

## Hoof morphometry before and after trimming in donkeys

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### Abstract

Similar to horses, care of donkey's hoof is vitally important. During normal weight bearing and locomotion, the equine hoof wall deforms in a consistent pattern. Two population of adult donkeys (12 and 10) weighing  $213\pm23$  kg, with very long hooves were referred for hoof trimming. Nipper was used to trim the outgrowth of hoof wall from the hoof. The feet were trimmed starting from the toe then from the lateral and medial side up to the heel area. The average toe length before trimming for front legs was  $12.2\pm4.1$  cm and for the hind legs was  $8.3\pm4.2$  cm, but after trimming, the average length of the cranial hoof wall for front leg was  $5.6\pm2.3$  cm and for hind leg was  $6.1\pm1.4$  cm. Heel-first landing in the front feet is necessary for soundness, and indicates a correct trim. Usually the equine foot is built to land on the well-padded frog. In conclusion, the donkeys' feet should be trimmed according to their work type and at least after every 6 weeks to prevent long hoof which induces lameness and injury.

**Keywords:** Donkey; hoof trimming; morphometric study

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### Introduction

Similar to horses, donkey's hoof care is vitally important. During normal weight-bearing and locomotion, the equine hoof wall deforms in a consistent pattern; the proximal dorsal wall rotates caudo-ventrally about the distal dorsal border and there is latero-medial flaring posteriorly (Douglas et al., 1996). This is because in a domestic situation, the rate of growth of the hoof often does not equal the rate of wear. This means, for donkeys and horses alike, the hoof is not wearing as quickly as it is growing. This is because the animals simply do not get enough movement on the right terrain. On the other hand subtle changes may develop in equine hooves in response to loading, and mild exercise may not be a strong adaptive stimulus (Summetley et al., 1998; Faramarzi et al., 2009). However, even with regular hoof trimming, donkeys need to have a proper amount of movement to allow adequate circulation to the hoof in order to grow good quality horn. Therefore, the donkey's owner must move their donkeys at least 15 km per day. Hoof

trimming should be done every 4 to 6 weeks on horses that are used barefooted (Thomason et al., 2001). The object of proper trimming is to make the shape of the foot, the angle of the foot axis and the foot level as nearly normal as possible. The foot should be trimmed so that pastern and hoof axis forms an unbroken line (Thomason, et al., 1998; John and Monique, 2005). Therefore, the objective of this study was to find out the normal dimensions of the foot in the donkeys after a proper trimming protocol.

### Materials and Methods

Two population of adult donkeys (12 and 10) weighing  $213\pm23$  kg, with very long hooves were referred for hoof trimming. The donkeys were restrained and the dimensions of the hooves were measured with calliper before hand. Calliper was used to measure the hoof's length at the centre of the toe. A hoof pick was used to clean debris from the bottom of the hoof, along the grooves on the sides of the frog, and from the sole area. A hoof knife was used for trimming

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away loose dried-out sole. The hoof knife was also used to trim off loose and ragged frog. Nipper was used to trim the outgrowth of hoof wall. Then the feet were trimmed starting from the toe then from the toe to the lateral and medial side up to the heel area by nipper. Toe length was measured from the top of the hoof wall to the bottom, or ground at the centre of the toe of the hoof wall. Each frog was cleaned, trimmed from the apex to the heel. The sole was given similar attention similar to the sole of the horses. The wall of hoof was trimmed until the white line appeared in white moist rubbery appearance. After trimming with the nippers, rasp was used to level the bottom of the hoof wall. Prior to trimming, the opposite foot calliper was used to mark the amount of hoof wall needed to remove to make a matched pair. The hoof gauge was used to match pairs of feet in their angle to the ground. As a rule, the front pair should match and the rear pair should match too.

## Results

The average toe length before trimming for front legs were  $12.2 \pm 4.1$  cm and for the hind legs were  $8.3 \pm 4.2$  cm, but after trimming the average length of the cranial hoof wall for front leg was  $5.6 \pm 2.3$  cm and for hind leg was  $6.1 \pm 1.4$  cm. The average heel length for front leg was  $3.4 \pm 1.4$  and hind leg was  $3.8 \pm 1.3$  cm. The animals used to walk with great difficulties before trimming, but after trimming they walked in a very comfortable manner. The mean angle of hoof was  $60 \pm 5$  degrees on the fronts, and  $65 \pm 6$  degrees on the rear hooves. Some farrier prefers to trim from the heel down to the toe, but many prefer to start from the toe upward to the heel area. In some cases there was a lesion such as sole haemorrhage in three cases which was diagnosed after trimming.

## Discussion

Heel-first landing in the front feet is necessary for soundness, and indicates a correct trim. Since the horse's foot is built to land on the well-padded frog similar to the biggest pad on a dog's or cat's foot therefore, heel-first landing gives correct circulation inside the foot, absorbs concussion to protect the leg joints from shock and helps remodel deformed hooves. Hind feet nearly always land heel-first due to the zigzag arrangement of the hind leg joints. The data supports the practice of elevating the heel (greater than 15 degrees) for conditions in which decreased fetlock extension may be desired such as with laceration or injury to the digital flexor tendons (Pearce et al., 2004). Further study is required to determine whether heel elevation greater than 15 degrees reduces *in vivo* digital flexor tendon tension and also to ensure that the marked flexion of the distal interphalangeal joint with greater



**Fig. 1:** a female donkey with long untrimmed hooves



**Fig. 2:** The left front hoof is trimmed compare to the right untrimmed foot



**Fig. 3:** Both front legs are trimmed. It is impossible to do a perfect trimming with so long hooves, unless you try for the second or third time hoof trimming

heel elevation is not detrimental over a prolonged period that may be required for the rehabilitation of

flexor tendon injuries in the donkeys and horses. Beveling the toe and engaging the frog and bars in the weight-bearing function of the foot resulted in elevation of the heel angle and solar angle of P3. These changes may be beneficial in treating under-run heels and negative solar plane angulations of P3 (Clayton, et al., 2011). The laminar morphology is closely associated with the position of the margins of the third phalanx and it is closely related with regular hoof trimming (Douglas and Thomason, 2000). Do not let the hooves grow out too long before cutting them back; the feet should never get more than one inch longer than normal. Insight into natural compensation mechanisms for hoof imbalance will aid in the understanding and treatment of pathologic conditions (Vanheel et al., 2006). Many donkeys develop a condition frequently called "seedy toe". This condition, as with horses, is caused by an incorrectly shaped hoof capsule that is overgrown or incorrectly trimmed. When the hoof capsule does not reflect a direct cast of the coffin bone, it places incorrect forces on the hoof capsule, white line, bones and internal tissues of the hoof, compromising proper horn growth and making it easier for ever-present bacteria to penetrate. The only way to correct this condition permanently is to keep the hoof trimmed in its physiologically correct shape which will remove the incorrect forces on the hoof and allow for proper hoof expansion so good quality horn can. Some studies support the concept that remodeling of primary epidermal lamina is, at least in part, stimulated and directed by varying stress or strain levels in the laminar junction (Lancaster et al., 2007; Thomason et al., 2008).

### Conclusions

Regardless of the techniques used, the donkeys should be trimmed according to their work type and at least every 6 week to prevent long hoof induced lameness and injury and to allow for hoof hydration in a domestic situation.

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