

The use of Intra Repiderma in the healing of dehorning/disbudding wounds

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1 Introduction

Dehorning or disbudding is the process of removing or stopping the growth of the horns of livestock. Cattle, sheep and goats are often dehorned for economic and safety reasons. Horns can pose a risk to humans, to other animals, and to the bearers of the horns themselves (horns are sometimes caught in fences or prevent proper feeding). The procedure is most commonly performed early in an animal's life, along with other actions such as castration. However when the removal of the horn buds is done of the calf at an early age (up to 2 or 3 months) when the horn itself is not yet developed (Rosenberger,1970) it is called disbudding. Some rationale for dehorning are:

- Horns may cause injuries to handlers or other cattle.
- In some breeds and in some individuals, horns may grow towards the head, eventually causing injury.
- Horns may break or damage, causing blood-loss and potential for infection.
- Horned livestock may become trapped in fences or vegetation.

Dehorning is considered by some animal rights activists to be an unnecessary cruelty. In the future, dehorning will probably only be allowed in The Netherlands under defined circumstances (e.g. applied by a veterinarian, proper pain killing) and may eventually even be forbidden when suitable hornless bred animals are available. But as long as it is allowed, it is important to end the procedure with a proper treatment to prevent subsequent infections.

2 Methods of disbudding

Disbudding involves destroying the horn-producing cells (corium) of the horn bud. Horn buds are removed without opening the frontal sinus. Chemical and hot-iron disbudding methods destroy the horn-producing cells, whereas physical methods of disbudding excise them.

Several methods for disbudding cattle exist, but each method has its advantages and disadvantages. Hot-iron disbudding is commonly performed and is reliable, but is considered to be quite painful. Electrical and butane hot-iron disbudding devices are available. Excessive heat applied during hot-iron disbudding can damage underlying bone. Disbudding via cautery may create less distress than physical dehorning using a scoop because nociceptors are destroyed by heat and pain perception is consequently reduced. Caustic materials (e.g., sodium hydroxide, calcium hydroxide) applied to the horn bud can damage surrounding skin

and/or the eyes if runoff occurs; as long as the active chemical is in contact with tissue, damage continues. Injection of calcium chloride under the horn bud results in necrosis of the horn bud, but its administration without prior sedation and/or local anesthesia is not recommended due to the level of discomfort induced by the procedure. Cryosurgical techniques are less reliable than hot-iron disbudding, require additional procedural time, and induce behavioral indicators of pain and distress.

Horn buds can be physically removed, using knives, shears, or dehorning spoons, cups, or tubes. To remove the corium and prevent horn regrowth, a complete ring of hair surrounding the horn bud should also be removed.

