**Treatment of Digital Dermatitis in Dairy Cattle**

**Clinical scenario**

On a routine mobility score of an organic dairy herd you notice a few cows with digital dermatitis. The farmer is reluctant to footbath as he has a low prevalence of disease and sees it as an added cost. He currently treats acute lesions with oxytetracycline spray, but is trying to reduce antibiotic use and has asked about non-antibiotic topical products. Is there any evidence that these are as good as topical antibiotics?

**PICO**

In (dairy cows with acute digital dermatitis) are (topical non-antimicrobials) as good as (topical antibiotics) in (resolving lesions).

**Search Strategy and Summary of Evidence**

Search terms

‘Digital Dermatitis Treatment Cattle Oxytetracycline’ OR ‘Digital Dermatitis Treatment Cattle Chlortetracycline’

Scout:

(Databases included: BioMed Central Journals, BioOne, British Library Public Catalogue, CAB Direct, CABI Animal Health and Production Compendium, Cochrane Library, Copax National, Academic and Specialist Library Catalogue, Consultant Veterinary Diagnostic Database, DEFRA, Directoryt of Open Access Journals, EThOS, Internet Center for Wildlife Damage Management, International Veterinary Information Service, National Institutes of Health, NOAH Datasheets, Pubmed, ResearchGate Scientific Network, ScienceDirect, Springer Protocols, SUNCAT< Veterinary Information Network, Veterinary Medicine, Veterinary Practice News, VetnetBase, Vetsonline, Vetstream, Web of Science, Wellcome Library, WikiVet, Wildpro, Wiley Online Library, Zetoc Electronic Table of Contents.)

* 23 Papers found
* 14 Papers excluded as they don’t meet the PICO question
* 1 Papers excluded as they are review articles/in vitro research
* 3 Papers excluded as they do not use commercially licensed and/or available products
* 5 Total relevant papers

Pubmed

* 24 Papers found
* 17 Papers excluded as they don’t meet the PICO question
* 0 Papers excluded as they are review articles/in vitro research
* 3 Papers excluded as they do not use commercially licensed and/or available products
* 4 Total relevant papers

