FOOT CARE MANAGEMENT
FOREWORD

Foot Care Management is the third in a series of management manuals published by Veepro Holland. Through these manuals Veepro Holland aims at providing you with useful management information. Dairy cattle world-wide need to receive proper guidance to fully utilize their potential.

Veepro Holland hopes that this manual may widen your knowledge about foot care and consequently contributes to less lameness in your herd.

The authors are indebted to the Dairy Training Centre ‘Friesland’ for their valuable assistance in the preparation of this manual.

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Veepro Holland
A dairy cow produces at its best if she is healthy and feels comfortable. A healthy cow will be able to eat enough feed to produce high quantities of milk while maintaining good fertility. For this reason a dairy farmer should closely watch the overall health status of his herd.

An important feature of the cows’ health is the use of their legs and feet. A dairy cow should be able to walk without any problems. Nowadays, with the confined housing systems in use, such as tie-stalls and free stall (cubicles) housing, proper preventive foot care has become necessary in order to keep the cows’ feet in good health.

Several studies have shown that good foot care can save the dairy farmer a substantial amount of money. A reduction in lameness means less veterinary costs and culling of cows, and subsequently higher milk production.

This manual informs you about the most occurring feet problems, their causes and treatment, and last but not least about the prevention of these problems.
CONFORMATION OF THE FOOT

For a clear understanding of the causes and the prevention of lameness, it is essential to understand the structure of the foot and the horn-forming process.

Figure 1 shows the conformation of the foot:

1. The horny wall of the claw.
2. The pastern.
3. The heel or bulb.
4. The weight-bearing border of the wall.
5. Growthrings.
6. The interdigital space.
7. The coronet.
8. The sole; if the claw is healthy, the thickness is 5 to 7 mm.
9. The soler part of the heel; the weight-bearing part of the heel.
10. The white line; the horny connection between the weight-bearing border and the sole.
11. The interdigital skin.

The forming of horn

The hoof is a casing around the foot. Between the hoof and the pedal bone lies a sensitive tissue known as the quick or the corium, the horn-forming tissue.

The horn of the wall is formed at the coronet. From here it grows very slowly at a rate of about 5 millimeters per month. The optimal distance from the coronet to the tip of the toe should be about 7½ centimetres. It means that it will take about 15 months before the newly formed horn tissue reaches the toe, where it will be worn away.

The horny layer covering the sole of the foot is produced from the quick at the bottom of the foot. This horny layer is softer than the horn of the wall. The junction between the horn of the wall and the horny layer of the sole is known as the white line, which runs around the toes and back along the inside of the claw.
Weight bearing

The overall weight of the cow should be taken on the solid horny wall of the claw and on the solar part of the heel. The weight should be equally distributed over the inner and the outer claw.

Correct weight bearing

Incorrect weight bearing due to overgrowth of the outer claw

Certain foot diseases will cause overloading of one of the claws. A diseased hind foot will lead to abnormal horn formation of the outer claw, whereas at the fore feet the inner claw will be overloaded if a foot is diseased.

Usually in case of a diseased hind foot, the outer claw will become higher than the inner claw, resulting in more pressure on the outer claw and consequently ulceration of the sole, which causes lameness.

The optimal angle of the claw in relation to the floor level is about 45°. If the angle is over 45°, then there will be probably overgrowth of the heel. An angle of less than 45° indicates overgrowth of the toe.

FOOT DISEASES

Five of the most common foot diseases in cattle are:
1. interdigital dermatitis,
2. laminitis,
3. interdigital phlegmon,
4. digital dermatitis and
5. sandcracks.

All these diseases can be diagnosed by their appearance. The treatment should be focussed on eradicating the cause of the disease.

