater distance between the proximal limit of the hoof wall and the extensor process of the distal phalanx (founder distance) (Fig 3). Cripps and Eustace (1999) reported a mean founder distance of between 3.1 and 5.2 mm for the front feet of normal horses depending on the breed, with the shorter distance being recorded in ponies. In contrast, the mean founder distance in normal donkeys is reported to be 10.4 mm. In addition, the mean intermucosal depth measured at the midpoint of the distal phalanx is 25 per cent greater in the donkey (16.2 mm) than the value reported by Cripps and Eustace (1999) for a pony. These differences are important when assessing radiographic changes associated with laminitis (Fig 4).

Loading pattern

Examination of the donkey foot has revealed a distinctive five-point loading pattern with focal stresses acting at the dorsal aspect of the hoof, the quarters and the heels. This is in contrast to the four-point distribution reported for the horse and reinforces the need to consider the differences that exist between the two species when examining the donkey foot, both for the purposes of trimming and for the treatment of pathological conditions.

Clinical conditions of the donkey hoof

Laminitis

Laminitis is one of the most common causes of lameness in donkeys in the UK, but it is often detected late by owners and vets. Donkeys with laminitis are reluctant to move, exhibit a short stride and often prefer recumbency (Fig 5). Donkeys are frequently ‘pasture ornaments’ and these mild signs may be easily missed until severe damage has occurred within the hoof. Clinical examination will reveal increased digital pulses and pain over the sole; in chronic
cases, there may be distortion of the hoof wall and abnormalities of the growth rings (Fig 6). Chronic cases can also develop muscle wastage resulting in prominence of the shoulder region (Fig 7).

The aetiology of laminitis in donkeys is similar to that in the horse; however, equine metabolic syndrome (EMS) and pars pituitary intermedia dysfunction (PPID; equine ‘Cushing’s disease’) become more important in obese and elderly animals. EMS should be tested for in donkeys that are overweight and preventative measures instituted if indicated (Fig 8). When calculating the proxies for insulin sensitivity in the donkey, the normal resting insulin value is 6.2 IU/ml (range 1.9 to 18.3 IU/ml) and the glucose value is 4.4 mmol/l (range 3.9 to 4.7 mmol/l).

There are a number of regimens to test for PPID (McGowan 2003). At The Donkey Sanctuary, a resting morning adrenocorticotrophic hormone (ACTH) concentration is measured; the normal value is below 35 pg/ml between November and June, and below 45 pg/ml between July and October.

Dietary control is essential in laminitis cases and a high fibre, low sugar diet is required with restriction of grazing. This can be difficult to achieve and, in cases with proven EMS, metformin at 30 mg/kg twice daily orally has proved useful to normalise insulin concentrations. Gradual weight loss can be achieved on a predominantly straw-based diet with a mineral/vitamin balancer. It is important to perform a clinical and dental examination and triglyceride check before beginning dietary restriction. Donkeys with poor dentition require access to a short chop fibre source. Treatment of PPID in donkeys is usually started with pergolide at 1 to 3 µg/kg orally once a day. In some donkeys, this drug can suppress appetite so careful monitoring is required for the first month of therapy.

While medical treatment of laminitis is similar to that used in the horse – namely, vasodilator therapy (acetylpromazine, intravenous/oral) and non-steroidal anti-inflammatory drugs (NSAIDs) – it is important to remember the need for increased frequency of administration for most NSAIDs in order to achieve pain control in the donkey (typical effective dose 0.5 g phenylbutazone/180 kg standard donkey, twice daily). Consideration should also be given to donkeys’ stoic nature when assessing the degree of pain they might be experiencing.