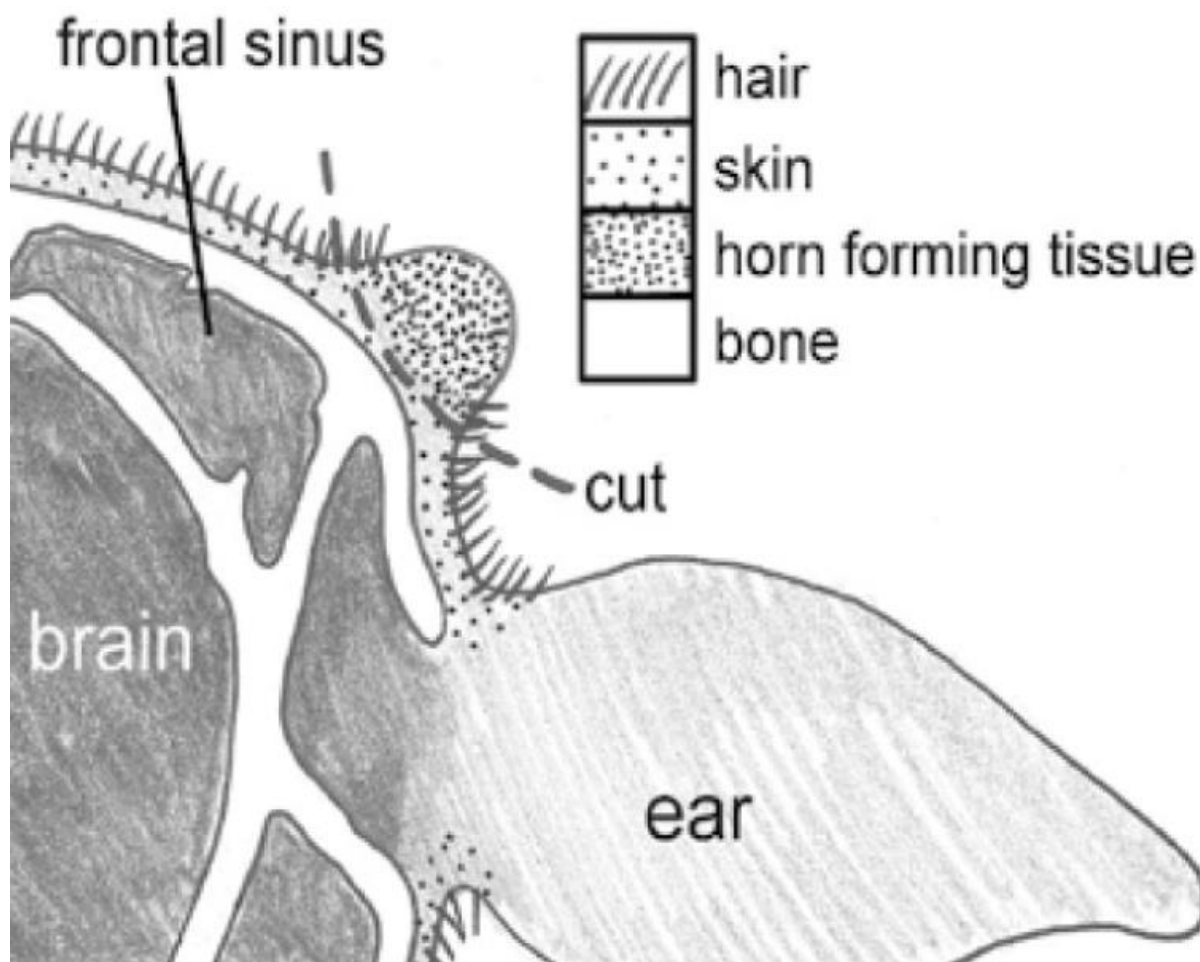


Figure 1. – Disbudding

3 Methods of dehorning

Dehorning is removal of the horns after they have formed from the horn bud. Physical methods of dehorning (gouge dehorning) include the use of embryotomy wire, guillotine

shears, or dehorning knives, saws, spoons, cups, tubes, or high tension rubber bands. The Barnes-type scoop dehorner is commonly used for physical dehorning. When cattle have large horns they are sometimes “tipped”, a procedure that removes the sharp end of the horn but leaves the base.

The presence of the cornual diverticulum of the frontal sinus causes surgical dehorning of adult cattle to be more invasive. Dehorning of adult cattle is associated with increased risks of sinusitis, bleeding, prolonged wound healing, and infection.

Dehorning is often carried out without any antiseptic preparation of the skin around the horn prior to the procedure. The aseptic technique is not considered practical or even necessary for many operative procedures performed on cattle (Heinze, 1970). However this non aseptic environment in which the dehorning takes place increases the risk of the invasion of the wound by pathogenic bacteria that causes infection and delays the prevention of healing