Interdigital dermatitis

Interdigital dermatitis, also called ‘slurry heel’ or ‘heelhorn erosion’, is a bacterial inflammation of the interdigital skin and the heel. The disease is less virulent, but more widespread when the cows are housed in a free stall housing system with a slatted floor than in tie-stalls with straw bedding.
The wet and smelly inflammation of the interdigital skin is characteristic of the initial stage of this disease. It becomes less noticeable during the process of the disease. The inflammation of the interdigital skin may spread to the horn of the heel of the adjacent claws. Abnormal horn formation, with ridges or fissures, may lead to bruising of the quick in this region. The feet become oversensitive, and subsequently lameness will follow.

Inflammation of the interdigital skin is characteristic of the initial stage

Laminitis

Laminitis is a metabolic disorder of the quick that occurs around calving. However, it often becomes apparent at a later stage when it reveals itself in changes of the horn production and in the transformation of the form of the claw. Laminitis does not last long (a few weeks), but the changes in the shape of the weakened claw may cause prolonged weight-bearing problems.

Laminitis and its effects occur mainly in the outer hind claws. One of the effects of laminitis is increased horn production. It results in more pressure on the claw, as it becomes excessively high. This overgrowth will cause bruising of the quick and ulceration of the sole and abnormal stances of the leg due to pain within the outer hind claws.

Abnormal growthrings caused by laminitis

The infection stimulates horn formation of the wall and the sole, and particularly the outer hind claw will be affected. Consequently this claw will become excessively high and considerably overloaded. It will eventually lead to ulceration of the sole and result in an abnormal stance of the leg, because of pain.

Treatment

When the cows are moved into paddocks, the inflammation of the interdigital skin often spontaneously disappears due to the improved hygienic environment. Horn formation in the bulb area will be restored, but old deformations will take some time to wear out. Trimming may be an important aid and considerably contributes to the process of restoration.

The most distinct changes caused by laminitis are:

- a buckled toe;
- abnormal growthrings dropping down backwards;
- yellow or red discolorations due to tissue fluid or blood in the horn of the sole and the white line;
- defects in the white line;
- double sole.
Treatment

Trimming of the claws in such a way that normal weight bearing is restored will help to cure the consequences of laminitis. The claw should be given rest in case of damage. Therefore, the healthy claw should be left high enough to release the affected one. If necessary, a hoof block should be fixed with a special glue under the healthy claw. Your veterinarian has ready-made hoof blocks available and it is recommended to consult him for advice.

Interdigital phlegmon

Interdigital phlegmon or foul-in-the-foot is a disease of the tissue close to the claw and in particular between the toes. It is accompanied by a hard swelling in the middle of the pastern region, just above the interdigital space. Only one leg is affected and the animal quite suddenly goes lame. A typical symptom is the ‘painful’ position of the leg. It is held slightly forward with the tip of the claws hardly touching the surface. Often, the swollen leg is moved a little up and down. This condition can be timely diagnosed and with effective treatment the interdigital phlegmon should not be a serious problem.

Digital dermatitis

Digital dermatitis, also known as Mortellaro’s disease, is characterized by a circumscribed inflammation of the skin near the coronet. In typical cases the inflammation is surrounded by a small white epithelial border. The hair around it often stands upright. The lesions are very painful when touched and may cause moderate to severe lameness.

Tetracycline-gentianviolet solution is an effective treatment against digital dermatitis

The most likely locations are:

- the bulb region behind the fissures, resulting from interdigital dermatitis;
- the interdigital skin, usually on top of an interdigital overgrowth;
- the coronet, usually near the transition of the interdigital skin.
Treatment
After thorough cleaning and drying of the infected area, a precise local application with a tetracycline-gentianviolet solution should be applied as effective treatment. The treatment should be repeated for all infected feet in the herd in order to control the spreading of the disease. Normally, a single treatment will be sufficient for the moment, but any new cases of lameness should be attentively watched for.

