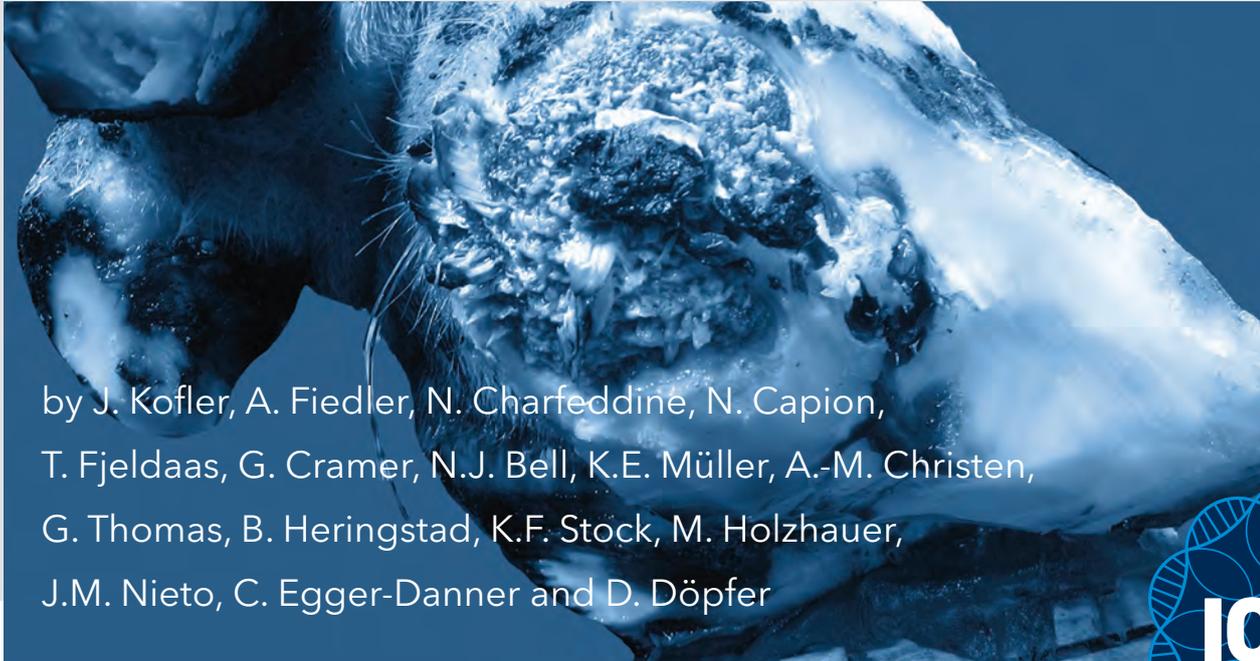


# ICAR Claw Health Atlas - Appendix 2

## Digital Dermatitis-Associated Claw Horn Lesions



by J. Kofler, A. Fiedler, N. Charfeddine, N. Capion,  
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## Digital dermatitis-associated claw horn lesions

DD-associated bovine claw horn lesions, characterized by penetration of the horn capsule and associated with white line infection and sole ulcers etc. are frequently encountered in dairy herds endemically infected by digital dermatitis (DD) (Blowey 2011, Evans et al. 2011, Holzhauer and Pijl 2011). In herds with endemic DD-infection, the exposed corium of the wall and/or the sole is also infected with *Treponema spp.* because they are present everywhere in the environment (Evans et al. 2011).

This disease responds poorly to standard DD treatment (Evans et al. 2011) or standard treatments of white line infection or sole ulcer (without a secondary infection with DD-associated *Treponema spp.*), therefore cows affected commonly have these lesions for several months, and sometimes for more than a year. Therefore historically these lesions have been called 'non-healing' claw horn lesions (Blowey 2011, Evans et al. 2011).