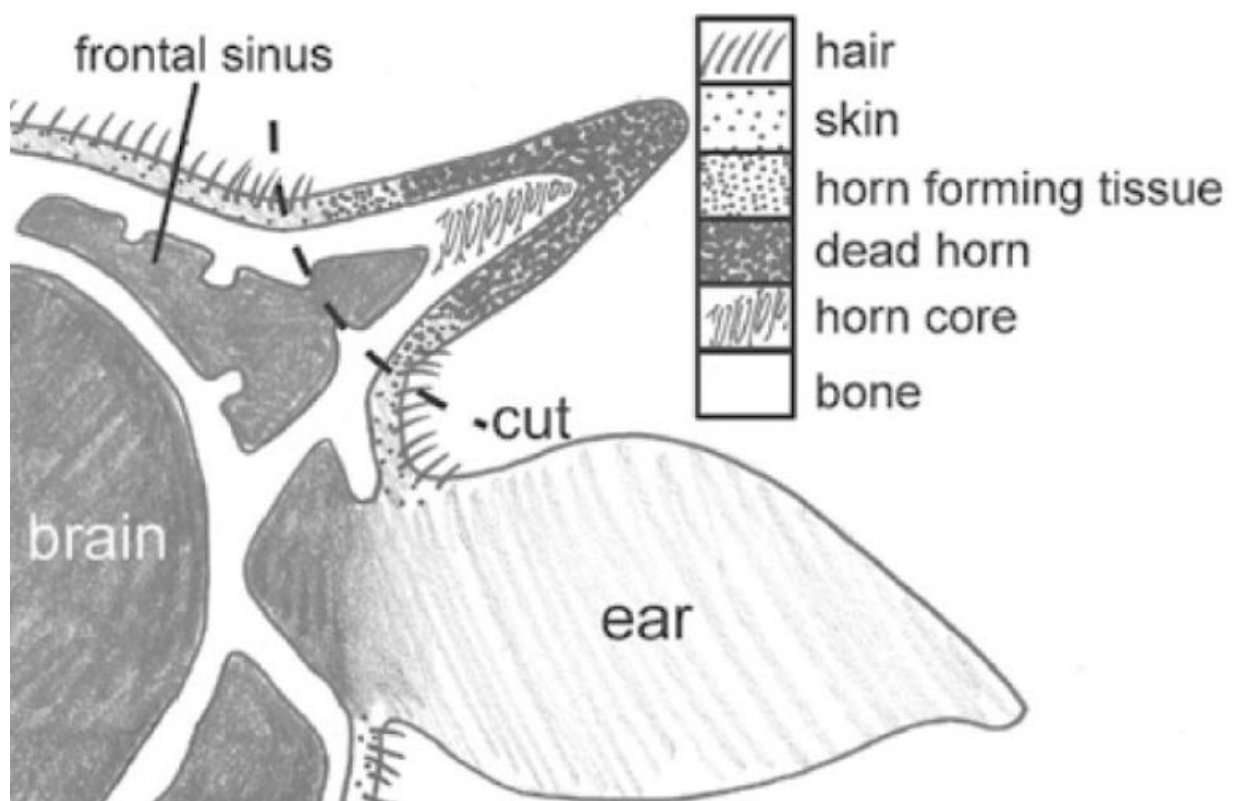


Figure 2.- Dehorning

4 Etiology

Disbudding and dehorning causes skin lesions. This damage of the skin barrier gives the opportunity of pathogenic bacteria to invade and to infect the wound. The micro-organisms isolated most commonly in sinusitis included *Proteus vulgaris*, *Pseudomonas aeruginosa* and *Escherichia coli*, which are common faecal contaminants of the environment of the animal.



Figure 5.- Dehorned cows

As can be seen in **Fig. 5**, the lesion of dehorning is an open wound that is susceptible for infections. Also during disbudding, an open wound is created, that requires to be prevented from infection.

5 Intra Repiderma

Intra Repiderma contains two active ingredients in spray form. Both components are required, as these components have a different clinical effect and thus provide a two-way mechanism for an effective skin treatment: Zinc is mainly incorporated for its positive effect on wound repair and copper is mainly incorporated for its anti-microbial properties, while it also has an effect on wound repair but with a different mechanism of action (stimulation of new blood vessel formation). This way Intra Repiderma treatment is based on inhibiting the cause of the disease (bacterial infection) as well as stimulating healing of the large open lesion.