Sandcracks
A sandcrack is a fracture of the horny wall in the same direction of the horn growth. Within intensive dairy farming systems, sandcracks are less common than the other foot diseases described. It is assumed that nearly all sandcracks originally begin as a small fracture of the horn near the coronet. When the crack reaches the quick severe lameness may follow. Sandcracks occur more frequently in fore feet than in hind feet. It is often noticed during very dry summers and in dry tropical climates.

Treatment
Immediate treatment of small cracks in the coronet with antibiotics should solve the problem and control any inflammation of the underlying quick. Healing will be considerably delayed, once pus is present and the quick is already damaged. In this case, a little horn should be removed to release the pus, but leaving the quick unexposed. If the quick is exposed, a plaster bandage can be used to cover the wound. Good results have been obtained by trimming the infected claw and fixing a block to the healthy claw to remove the load from the cracked claw. A complementary treatment in a sodium carbonate (soda) bath may help solving the problem.

PREVENTIVE MEASURES

1. Hygienic housing
Foot diseases and lameness occur in all kinds of housing systems. However, its incidence and seriousness differ from farm to farm. These differences are to a large extent dependent on the level of hygiene, especially in case of interdigital dermatitis. Good hygiene can be achieved through thorough cleaning and disinfection of housing as a routine (once or twice a year).

Clean and dry housing is an important preventive measure

Level and dry surfaces in- and outdoors make walking much easier and will cause fewer lameness problems. The advantages of dry housing conditions are less slippery floors and reduced access of bacteria. A dairy farm in a hot and dry climate will have relatively fewer cases of interdigital dermatitis. Furthermore, unpaved areas in open-air corral dairy systems should have sufficient slope for adequate drainage to avoid mucky surroundings.

Cows will need time to get used to slatted floors and it is advisable to make the older calves and maiden heifers get used to this system as early as possible. Otherwise the sudden change of environment, together with the start of milk production after calving may be too great and may eventually cause foot problems.

2. Nutrition
Laminitis is related to some disorders of the digestive tract, the uterus and the mammary system. These disorders are to a large extent influenced by nutrition. Consequently, the amount of feed and the composition of the diet has a considerable effect on the health of the feet.
Laminitis and related disorders occur particularly from several days before, until some weeks after calving. During this period there is a rapid increase in the intake of concentrates and most of the time reduced roughage (long fibre) consumption. This is the main cause of rumen acidosis, which is considered to have a great influence on the occurrence of laminitis.

3. Regular hoof trimming

Lameness is caused by abnormal weight bearing as a result of excessive horn formation. Once excessive horn formation occurs, then trimming is necessary to prevent lameness. The purpose of hoof trimming is to restore the claws to their normal functional weight-bearing surface.

Since most cases of lameness occur in early lactation, checking and trimming of feet at drying-off time can effectively contribute to the prevention of lameness. In an intensive dairy farming system, it is recommended to trim all milking cows twice a year as a routine.

Good nutrition prevents laminitis

The prevention of laminitis should be based on a feeding regime according to the cows’ energy and protein requirements. Sudden changes within the daily ration should be avoided at all times. Important feeding guidelines in relation to the cows’ health are:

- feeding little or no concentrate during the dry period;
- ensuring that there is always sufficient good-quality roughage available;
- gradual increasing the amount of concentrates after calving.

Feeding a well-balanced mineral mix with additional zinc is considered to have a positive effect on the prevention of interdigital phlegmon. Zinc increases the resistance of the skin to the penetration of bacterial infections. It will also improve the skin’s healing ability in case of an infection.

When hoof trimming is regularly carried out, all facilities for making it an easy job should be present. The equipment required comprises a sharp left and right hoof trimming knife and a sharpening stone, a hoofcutter, and a curved hand rasp. At all times keep your hoof knives as sharp as possible for ease of working. The availability of a hoof trimming box will make the job much easier.