In view of recent studies reporting successful treatment of these 'non-healing' lesions, it is proposed that the nomenclature is changed to **DD-associated white line disease (DD-WLD), DD-associated sole ulcers (DD-SU), DD-associated bulb ulcers (DD-BU), DD-associated toe ulcers (DD-TU), DD-associated toe necrosis (DD-TN) and DD-associated horn fissures (DD-HF)** (Kofler et al. 2015).

Most of these large DD-associated claw horn lesions are chronic, persist for several months and represent a serious welfare issue for the affected cattle. Appropriate and effective treatment for these lesions consists of the complete removal of all loose horn around the lesion and thinning out the horn margins around the lesion using a hoof knife, followed by surgical debridement of the infected corium layer using local anesthesia. In all these cases, a block must be applied to the partner claw, and a protecting bandage (protection of the wound from immediate new contamination) to the foot. Systemic administration of NSAIDs for three days and weekly bandage changes until the complete lesion is covered by a new horn layer (this takes approximately 2 - 8 weeks depending on the size of the corium lesion) have been reported to be very effective (Nouri et al. 2013; Kofler et al. 2015). Claw amputation has never been indicated in such cases (Nouri et al. 2013; Kofler et al. 2015).

In long-standing cases of such DD-associated claw horn lesions (several months and up to more than a year), the surgical removal of the infected corium by a veterinarian using a local anesthesia is mandatory to prevent the DD-associated *Treponema spp.* in the infected corium completely inhibiting horn cell production.



An alternative therapeutic approach in early and therefore small DD-associated claw horn lesions consists of removal of all loose horn around the lesion, thinning out the horn margins around the lesion using a hoof knife (therapeutic hoof trimming), followed by topical application of salicylic acid paste or powder (using licensed products only), and again blocking the partner claw and application of a bandage followed by regular changes of the bandage (Holzhauer & Pijl 2001, Fiedler & Maierl 2015). By the first bandage change one week later, all the dried salicylic acid must be completely removed from the lesion, the wound cleaned, and the local treatment continued using salicylic acid or an antimicrobial spray application, depending on the current wound healing status. Again, the lesion must be covered with a bandage. Bandage changes must be performed until the lesion is covered completely by new horn.

### Definition of DD-associated claw horn lesions

Including DD-associated white line infection or abscess (DD-WLA), DD-associated sole ulcer (DD-SU), DD-associated bulb ulcer (DD-BU), DD-associated toe ulcer (DD-TU), DD-associated toe necrosis (DD-TN) and DD-associated axial or abaxial or dorsal horn fissure (DD-HF). Claw horn lesions with an exposed corium of various extents in cows with a present endemic DD infection showing a secondary infection of DD-associated *Treponema spp.*, and having a history of several months and up to more than one year without healing. The exposed corium in these claw horn lesions may show the same characteristic surface morphology and the same pungent odour as is common in M2 lesions on digital skin.

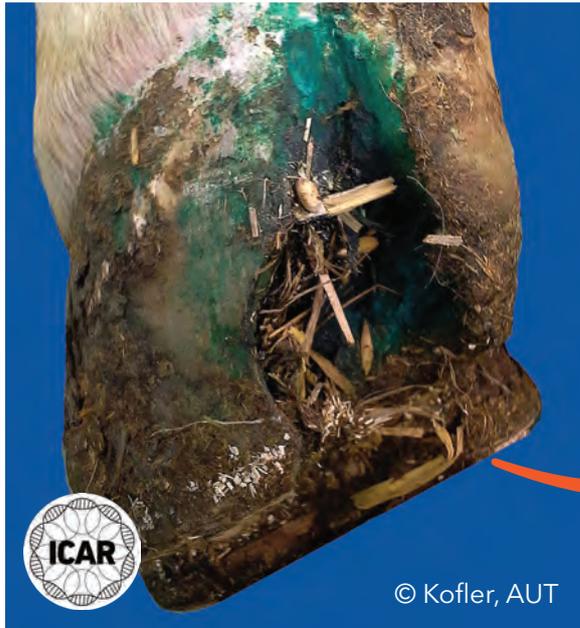
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- Fiedler A, Maierl J (2015): A case study: treatment of 'non-healing' bovine hoof horn lesions. Proceedings of 18th Int. Symposium & 10th Int. Conference on Lameness in Ruminants, Valdivia, Chile, p. 138.
- Holzhauer M, Pijl R (2011): Non-healing white line lesion-advanced experience. Proceedings of 16th Symposium & 8th Conference on Lameness in Ruminants, Rotorua, NZ, p. 149.
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- Nouri M, Ashrafi-Helan J (2013): Observations on healing process of wall ulcers with concurrent digital dermatitis in 52 cattle: gross and light microscopic pathology. *Animal Vet Sci* 1 (6), 60-65.