6 Mode of action

6.1 Antimicrobial properties copper

The bactericidal properties of copper have been known for many years. It has been used as a disinfectant for veterinary purposes and in the food industry. Copper sulphate, for example, has been used for many years as a disinfectant if footbaths for cattle (Epperson and Midla, 2007).

Copper at low concentrations is required for living organisms including bacteria. At higher concentrations however, copper can be bactericidal or bacteriostatic. These effects can be caused by different mechanisms including substitution of essential ions and blocking of functional groups of proteins, inactivation of enzymes, production of hydroperoxide free radicals by membrane bound copper and alterations of membrane integrity (Faúndez, 2004).



Figure 6.- Intra Repiderma

6.2 Wound healing properties of copper

Besides the earlier mentioned bactericidal and bacteriostatic effects, copper has also an effect in wound repair (Sen, 2002). An important phase in the wound healing is the angiogenesis (the formation of new blood vessels). This enable more fresh blood flow to the wound and thus the supply of essential wound-recovery stimulating factors. The most prevalent factor to stimulate this process is the vascular endothelial growth factor (VEGF) (Stefanini, 2008). The expression of VEGF is copper sensitive: when Cu^{2+} was topical applied, wound healing was accelerated.

Another effect of topical Cu^{2+} was the accelerated secondary healing and contraction of dermal wounds in humans (Sen, 2002). The authors concluded that copper-based therapeutics are a feasible approach for wound healing.

6.3 Wound healing properties of zinc

Zinc is an essential element in both animal and humans. It serves as a co-factor in numerous transcription factors and enzyme systems including zinc-dependent matrix metalloproteinase's that augment auto debridement and keratinocyte migration during wound repair (Lansdown, 2007). Zinc confers resistance to epithelial apoptosis through cytoprotection against reactive oxygen species and bacterial toxins possibly through antioxidant activity of the cystein-rich metallothioneins.

Zinc deficiency of hereditary or dietary cause can lead to pathological changes and delayed wound healing. Topical administration of zinc appears to be superior to oral therapy due to its action in reducing super-infections and necrotic material via enhanced local defense systems and collagenolytic activity, and the sustained release of zinc ions which stimulates epithelialisation of wound (Lansdown, 2007).

6.4 Chelated forms of copper and zinc

Often copper and zinc are used as inorganic form (e.g. copper sulphate, zinc chloride, etc). In Repiderma the copper and zinc organic chelated complexes. This allows a deeper penetration into cells / skin layer which gives rise to a better efficacy of the product as the infectious diseases are often also present in deeper skin layers. This improved efficacy has been demonstrated in different practical field trials.

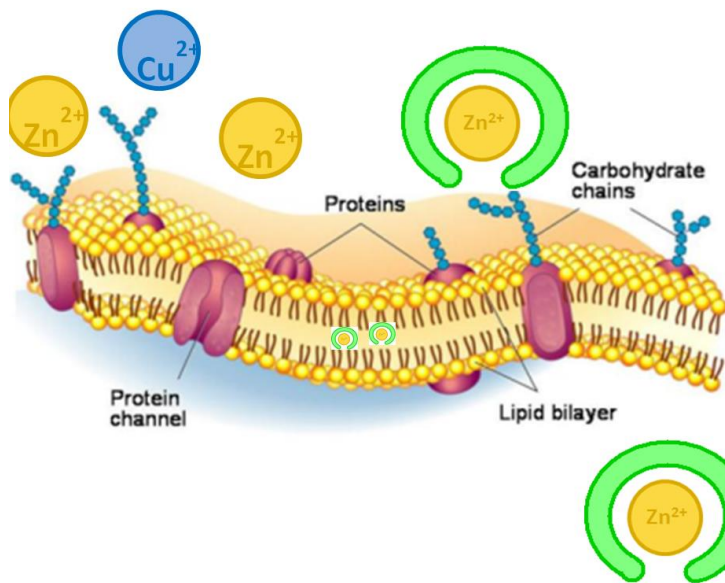


Figure 7.- Simulation of the penetration of chelated zinc and copper in comparison with ionized zinc and copper

7 Materials and Methods

A group of 20 young calves were dehorned. The resulting wounds of 10 calves were treated with the antibiotic, CTC-spray, the wounds of the other 10 calves were treated with Intra Repiderma. The following parameters were studied: the healing time as well as the appearance of the horn wounds during healing were studied. The healing rate was determined by measuring the wound size each day following dehorning.