In total, 6 relevant papers

**Summary of Evidence**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Title, Authors, Published | Study Type Patient Group | Intervention | Control | Outcome | Key Points | Weaknesses |
| Efficacy of salicylic acid in the treatment of digital dermatitis in dairy cattle.  Schultz N, Capion N.  2013, Veterinary Journal, UK | RCT 201 lesions from 173 cows from 4 commercial dairy herds | All lesions cleaned with water and a stiff brush, dried and photographed.  Tx: 10g of salicylic acid applied topically within a bandage left in place for three days. | Cx: Cyclo Spray (Chlortetracycline) applied twice for 3s with a 30s interval | Pain, lesion size and clinical appearance (M0-M4) evaluated on days 3, 14, 34 post-tx.  Pain:  0 – No pain or moderate pain (raises foot for <2 seconds)  1 – Obvious pain, raises foot for >2 seconds  Lesion progression defined as:  0 – Smaller  1 – Larger or the same size  Healing defined as a change to M0.  Improvement defined as changes of M2 or M4 to M1 or M3.  Overall positive effect defined as healed + improvement.  Comparison of treatments using logistic regression. | Significant difference (p=0.01) in healing rate at day 34:  Cx – 3.1% (0 – 6.5)  Tx – 13.6% (7 – 20)  No significant difference (p=0.6) in improvement rate at day 34:  Cx – 33.7% (24.3 – 43)  Tx – 36.9% (27.6 – 46.2)  Significant difference (p=0.05) in overall positive effect at day 34:  Cx – 36.7% (30 – 43.4)  Tx – 50.5% (43.6 – 57.4)  No significant difference in pain or lesion progression between the treatment and control groups. | Low cure rates and low improvement rates.  Unfair comparison as the control treatment is licensed for treatment on 3 consecutive days.  Non-blinded |
| Curative effect of topical treatment of digital dermatitis with a gel containing activated copper and zinc chelate.  [Holzhauer M](http://www.ncbi.nlm.nih.gov/pubmed/?term=Holzhauer%20M%5BAuthor%5D&cauthor=true&cauthor_uid=21957114)1, [Bartels CJ](http://www.ncbi.nlm.nih.gov/pubmed/?term=Bartels%20CJ%5BAuthor%5D&cauthor=true&cauthor_uid=21957114), [van Barneveld M](http://www.ncbi.nlm.nih.gov/pubmed/?term=van%20Barneveld%20M%5BAuthor%5D&cauthor=true&cauthor_uid=21957114), [Vulders C](http://www.ncbi.nlm.nih.gov/pubmed/?term=Vulders%20C%5BAuthor%5D&cauthor=true&cauthor_uid=21957114), [Lam T](http://www.ncbi.nlm.nih.gov/pubmed/?term=Lam%20T%5BAuthor%5D&cauthor=true&cauthor_uid=21957114).  2011, Veterinary Record, UK | RCT on 5 dutch dairy farms in 2009-2010, 205 hindfeet.  Power calculation to detect a 10% difference at 80% power and alpha at 0.05 = 300 cows per treatment. | IntraHoof Fit (IHF) Copper + zinc chelate gel applied topically on days 0, 3 and 7. | Chlortetracycline (CTC) spray applied topically on day 0, 1 and 2. | Transition between M stages as determined by lesion photography.  Cure defined in the method as transition from M2🡪M0 at days 7, 21 and 28.  Statistical comparison using a Kruskall-Wallis test due to ordinal date. | At d28:  IHF 0.92 (0.84-0.96)  CTC 0.58 (0.47-0.68)  Cure rate of M2 lesions is significantly improved with IHF relative to CTC at 28 days (p<0.01). | Inconsistent definition of cure between the method and results section. In the results cure is defined as all transitions from painful M2 lesions to M0, 1, 3 and 4.  Non-random allocation (alternating treatment and control).  No negative control.  Only M0 should be considered as a cure.  Non-blinded. |
| Efficacy of a nonantimicrobial cream administered topically for treatment of digital dermatitis in dairy cattle.  Dale A. Moore, DVM, MPVM, PhD, DACVPM Steven L. Berry, DVM, MPVM Marla L. Truscott​‌Vasyl Koziy, DVM  2001, Journal of the American Veterinary Medical Association, USA | RCT. 98 cows with active DD from a single commercial free-stall 1200 cow Holstein dairy herd. DD defined as characteristically round to oval, circumscribed, hairless, moist, erosive, and proliferative on the foot of a hind limb.  Footbaths not used on this dairy.  Power calculation to detect a 40% difference with power 80% and alpha 0.05. = 33 cows per group. | Topical non-antimicrobial cream – soluble copper with peroxide and a cationic agent.  Both tx placed on a 4x4 gauze sponge + held in place with an elastic bandage. Bandage was removed after 5d. | Positive Cx: Lincomycin  Negative Cx: no therapy | Cows examined every 4 weeks for 130d after tx. Lesion score, signs of pain, lesion size + lesion activity.  Statistical comparison by chi2 test. | 29d after a single tx both groups had significantly reduced scores for signs of pain, lesion activity, lesion size and decision to retreat relative to no tx control.  Efficacy of the two tx were not significantly different for decreasing pain score, lesion activitiy or lesion maturity score.  Lincomycin significantly more efficacious in decreasing lesion size + avoiding retreatment.  Compared with control cows, non-antimicrobial cream was 10x more likely to result in a reduced lesion size and lincomycin 18x.  Cows with 3 or more lactations were more likely to have a healed lesion at d29 compared with 1st and 2nd lactation cows. | 1 farm only.  Bacterial cure was not assessed  4 weekly observation. Lesions likely to heal more quickly.  “It may also allow treatment in the interdigital space between the heel bulbs, which could be a site of residual infection.” – this claim was not tested in this study.  Non-blinded |
| Efficacy of two modified nonantibiotic formulations (Victory) for treatment of papillomatous digital dermatitis in dairy cows.  [Shearer JK](http://www.ncbi.nlm.nih.gov/pubmed/?term=Shearer%20JK%5BAuthor%5D&cauthor=true&cauthor_uid=10791790)1, [Hernandez J](http://www.ncbi.nlm.nih.gov/pubmed/?term=Hernandez%20J%5BAuthor%5D&cauthor=true&cauthor_uid=10791790).  2000, Journal of Dairy Science, USA | RCT blinded 78 cows with papillomatous DD | 3 formulations of Victory (non-antibiotic)  Tx 2 (22): Original Victory  Tx 3 (17): Victory with reduced soluble copper peroxide but increased cationic agent.  Tx 4 (20): Victory with normal soluble copper + cationic agent but reduced peroxide. | Tx 1 (19): OTC solution  All treatments once daily for 5d, not tx for 2d, then once daily for 3 more treatments. | Cows examined at d7, 14, 28 for pain and lesion scores.  Pain:  0 – No signs of pain  1 – Signs of mild pain  2 – Signs of severe pain  Lesion:  0 – No visible lesion  1 – Lesion ≤ 2.5cm in diameter  2 – Lesion > 2.5cm in diameter  Statistical analysis using a Fisher’s exact test due to ordinal data. | Group C (Tx 3) the most effective, proportion of cows with signs of pain were significantly lower compared to Tx 1.  Low efficacy of OTC, is this due to resistance? 40% reduction in pain.  No significant difference in presence of lesions at day 7, 14, or 28.  At d28 sig diff in signs of pain in 1 + 2 vs 3 + 4. 3 appeared best. | No negative control.  Too small a sample size.  Bacterial culture and sensitivity needed to demonstrate resistance.  Subjective pain score is prone to bias. |
| Comparison of topical application of oxytetracycline and four nonantibiotic solutions for treatment of papillomatous digital dermatitis in dairy cows.  Hernandez J, Shearer JK, Elliot JB.  1999, Journal of the American Veterinary Medical Association, USA | Blinded RCT, 66 cows from a single herd, allocated into 6 groups of 11. | All lesions were washed and treatments applied once daily for 5 days, no treatment for 2 days then once daily for 3 days.  Tx (2): commercial formulation of soluble copper, peroxide compound + cationic agent  Tx (3): 5% copper sulphate solution  Tx (4): Acidified ionised copper solution  Tx (5): Hydrogen peroxide-peroxyacetic acid solution | Positive Cx (1): Oxytetracycline spray  Negative Cx (6): Tap water | Cows examined days 14 and 30 after initial treatment for ordinal pain and lesion scores.  Pain:  0 – no signs of pain  1 – signs of mild pain (limb withdrawal)  2 – Severe pain (cow holds foot off ground)  Lesion:  0 – No visible lesion  1 – Lesion ≤ 2.5cm in diameter  2 – Lesion > 2.5cm in diameter  Kruskall-Wallis and Fisher’s Exact were used to compare groups due to ordinal data. | There was no significant difference between oxytetracycline and the commercial product, but both were significantly more effective in reducing pain and lesion scores than tx 3 and 4. | No significant difference is not the same as equivalence, oxytetracycline spray appears superior to the commercial formulation.  Small sample size on only one farm.  Non validated pain and lesion score.  No account for stage of disease like the Mortellaro scoring system does. |
| Study on the effectiveness of topical application of antiseptics in the therapy of digital dermatitis in dairy cattle Stevancevic , M. ; Toholj , B. ; Lako , B. ; Potkonjak , A. ; Kuljaca , V. , Pik Becej , Bece 2009, Acta Veterinaria Denmark | 183 Holstein-Friesian cows from 3 farms | All lesions were debrided with a saline soaked cotton swab, and tx applied once daily for one week, then every other day up to 30d.  Tx 1: Copper sulfate 8%  Tx 2: zinc sulfate 8%  Tx 3: Formalin 8%  Tx 4: Peracetic acid 3% | Positive Cx: Chlortetracycline spray topically once daily for 7d  Negative Cx: Saline and cover with vaseline | Clinical examination on days 15 and 30, change in mean lesion score.  Lesion score:  0 – no lesion  1 – concave or planar lesions, weak to moderate pain, <2cm  2 – Planar lesions with present granulation tissue, painful, >2cm  3 – Large chronic lesions that are prominent over the surface of surrounding skin, +/- papillomatous skin proliferates  (scoring system taken from Britt et al 1999)  Analysis of variance of means used to test for statistical difference | All treatments were significantly better than the negative control at day 15 and 30.  At day 15 zinc sulphate was significantly better than the other antiseptics but not as good as the antibiotic spray.  At day 30 there was no significant difference between zinc sulphate and chlortetracycline, but both treatments were significantly better than all the other groups. | Mean lesion score – flawed statistically.  Non-blinded |