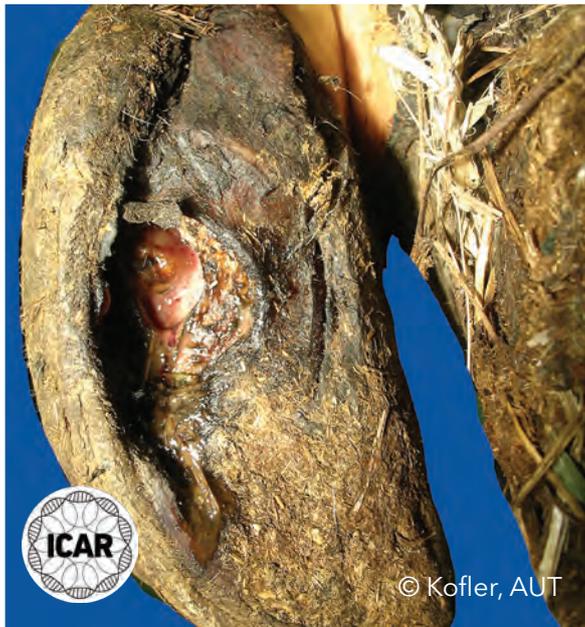
## DD-associated white line abscess (DD-WLA)

Highly increased heel height (left) caused by non-weight bearing of the plantar sole area for prolonged periods. The same claw after hoof trimming and the removal of loose horn (right).



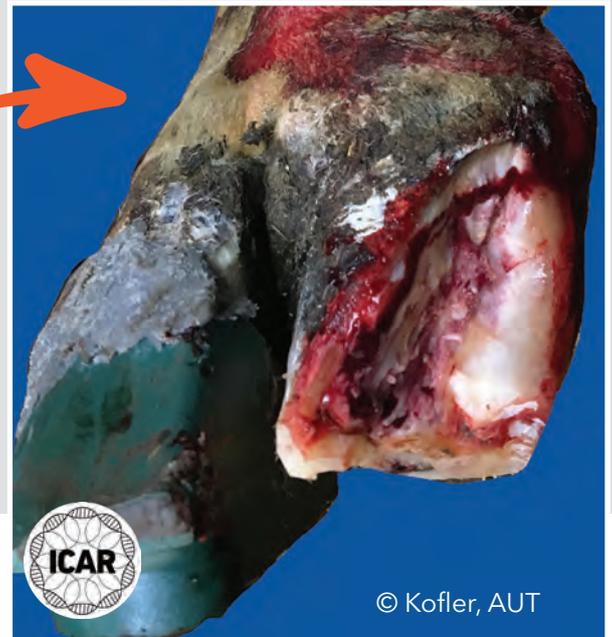
## DD-associated white line abscess (DD-WLA)

Long-standing DD-associated white-line infection (left) and long-standing DD-WLA after the removal of some loose wall horn (right).



## DD-associated white line abscess (DD-WLA)

Some loose horn around the lesion had been removed (left), after surgical removal of all the loose horn and the infected corium layer using local anaesthesia, the lesion appears clean and free of infected tissue (right).