Figure 8. Doctor of Veterinary Medicine (DVM) Peter Hut of *Veterinairs Skasterlan* in the Netherlands

Testimonial

During my internship I investigated different sprays like zinc spray, aluminum spray and chlortetracycline spray (CTC) that are on the market and can be used for treatment of dehorning wounds. With Intra Repiderma I got the best results. You only have to use it once and after a few days you see that the skin is healed and the cow doesn't show any signs of skin irritation, the healing properties of Intra Repiderma are far better than the other products. Also with all the cows I treated with Intra Repiderma, none got infections wounds. Another big plus is the intense green color of the spray so you can clearly see which part you have treated. Intra Repiderma is the number one replacement for antibiotics.

8 Results

The dehorning wounds that were treated with Intra Repiderma healed faster than those treated with CTC-spray. In four animals treated with CTC-spray, incomplete wound healing was observed, resulting in a large scar and irregular skin margins, having an unattractive appearance. All lesions that were treated with Intra Repiderma healed very well and this skin showed little scar formation.

9 Adverse effects

No adverse effects have been reported on the treated cows. No signs of skin irritations were observed. Intra Repiderma has no withdrawal time.

10 Comparing products

In table 1 different products are compared that are on the market for dehorning.

Table 1. – Dehorning sprays

Name	Active ingredient	Remarks
Acederm	Allantoïne	Allantoine helps with the growth of epithelial cells and reduces the scare tissue formation. Apply twice a days. First clean the wound and then spray it on the wound.
Aluspray	Aluminium powder	Aluminum is an adstringentia, use one or twice a day.
Intra Repiderma	Copper- and zinc chelate	The active ingredients are present in the spray as micronized particles (3-4 µm) so it is easy absorbed by the wound tissue. Intra Repiderma is similar to Intra hoof-fit Gel, which is proven to be 1.57 times more effective than CTC spray.
CTC-spray Animadezon-spray	Chlortetracycline	The product can only be used with there is proof that the bacteria is susceptible to chlortetracycline treatment. Because of overuse there are a lot of bacteriological infections where chlortetracycline cannot be used anymore. Resistance of chlortetracycline impede the treatment of other tetracycline treatments by cross resistance formation.

11 Study 2



Figure 9. Dairy farmer Gert Lammers

In a second study, six calves of 2 to 9 weeks of age were disbudded. First, animals were sedated by a veterinarian, who then applied local anesthesia and systemic pain killing. The skin and horn forming tissue were removed using a hot iron disbudding device (**Fig. 10**). This

results in two open wounds on the skull of the animal. In each calve, one of the wounds was treated with Intra Repiderma, and the other with antibiotic spray.