It should be emphasized that accurate hoof trimming cannot be learned from paper. **Thorough practical training is an absolute must for proper hoof trimming.** It is recommended to participate in a special training course.
**Getting started**

To start hoof trimming a rope with a slipknot is tied around the cow’s hind leg just above the hock. It does not matter whether the leg is raised by a rope across a beam, a pulley or a lever. For an effective hold and a convenient working level the hock should be sufficiently raised up for ease of working. For trimming the fore feet, there should be some form of restraining equipment, for example a trimming box with an additional support, on which the fore feet can be tightened.

An additional support can be used to trim the fore feet

Before starting the actual trimming, the feet should be properly cleaned to get a good view of the whole claw.

**Stage one**

The first stage in hoof trimming is to cut the sound claw back to the correct length by using the hoof cutter. Measure the length of the claws and make a carving at 7½ centimetres from the coronet. If necessary, trim the sound claw back to the correct length.

Cut a plane bearing surface underneath this claw with the hoof knife. Good workmanship is to slice thin layers of horn and to move the knife away from yourself to avoid injuries. As little horn as possible should be taken away in the heel area, so that it will be easier to make the other claw equally high. It is important that the sole should keep a thickness of about 5-7 mm.

Cutting the claw back to the correct length

**Stage two**

If necessary, cut the overgrown claw to the same length and cut the claw to the same height as the other one. Make sure that the sole does not become too thin and that a plane bearing surface parallel to the shin bone is obtained.

The claws should be cut to the same height
Stage three
If necessary, slice off thin layers of horn to cut some slope in the sole.

This is called functional trimming. If there are still sole lesions remaining in one of the claws, then apply further treatment, as described under stages four and five (curative trimming). Otherwise continue with the other foot.

Stage four
More height should be taken away from the affected claw towards the heel, in such a way that most of the weight is taken by the healthy claw. This will provide more rest for the bruised claw. If this is not possible, because the sole would become too thin, then fix a block underneath the sound claw.

Stage five
Take away loose horn and trim down the hard ridges, but make sure that the quick is not being damaged.

4. Footbath

A footbath is a regular hygienic procedure to prevent foot diseases, such as interdigital dermatitis. The correct solution for footbaths is 3 - 5 litres of commercial formalin added to 100 litres of water. Be aware that the formalin becomes less effective when the temperature of the bath solution decreases below 15° C.

Copper sulphate may also be used. Suitable dimensions for a footbath are about 75 centimetres wide, 3 to 5 metres long and 15 centimetres deep. The bath should be filled up to a level of 10 cm.

The best place for a footbath is after the exit of the milking parlour. The best results are obtained when the animals are kept in a dry place for about half an hour after they have left the bath. During this time the formalin will act accordingly. Depending on the number of cows a foot bath can be used for about 2 - 3 days. After this period the bath will lose its strength. If the bath becomes too dirty, it should be replenished.

Good prevention against interdigital dermatitis is achieved by applying two bathing periods, at an interval of three or four weeks when the cows are housed.

5. Breeding

In order to reduce the susceptibility to foot diseases adequate selection traits are needed. These traits must be heritable and must have a correlation with the occurrence of foot disorders. Possible traits for selection are the set and the bone quality of the legs, the use of the legs and feet when walking and the claw angle. In the Netherlands as well as in many other countries these traits are being classified and breeding values are estimated for sires and cows. It is recommended to use semen of proven sires that are known for improving the quality of feet and legs, and foot angle.

The resistance to all foot diseases mentioned will not be equally improved by breeding. Some will be more genetically influenced than others.
SUMMARY

Sound legs and feet are important features for good health of the dairy cow. Therefore, foot diseases should be prevented as much as possible. This can be done by good stockmanship. With proper foot care, lameness should not be a serious problem.