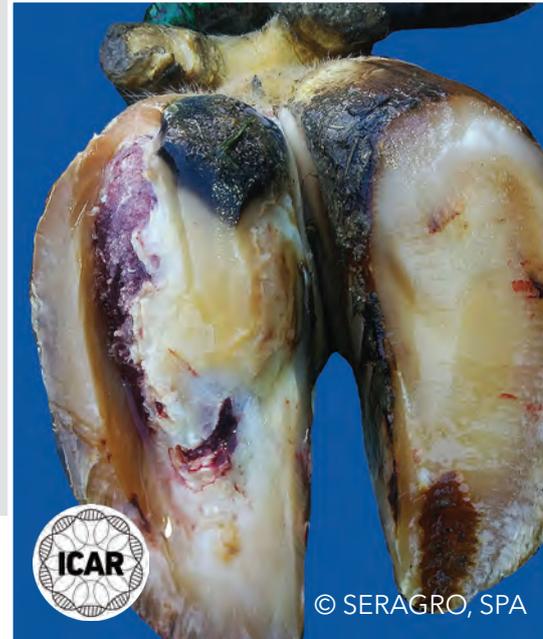
## DD-associated white line abscess (DD-WLA)

DD-infected corium before the removal of dirt (left) and after cleaning and removal of all loose horn on the wall and the bulb of the heel and thinning out the horn margins (right) using local anaesthesia.



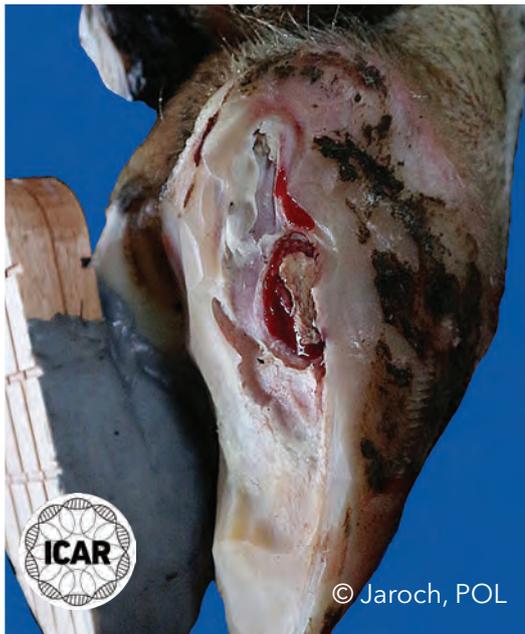
# DD-associated white line abscess (DD-WLA)

DD-WLA after the removal of all loose horn (left); the abaxial wall still has to be removed (right) and a block applied to the partner claw.



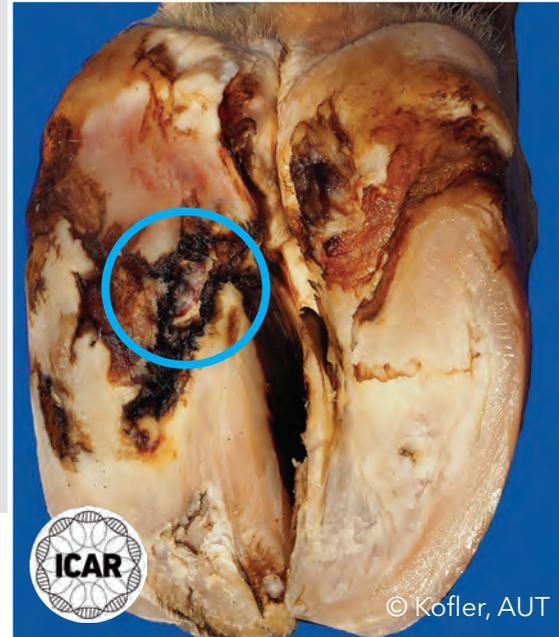
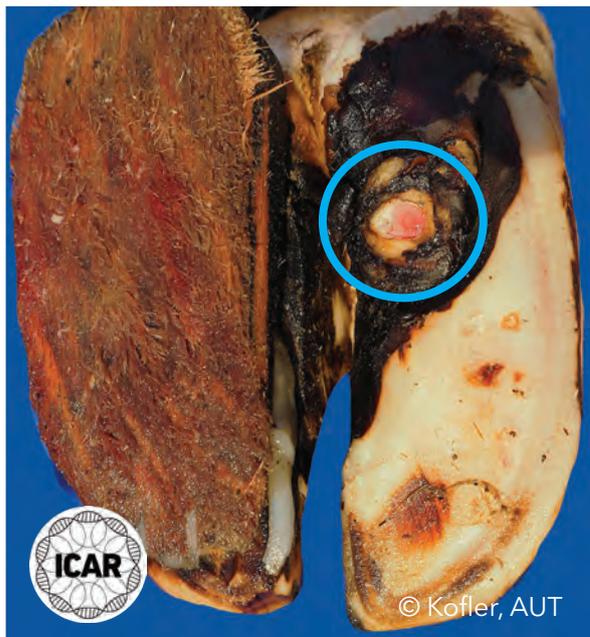
## DD-associated white line abscess (DD-WLA)

