



Structure & Purpose

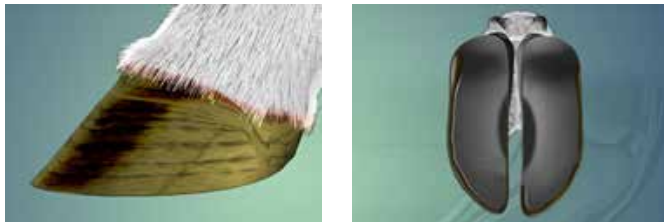
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The claw, or hard hoof, has two purposes:

1. To act as protection for the dermis or corium, also known as the "quick".
2. To bear the body weight

The hard hoof or claw consists of horn which varies in hardness.



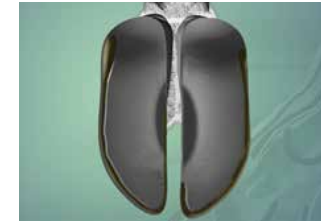
The hardest horn of the claw is found in the hoof wall. The wall, formed by the coronary band, gets worn away underneath the claw. This is known as the weight-bearing border.



The coronary band separates the skin and hair from the horn.



Towards the back of the hoof, the wall merges with the heel bulb. This is softer than the horn in the wall.



The weight-bearing border runs from the bulb of the heel to the toe and partially back again.

It can be divided into two categories:

- the biaxial or outer wall
- the axial or inner wall



The purpose of the weight-bearing border is to prevent the claw from wearing away too quickly. The outer and inner walls need to provide sufficient support for the claw to remain in an upright position. The claw must not turn inwards, shifting the weight onto the claw beside it. This will cause a disproportionate strain on the coronary band.

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The so-called 'white line' is inside the weight-bearing border. This white line is actually greyish in colour. It is the softest horn within the claw and it joins the weight-bearing edge and the sole of the claw.



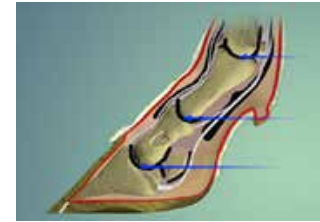
The inside of the claw is known as the sole. Next to the horn in the wall, the sole horn is the second hardest type of horn in the claw. At the back, the sole horn merges with the bulb horn on the heel bulbs. The bulb horn is softer than the sole horn. A normal sole and bulb sole are between five and seven centimetres thick.



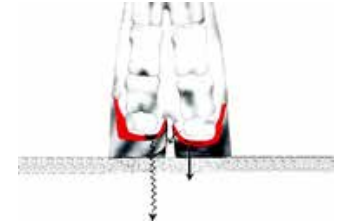
Together, the weight-bearing border, the sole and the bulb sole form the weight-bearing surface of the claw. The weight-bearing surface "carries" the weight of the cow when she is standing or walking.



The space between the claws is known as the interdigital cleft. The skin between the claws is known as the interdigital skin. The interdigital skin is hairless.



The digits are held together by joints and are capable of moving independently from each other. Names of the joints in descending order: Fetlock joint, pastern joint and pedal joint.



Now let's look at the claw from the inside:

The bovine foot consists of the shin bone, two long pastern bones, two short pastern bones, two pedal bones and two navicular bones.



The bones are put in motion by the use of tendons. Let's now look closely at the pedal bone. The deep flexor tendon is attached to the lower back of the pedal bone. The extensor tendon is attached to pedal bone at the upper front.

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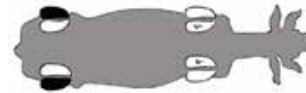


The pedal bone is found in point of the claw beside the coronary band. At the back of the claw, the pedal bone is covered by the digital cushion. The digital cushion serves as a shock absorber for the pedal bone. The digital cushion absorbs the first shock caused by pressure between the pedal bone and the corium. In this way the weight of the cow is evenly distributed over the corium in the claws.

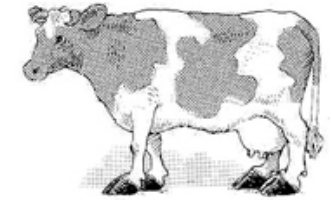


Distribution of the weight when the cow is standing squarely.

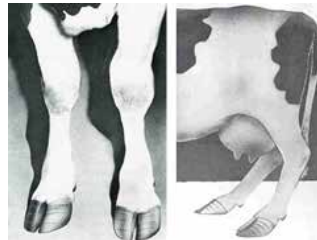
60% of a cow's body weight is supported by the front legs.
40% of a cow's body weight is supported by the hind legs.



The hind legs are joined to the body at the hips, and are less flexible. The hind legs are not straight, but are curved at the hock.



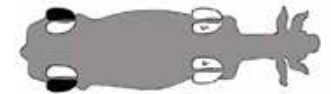
The weight of the foot puts pressure on the pedal bone, through the shin bone, the long pastern bone and the short pastern bone. Lastly, the pedal bone presses on the corium, which in turn is supported once more by the horn.



The front legs are directly under the body and are joined flexibly to the body. The claws are somewhat bigger than those of the hind legs and they are more uniformly formed.



Lameness usually occurs in the hind legs and mainly in the outside rear lateral claw.



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The most important cause of lameness in the rear lateral claw are:

Difference between form and size of the claws.

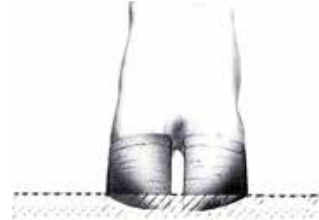
The rear lateral claw is often bigger than the rear medial claw.



Variable pressure on the lateral claws.
A hard surface.



The walking surface or floor under the cows' feet can cause lameness.



A soft walking surface, such as straw in a deep-litter barn, and a meadow, cause fewer problems with stability of the claws. The surface gives under the weight and the weight-bearing surface of the claw is evenly supported and remains more or less stable. The softer the ground, the less impact variable pressure has on the lateral claw. The walking surface and the digital cushions serve as shock absorbers.



A hard surface, such as concrete floors and slatted floors, cause more problems with instability of claws. The effect of the variable pressure on the lateral claws is much greater in this case. The surface does not give under pressure and the stability of the weight-bearing surfaces of the claws is now of utmost importance. An uneven weight-bearing surface means an excessive pressure is put on the claw. The force which is exerted on the pedal bones must now entirely be cushioned by the digital cushions.

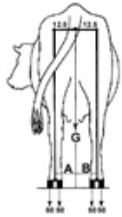


A wet floor results in softer horn. Soft horn grows quicker!

Dierlijk Erfelijke Vruuchtbaarheid-tekstkaart								
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100	101	102

It is difficult to say whether lameness is caused by hereditary factors. An impression can be given if details are registered.

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BIOMECHANICS

How is the weight distributed over the hind legs and what causes excessive growth of the rear lateral claw? The cow is standing squarely on all four legs and the claws are of even height. The weight is distributed 50/50, meaning that it is evenly distributed over both claws. The medial claw normally has a smaller weight-bearing surface than the lateral claw and, therefore, supports less weight than the lateral claw.

Medial claw: 48% of the leg weight.
Lateral claw : 52% of the leg weight.

When the animal moves sideways, the hips move sideways, too. The weight shifts from one leg to the other.

On a soft surface: the change in position has little effect.
On a hard surface: the change in position has a great impact.

The weight shifts from one lateral claw to the other lateral claw.
The pressure on the medial claws remains practically the same.