The general guidelines for proper foot care are:

1. maintaining a hygienic environment with dry surface areas and proper drainage to avoid dirty circumstances;
2. feeding sufficient good quality roughage and avoiding sudden changes in the daily ration;
3. hoof trimming should be done on a regular basis, preferably at least twice a year;
4. using footbaths regularly;
5. selecting proven sires that improve legs and feet.
REFERENCES FOR FURTHER READING

- Foot care in cattle, compiled by the Department of Large-animal Surgery of the Faculty of Veterinary Medicine, State University of Utrecht and the Dairy Training Centre ‘Friesland’.
- Foot care in cattle, lecture notes Dairy Training Centre ‘Friesland’.
- Colour atlas on disorders of cattle and sheep digit by J. Espinasse, et al.
- Claw Treatment, video by WOPA BV and Dairy Training Centre ‘Friesland’.
Dairy Training Centre Friesland (DTC-Friesland) was established by various Dutch farmers’ organizations and is controlled by the Ministry of Agriculture. The Centre conducts a variety of international training programmes and courses. We also provide consultancy and management services.

All courses have a strong practice-oriented character based on the training concept of **learning by doing**. The practical training is very intensive; one instructor monitors groups of six students and on subjects like milking even three students only.

DTC-Friesland offers training on the following subjects:

- **Dairy Husbandry**
  * machine- and handmilking, milking machines, milk hygiene
  * feeding, ration calculation, feedplans, quality of feedstuffs
  * fertility management, heat detection
  * breeding, use of A.I., culling, body conformation
  * housing, tying/cubicle systems, hygiene
  * health, mastitis control, hoofcare
  * calf-rearing
  * farm economics
  * farm administration

- **Forage production**
  * pasture management
  * fodder crops
  * silage making
  * farm machinery

- **Milk processing**
  * manufacture of cheese, butter, yoghurt, ice-cream, etc.
  * milk collection and payment systems
  * marketing
  * management of a dairy unit

- **Sheep husbandry**
- **Dairy goat husbandry**
- **Intensive beef production**
- **Horse-keeping and animal traction**
- **Teaching methodology**

Visits to farmers’ organizations, A.I.-stations, Health and Extension service, etc., are integrated in the courses to provide a good picture of the dairy sector in the Netherlands.

Thorough practical training is an absolute must for proper hoof trimming.
COURSE PROGRAMME
A variety of courses is offered on one or more of the earlier mentioned subjects. Most of these training programmes are tailor-made and completely designed in accordance with the client’s requirements. The duration of the courses varies from 1 week to several months and attendance is arranged preferably in groups of a multiple of 6 participants. Each year in September the Centre organizes the 6-week course “Modern Dairy Farm Management”. This course is designed especially for persons in charge of a large scale dairy enterprise. For groups of the indicated size the course can be organized at any time during the year.

FOOT CARE COURSES
Together with the Veterinary Faculty of the State University of Utrecht, DTC-Friesland has played a prominent role in the development of the “Dutch method” of foot care. This enables the Centre to offer unique training opportunities in preventive and curative foot care. Practical courses are organized frequently in English, French, Spanish and German for groups of a multiple of 4 persons. Our staff regularly conducts these courses also in other countries.

Basic course in foot care
The basic course is conducted for farmers and their employees. It is strongly practice-oriented and 70% of the time is spent on practicals. After the course the participants are able to carry out routine claw trimming in their herd in a proper way. Defects in the claws can be recognized and treated. The duration of a basic course is at least 1 week. However, to reach a sufficient level in functional foot care, a period of 2 - 3 weeks is advisable.

Diploma course in foot care
To reach a professional standard in claw trimming more experience is required after a basic course of 3 weeks. First the participant should gain practical experience by actual trimming of 800 - 1000 cows. After this he comes back to the Centre for 1 week. Additional training is provided and the course is finalized by an examination. Having passed the examinations, the participant is awarded a Diploma, which entitles him to work as a professional hoof trimmer.

FACILITIES
The courses are carried out on the 4 farms belonging to the Centre and moreover extensive use is made of 20 private farms in the neighbourhood. The Centre owns a hostel which provides full board and lodging in single or double bedrooms.

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