DD-infected corium after the removal of all the loose horn and careful thinning out of the horn margins using local anaesthesia.



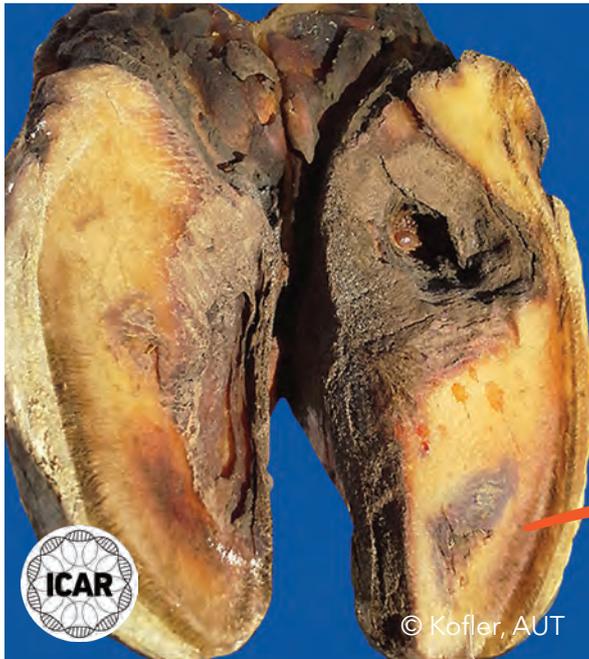
## DD-associated sole ulcer (DD-SU)

DD-associated sole ulcers after an inadequate therapeutic attempt; the circles indicate the exposed corium of the sole.