**Comments**

There is reasonable evidence that topical non-antimicrobial products can work at least as well as tetracyclines to resolve lesions, with none of the studies showing antibiotics to be significantly better. Due to increasing pressure to reduce the use of antimicrobials in farm animals, especially in the organic sector, commercial non-antibiotic formulations should be considered as a 1st line treatment for acute digital dermatitis. Furthermore they are not classified as a prescription medicine and so may be carried by foot trimmers. Repeat treatments improve the resolution of lameness and give the farmer opportunity to follow lesion progression.

**Bottom Line**

Topical non-antibiotic products resolve acute digital dermatitis lesions at least as well as topical antibiotics.

Britt JS, Berry SL, Shearer J, Hemling T, Steevens B, Dreher M, 1999, A uniform protocol for evaluating response to treatment of PDD lesions, Bovine Pract, 33, 2, 149-54

Hernandez, J., Shearer, J. K., & Elliott, J. B. (1999). Comparison of topical application of oxytetracycline and four nonantibiotic solutions for treatment of papillomatous digital dermatitis in dairy cows. *Journal of the American Veterinary Medical Association*, *214*(5), 688–90.

Holzhauer, M., Bartels, C. J., van Barneveld, M., Vulders, C., & Lam, T. (2011). Curative effect of topical treatment of digital dermatitis with a gel containing activated copper and zinc chelate. *The Veterinary Record*, *169*(21), 555.

Moore, D. a, Berry, S. L., Truscott, M. L., & Koziy, V. (2001). Efficacy of a nonantimicrobial cream administered topically for treatment of digital dermatitis in dairy cattle. *Journal of the American Veterinary Medical Association*, *219*(10), 1435–1438.

Schultz, N., & Capion, N. (2013). Efficacy of salicylic acid in the treatment of digital dermatitis in dairy cattle. *Veterinary Journal (London, England : 1997)*, *198*(2), 518–23.

Shearer, J. K., & Hernandez, J. (2000). Efficacy of two modified nonantibiotic formulations (Victory) for treatment of papillomatous digital dermatitis in dairy cows. *Journal of Dairy Science*, *83*(4), 741–5.

Stevančević, M., Toholj, B., Lako, B., Potkonjak, A., & Kuljača, V. (2009). Study on the effectiveness of topical application of antiseptics in the therapy of digital dermatitis in dairy cattle. *Acta Veterinaria*, *59*(4), 437–446.