

Section

Fields (of activity)

# *In-vitro* and *ex-vivo* testing of alternative disinfectants for use in foot baths against virulent *Dichelobacter nodosus* to replace formalin, zinc sulfate and copper sulfate.

Tobias Hidber <sup>1,2</sup>, Peter Kuhnert <sup>2</sup>, Urs Pauli<sup>3</sup>, Adrian Steiner <sup>1</sup>

<sup>1</sup> Clinic for Ruminants, Vetsuisse-Faculty, University of Bern, Bremgartenstrasse 109a, 3012 Bern, Switzerland <sup>2</sup> Institute of Veterinary Bacteriology, Vetsuisse-Faculty, University of Bern, Längassstrasse 122, 3001 Bern, Switzerland

<sup>3</sup>Institut für Virologie und Immunologie, Sensemattstrasse 293, 3147 Mittelhäusern

### Key words

*In-vitro* disinfectant testing, *ex-vivo* disinfectant testing, foot rot, *Dichelobacter nodosus*, foot bath, PMAxxqPCR

### Aim of the study

The study was performed to identify disinfectants, which are highly effective against *Dichelobacter nodosus (D. nodosus)*, non-carcinogenic, environmentally acceptable, inexpensive, available as concentrate and suitable for licensing with the goal to replace formalin, zinc sulfate and copper sulfate.

### Material and methods

The study consisted of 4 parts: (i) literature review was performed to select potential disinfectants. (ii) opinion inquiry involving experts from the FSVO, the food safety and animal health office of the canton of Grisons, ETH Zürich, consulting and health service for small ruminants and several private pharmaceutical companies lead to the selection of one favorite disinfectant product with an already existing registration as biocide (DESINTEC® Hoof Care Special D (Desintec)). (iii) *In-vitro* testing of various disinfectants against isolated *D. nodosus* without and with organic soiling. (iv) *Ex-vivo* testing by footbathing foot rot affected feet of slaughtered sheep and quantification by PMAxx-qPCR evaluating the disinfectant effect under more realistic circumstances. Desintec (3, 6 and 9%) was compared with 4% formalin and 10% zinc sulfate.

### **Results and significance**

*In-vitro:* Desintec achieved a > 5 log reduction in a 1:100 dilution without and with organic soiling, whereas in 1:1000 solution, the reduction was no more sufficient in the presence of organic soiling. Components of Desintec (glutaraldehyde, acetic acid, glycolic acid) all achieved a > 5 log reduction at 5% without and with organic soiling. Formalin (4%) and copper sulfate (5% and 10%) revealed a reduction > 5 log whereas zinc sulfate (10%) failed to demonstrate a > 5 log reduction without and with organic soiling.

*Ex-vivo:* 4% formalin versus 0.85% NaCl evoked a significant reduction, whereas 10% zinc sulfate and 0.85% NaCl were not significantly different. For this reason, the more effective disinfectant formalin was chosen for comparison with Desintec. Both 6% and 9% Desintec showed no significant differences compared with 4% formalin (power >80%).

Our *in-vitro* and *ex-vivo* experiments showed that 6% Desintec is an effective alternative to 4% formalin, 10% zinc sulfate and 5% copper sulfate for the use in sheep footbaths to combat virulent *D. nodosus*. The product is not only effective but also non-carcinogenic, is biodegradable and available as concentrate, making it an improvement over the currently used disinfectants. The results of this study represent a step forward on the way to a nationwide footrot control program in Switzerland, mainly based upon herd-level footbathing. Further *in-vivo* testing of 6% Desintec is warranted.

## Publications, posters and presentations

Paper in preparation for publication in Veterinary Microbiology. As soon as accepted, the manuscript will be used as the basis of the Dr.med.vet. Dissertation of Tobias Hidber.

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