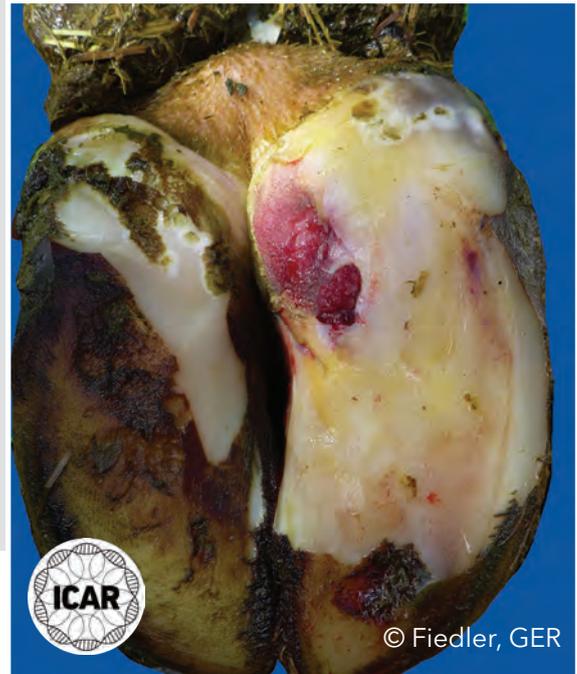
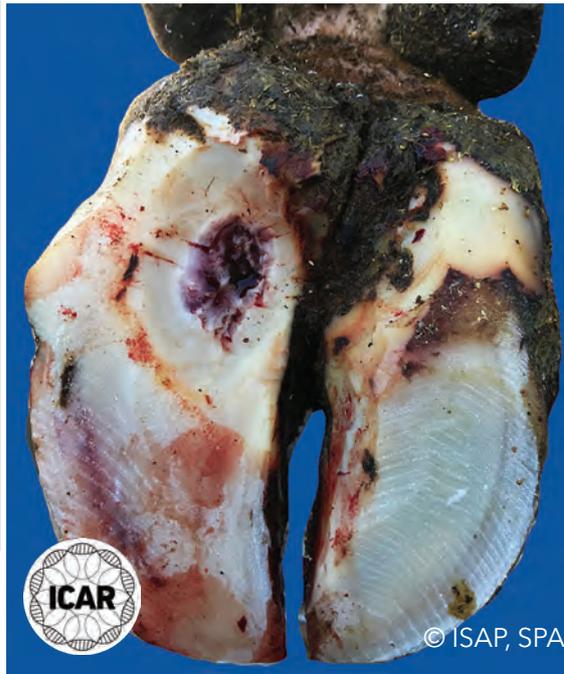
## DD-associated sole ulcer (DD-SU)

Characteristic appearance of a long-standing DD-SU with a thick horn layer in the plantar sole area, and the exposed corium without any horn production (left); DD-SU after hoof trimming (right).



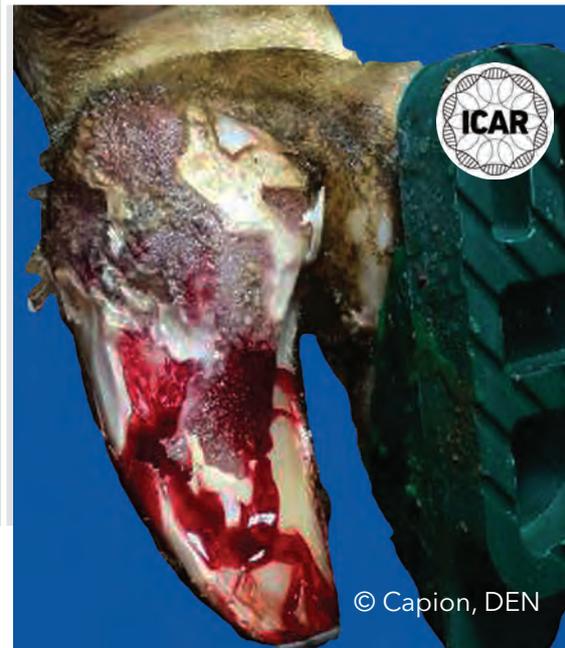
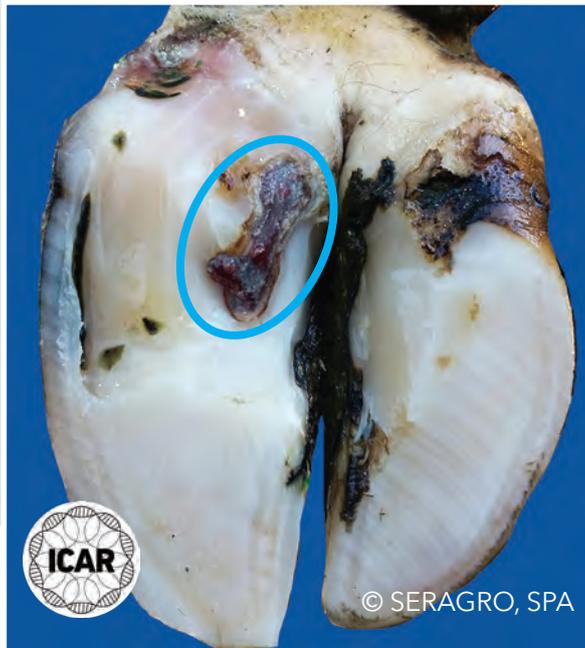
## DD-associated sole ulcer (DD-SU)

DD-SU after the complete removal of all loose horn using local anaesthesia.