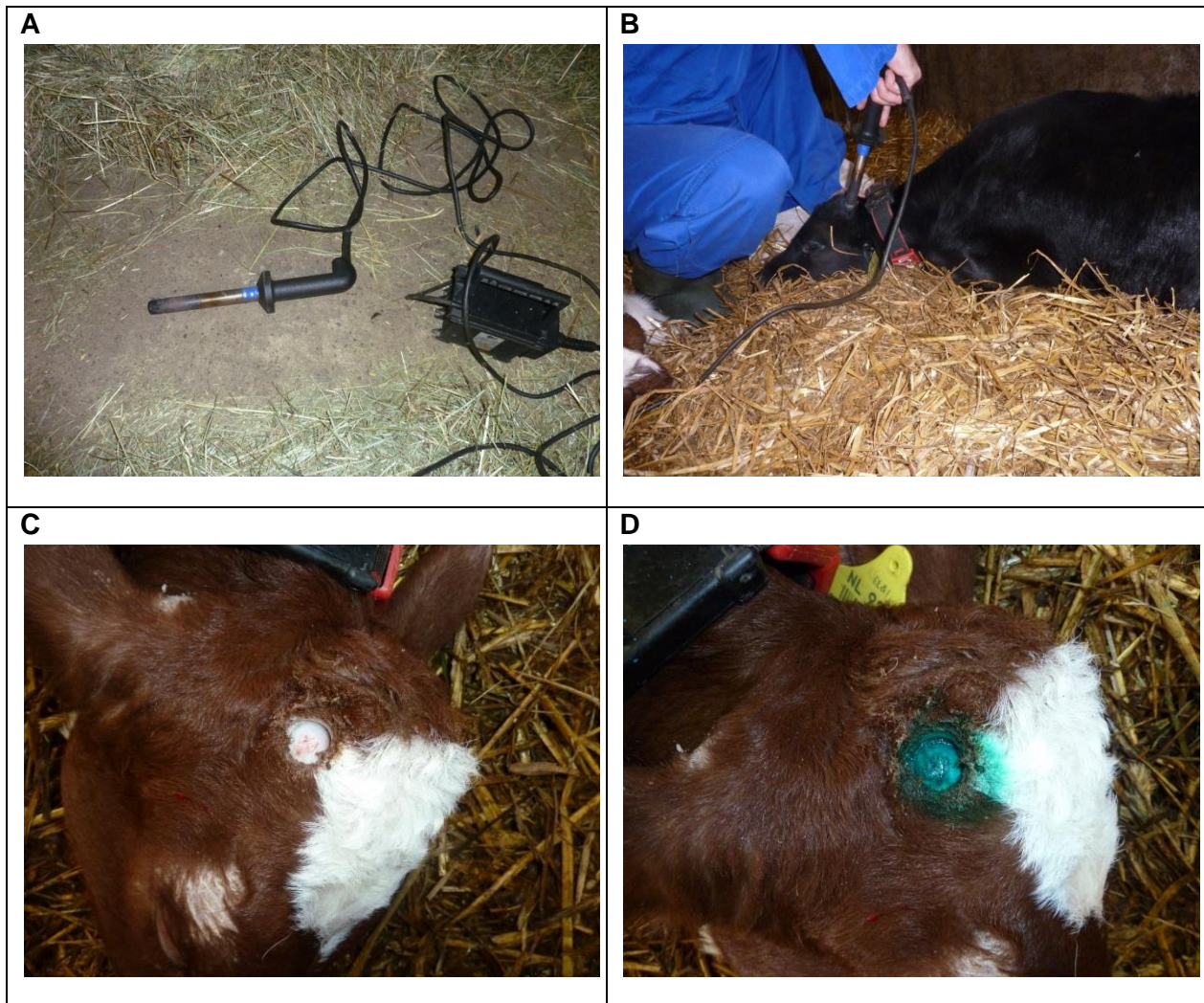










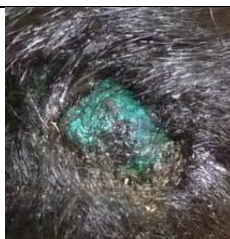



Figure 10. Disbudding of young calves. (A) Hot iron disbudding device. (B) Disbudding of an anaesthetized calve. (C) Open wound after disbudding. (D) Wound covered with Intra Repiderma spray.

After 1 day, it was already visible that the majority of the Repiderma treated wounds had a more dry appearance than the wounds treated with antibiotics. At day 2 and 9, all wounds were slowly closing, and it appeared that the Repiderma treated wounds were slightly smaller than the wounds treated with antibiotics. The (colored) spray was still clearly visible in the wound area. No signs of infection were observed.

	Antibiotic spray		Repiderma	
	Animal 1	Animal 2	Animal 1	Animal 2
Day 0				
Day 2				
Day 9				

12 Conclusion

Intra Repiderma is very effective for the treatment of dehorning wounds, with the great advantage that it does not contain antibiotics. Keep in mind that for severe lesions the treatment has to be repeated several times.

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