In acute cases, frog supports alone are generally not useful due to the anatomical differences; however, a thick cotton pad and deep bedding can provide suitable support and comfort. Lateromedial radiographs are essential for prognosis, but interpretation can be difficult if using standard equine radiological measurements. In a recent study assessing the radiological anatomy of a group of laminic donkeys, the mean founder distance was 13.4 mm (Collins and others 2011). In chronic or neglected cases of laminitis, the external appearance of the hoof may be quite misleading. Assessment of depression around the coronary band is complicated by the normal anatomical position of P3 more distally in the hoof capsule; clinical signs of pain are often absent until quite severe anatomical changes have occurred, making radiographs an essential part of the diagnosis. The images shown demonstrate some of the typical changes seen in such cases: remodelling or lipping of the tip of P3; demineralisation of the distal margin of P3; and distal displacement of P3 within the hoof capsule (Figs 9 and 10).

Corrective farriery has a large part to play in rebalancing and rehabilitating hooves once the acute phase is over. In some animals, commercially available therapeutic shoes can be of benefit; however,
the differences in the shape of a donkey's foot can sometimes make it difficult to fit these shoes. In cases where the main objective is to remove load bearing from the solar surface, hoof resins can be used to recreate a hoof wall, thereby lifting the flat or convex solar surface of a chronic laminitic hoof away from the ground surface.

**White line disease**
Donkeys appear to be particularly prone to white line disease (WLD), which may reach extensive levels both circumferentially and proximally around the hoof wall. The aetiology is multifactorial, with genetic factors, mechanical stress, poor farriery and adverse environmental conditions cited as possible causes (Moyer 2003). Donkeys' hooves have a greater moisture content than horses' hooves in the UK, which may exacerbate the problem. In addition, repeated bouts of laminitis weaken the sole/wall junction, with stretched and damaged laminae providing an ideal environment for keratinolytic fungi and bacteria to invade.

The condition is recognised by finding crumbly grey/white horn material at the sole/wall junction (Fig 11). Affected donkeys are not usually lame; however, in severe cases, the deep layers become filled with a black, moist, foul smelling discharge that may cause lameness and sensitivity to hoof testers.

Treatment is aimed at debriding all affected horn, rebalancing the hoof and providing dry clean bedding. Due to the different hoof wall loading pattern and thick sole, donkeys can cope quite well with extensive debridement at the toe. However, radiographs can be useful to assess underlying pathology in cases where the sole appears thin or there is doubt about how much hoof to resect. This is particularly recommended in donkeys with signs of concurrent chronic laminitis and dropped soles.

**White line abscess**
White line abscess (WLA) can be extremely frustrating to deal with in the donkey; there is rarely an obvious lesion and many hooves have stretched laminae and multiple areas of WLD which need to be searched. Small hoof testers are needed to assess the pain response around the white line accurately; however, some breeds of donkeys (especially giant breeds such as the Poitou and the mammoth) show little response to hoof testers. Good lighting and sharp tools are required to search the affected area carefully. Difficult cases may benefit from bilateral axial sesamoid nerve blocks, poulticing/hot tubbing and re-examination in 24 hours; the nerve blocks allow the donkey to move around more comfortably and force pus down any small lesion.

In longstanding cases, pus may move dorsally and burst out the coronary band, or inwards to the pedal bone; due to the thickness of the donkey sole, pus rarely under-runs here. Radiographs may be required to assess the pedal bone if no pus can be released after three to four days and the donkey remains severely lame. In all cases where severe lameness is present, the donkey’s appetite must be carefully monitored and hyperlipaemia avoided.

Tetanus status should be confirmed; not all donkeys will be vaccinated. Adequate analgesia should be provided to maintain comfort and appetite.

**Chronic foot disease**
Chronic foot disease is a descriptive term used to categorise cases with a combination of chronic laminitis, WLD, pedal bone degeneration and pain. There may be
variable changes in the hoof capsule and internal structures of the hoof. It is possible to keep such cases comfortable with long-term NSAIDs, careful farriery and soft bedding/level turnout, but the quality of life of such patients should be assessed regularly by recording the time spent recumbent, appetite, weight, condition score and response to analgesia. Objective assessment can be very useful in deciding when euthanasia is appropriate to prevent suffering.