## DD-associated sole ulcer (DD-SU)

Small (left) and a large long-standing DD-SU (right) with extended pododermatitis involving the corium of the bulbs of the heel after the removal of loose horn using local anaesthesia.



## DD-associated bulb ulcer (DD-BU)

Long-standing DD-BU and white-line infection after the removal of loose horn around the exposed corium using local anaesthesia.



© Capion, DEN



## DD-associated bulb ulcer (DD-BU)

Small (left) and a large long-standing DD-BU after the removal of all loose horn using local anaesthesia.



## DD-associated bulb ulcer (DD-BU)

DD-BU after exposure and removal of the double sole.



## DD-associated toe ulcer (DD-TU)

Long-standing DD-TU from a cow (left) and from a breeding bull (right) after inadequate therapeutic attempts showing the characteristic protruding hypergranulation.



## DD-associated toe ulcer (DD-TU)

DD-infected corium at the toe with hypergranulation before cleaning and removing the dirt (left), and after therapeutic hoof trimming and surgical debridement of the infected corium layer using local anaesthesia (right).



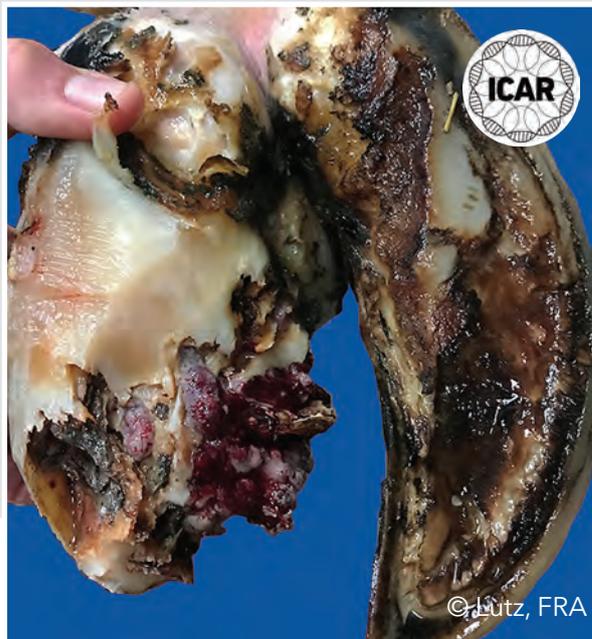
# DD-associated toe necrosis (DD-TN)

DD-TN after the removal of some loose horn.



## DD-associated toe necrosis (DD-TN)

Long-standing DD-TN (approximately 18 months in the claw of the left image) after the removal of loose horn.



## DD-associated axial horn fissure (DD-HFA)

Long-standing DD-HFA (left) characterized by the presence of a moderate hypergranulation covering the axial horn fissure. DD-HFA after the removal of loose horn (right).



## DD-associated axial horn fissure (DD-HFA)

Long-standing DD-HFA (left) characterized by the presence of severe hypergranulation covering the fissure. Long-standing DD-HFA after the removal of loose horn (right).



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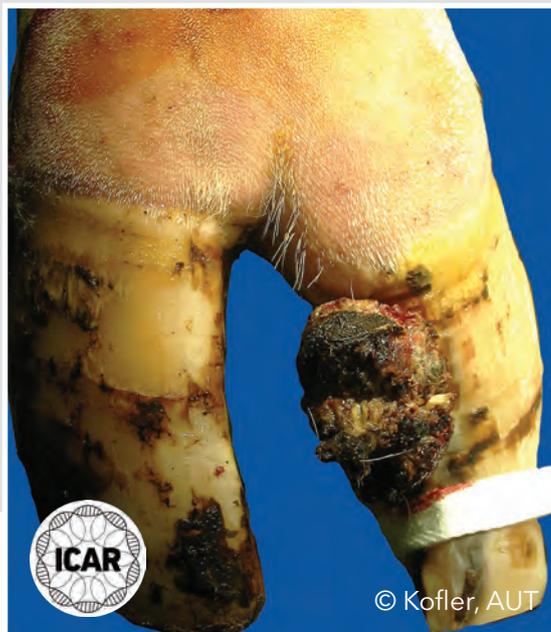
## DD-associated axial horn fissure (DD-HFA)

Long-standing DD-HFA after the removal of most of the loose horn around the lesion using local anaesthesia. There is still some infected corium covered by loose horn, which must be removed surgically.



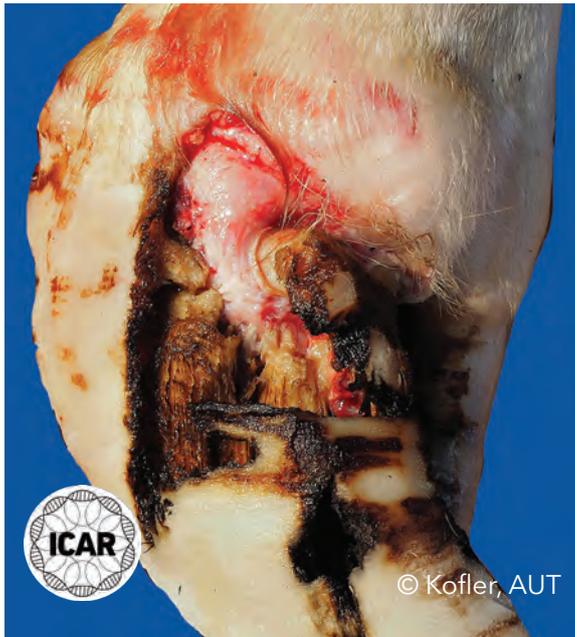
## DD-associated axial horn fissure (DD-HFA)

Long-standing DD-HFA characterized by the presence of severe hypergranulation tissue covering the axial fissure. Note that the hypergranulation originates from the axial wall (fissure).



# DD-associated vertical horn fissure (DD-VHF)

Long-standing DD-associated vertical horn fissures characterized by the presence of severe hypergranulation protruding from multiple horn fissures on the abaxial wall.



# List of image contributors

**Capion, Nynne (DAN):** DD-SU P16b; DD-BU P17a

**Fiedler, Andrea (GER):** DD-WLA P12b; DD-SU P15b; DD-BU P18a; DD-BU P18b; DD-TN P22a;  
DD-VHF P28b

**ISAP (SPA):** DD-SU P15a; DD-HFA P23b

**Jaroch, Karol (POL):** DD-WLA P12a

**Kofler, Johann (AUT):** Table of content DD-WLA P4a; Table of content DD-WLA P4b; ; DD-WLA P7a;  
DD-WLA P7b; DD-WLA P8a; DD-WLA P8b; DD-WLA P9a; DD-WLA P9b; DD-WLA P10a;  
DD-WLA P10b; DD-SU P13a; DD-SU P13b; DD-SU P14a; DD-SU P14b; DD-TU P20a; DD-TU P20b;  
DD-TU P21a; DD-TU P21b; DD-TN P22b; DD-HFA P24a; DD-HFA P24b; DD-HFA P25a;  
DD-HFA P25b; DD-HFA P26a; DD-HFA P27a; DD-HFA P27b; DD-VHF P28a

**Lutz, Catherine (FRA):** DD-HFA P23a

**SERAGRO Company (SPA):** DD-WLA P11a; DD-WLA P11b; DD-SU P16a; DD-BU P19a