These cases can respond very poorly to the stress and increased weight bearing of travel in a horse box. The Donkey Sanctuary has come across a number of cases where donkeys with stable but chronic hoof disease have suffered severe deterioration and pain following transport; all veterinary surgeons examining donkeys, especially old donkeys, should therefore be particularly careful in assessing fitness to travel in these cases.

**Overlong hooves**

Unfortunately, overlong hooves caused by neglect are not uncommon in donkeys; they can reach dramatic lengths and compromise mobility (Fig 12). Such cases should only be tackled by experienced farriers and veterinary surgeons working together. In many cases, the normal relationship of the pedal bone has been retained within the hoof, but radiographs should be taken to confirm this and to guide trimming.

When trimming such hooves, the veterinary surgeon/farrier should start by correcting the heel length, before moving on to the solar surface and finally the toe. In most cases, correction can be achieved within one trim and mild analgesia is only required for a short time. Figs 13 to 16 demonstrate the various stages in the restoration of a long hoof to a normal weight-bearing relationship with the ground.

**Distal interphalangeal joint contracture**

Due to the naturally upright hoof pastern angle of the donkey, distal interphalangeal joint contracture (‘bellerina syndrome’) is not always detected early. The condition is seen usually in young, rapidly growing donkeys being fed in excess of dietary requirements. In mild cases, the heel of the affected hoof will be elevated but the dorsal hoof wall will not be beyond the vertical. In severe cases, the dorsal hoof wall will tip beyond the vertical and there is a notable reduction of the heel/fetlock distance (Fig 17). While alteration in diet, farriery and analgesia may reverse mild cases, more severe cases require surgical intervention (Walsmsley 1995).

Typically, standing surgery in the mid metacarpus will produce acceptable results in the non-athletic donkey, although there will be a blemish at the surgical site.
Keratomas

Keratomas are seen in donkeys affecting both front and hind feet. Clinical signs include repeat abscess-like lameness with discharge of pus frequently at the coronary band. In some cases, there will be deformity of the hoof wall externally and white line at the solar surface. A dorsoproximal-palmarodistal oblique radiograph will confirm the diagnosis, revealing a smooth defect in the margin of P3. Surgical removal is required but recurrence can be an issue.

Role of education

In the past, not all farriers have been keen to treat donkeys and The Donkey Sanctuary is working hard to ensure veterinary surgeons and farriers feel confident with donkey feet. There is a free donkey foot trimming video available from The Donkey Sanctuary, and a veterinary surgeon and farrier run training courses at some UK farriery schools. There is also The Donkey Sanctuary-sponsored annual donkey foot trimming competition at the Royal Welsh Show. For any queries regarding donkey feet and trimming, please contact the veterinary department at The Donkey Sanctuary, Sidmouth, Devon, EX10 0NU, or vets@thedonkeysanctuary.com.

Summary

The consequences of poor hoof care and longevity mean that foot-related disorders are important welfare issues in donkeys. Knowledge of the subtle differences between donkey and horse hooves with respect to anatomy and physiology will help the clinician make more appropriate decisions regarding the treatment and management of these animals.

References


Self-assessment test: Donkey hoof disorders and their treatment

(1) What is the consequence of increased moisture uptake by donkey hooves versus horse hooves in the UK environment?

(2) When starting a donkey with laminitis on a diet, what should the clinician be careful to:
   a. check for?
   b. avoid?

(3) What donkey-specific factors affect treatment of laminitis in the donkey?

(4) What has gone wrong in the treatment of the overlong donkey hoof in picture below?

(5) This donkey was rescued from an unsuitable environment. Describe the changes seen in the hoof and the radiograph; how might you treat this?

(6) This donkey was presented for ‘pus in the foot’. What is the actual problem?
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