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Effectiveness of a combined (4% chlorhexidine digluconate shampoo and solution) protocol in MRS and non-MRS canine superficial pyoderma: a randomized, blinded, antibiotic-controlled study

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Background – There is a lack of studies comparing topical antiseptics to systemic antibiotics in the treatment of canine superficial pyoderma.

Hypothesis/Objectives – To compare the efficacy of topical chlorhexidine with systemic amoxicillin–clavulanic acid for the treatment of canine superficial pyoderma.

Animals – A randomized controlled trial was conducted in dogs with superficial pyoderma. Group T (n = 31) was treated topically with 4% chlorhexidine digluconate shampoo (twice weekly) and solution (once daily) for 4 weeks. Group S (n = 20) was treated orally with amoxicillin–clavulanic acid (25 mg/kg) twice daily for 4 weeks.

Methods – Bacterial culture and susceptibility testing were performed on clinical specimens collected before treatment. Severity of lesions and number of intracellular bacteria were evaluated using four-point scales to calculate a total pyoderma score for each dog. Pruritus was assessed by owners using a visual analog scale (range 0–10). Scores were analysed for statistical differences between groups T and S.

Results – *Staphylococcus pseudintermedius* was isolated from 48 dogs, including eight meticillin-resistant strains (MRSP). Although the number of dogs was small, no significant differences in pyoderma and pruritus scores were observed between groups throughout the study except for day 1, when group S had a significantly higher total score than group T (P = 0.03). Treatment with chlorhexidine products resulted in resolution of clinical signs in all dogs including those infected with MRSP.

Conclusion and clinical importance – Topical therapy with chlorhexidine digluconate products may be as effective as systemic therapy with amoxicillin–clavulanic acid. This finding supports the current recommendations to use topical antiseptics alone for the management of superficial pyoderma.

Introduction

Treatment of canine superficial pyoderma has been traditionally based on systemic antibacterial administration for 3–4 weeks, with topical antimicrobial therapy suggested as an adjunctive treatment.[1] Topical therapy may be administered either by applying creams or ointments containing topical antibiotics such as mupirocin or fusidic acid, by spraying with solutions containing chlorhexidine and by washing with shampoos containing antiseptics, such as chlorhexidine, benzoyl peroxide and ethyl lactate.[1] Guidelines on the treatment of cutaneous bacterial infections have been published and the authors suggested the use of topical antimicrobial shampoos and sprays for mild superficial, surface and/or focal infections.[2,3] The guidelines recommend amoxicillin–clavulanic acid, cefalexin or clindamycin as first-line empirical agents for systemic antibiotic therapy.[2,3]

The recent emergence of meticillin-resistant *Staphylococcus pseudintermedius* (MRSP) and other multi-resistant staphylococci makes the choice of an effective antibiotic more difficult and nearly impossible in some cases.[4–7] Meticillin-resistant and -susceptible staphylococci are equally sensitive to antiseptics, such as chlorhexidine digluconate.[8,9] Previous studies have reported that chlorhexidine acetate or gluconate may be effective

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as sole treatments in canine superficial pyoderma.[10–12] However, these studies showed improvement of the disease following treatment with topical chlorhexidine for 2 weeks, whereas complete resolution of superficial pyoderma was not achieved.

The aim of this study was to evaluate the clinical efficacy of combined topical treatment with 4% chlorhexidine digluconate shampoo and solution compared to systemic antimicrobial therapy with amoxicillin–clavulanic acid in dogs affected with superficial pyoderma.

Materials and methods

Study design, inclusion and exclusion criteria

This randomized, controlled and single-blinded study was conducted over a period of 2 years at seven veterinary practices in Italy. Inclusion criteria included a clinical diagnosis of superficial pyoderma and written informed consent from the owner. Most of the dogs were either first opinion cases or were enrolled during the diagnostic investigation for the primary dermatological disease. During the inclusion visit superficial pyoderma was diagnosed based on the presence of one or more papules, pustules, epidermal collarettes or crusts, with detection of at least one neutrophil with intracytoplasmatic bacteria on cytological examination. Each owner agreed to perform the assigned treatment and to comply with the planned visits without disclosing the treatment group assignment to the blinded examiner. Dogs with deep pyoderma, *Malassezia* dermatitis or ectoparasitic diseases were excluded. Additional exclusion criteria included treatment with systemic antibiotics, topical therapies (except spot-on ectoparasite preventatives) or ear medications within the prior 10 days, oral or injectable glucocorticoids within the prior 30 days, and repositol glucocorticoids within the prior 90 days. Dogs were excluded during the trial if they had adverse reactions to topical or systemic therapy, if they required systemic antibiotics or glucocorticoids for other medical conditions, or if their owners did not comply with the protocol.

Treatment groups and protocols

Randomization of treatment groups was achieved by a random number table. At the inclusion visit (Day 1), dogs were assigned to two treatment groups by one of two examiners (nonblinded examiner): group T (topical therapy) and group S (systemic therapy). Group T was treated for 4 weeks with (i) 4% chlorhexidine digluconate shampoo (Chlorexyderm® shampoo 4%, ICF; Cremona, Italy) twice weekly and (ii) 4% chlorhexidine digluconate solution (Chlorexyderm® soluzione 4%, ICF) applied once daily on the days when the dogs were not shampooed. Three to 5 min contact time was allowed for the shampoo before rinsing and dogs were left to dry naturally or were dried with a bath towel. The last shampoo treatment before each recheck visit was performed at least 3 days before the clinical examination.

Group S was treated with amoxicillin–clavulanic acid (Synulox®, Zoetis; London, UK) 25 mg/kg orally twice daily for 4 weeks. Because MRSP is by definition resistant to amoxicillin–clavulanic acid, dogs affected by MRSP superficial pyoderma and assigned to group S were reassigned to a third group (group NR, not randomized) and treated using the topical therapy protocol of group T. Subjects included in group NR were not used for the statistical analysis in order to maintain the blinding and the prospective nature of the study.

Clinical examination

Dogs were examined on days 1, 7, 28 and 56 by the other examiner, who was blinded to the treatment assigned. Presence/absence and severity of five parameters, which included papules, pustules, collarettes, crusts and alopecia, were evaluated at each time point with a 0–4 severity scale (0 = none; 1 = mild; 2 = moderate; 3 = severe; 4 = very severe). Smears were obtained by direct impression from a fresh lesion or exudate from a pustule opened with a sterile needle. Samples were stained with a Romanowsky-type stain (Hemacolor®, Merck; Darmstadt, Germany) and evaluated using high power microscopy fields (HPF: ×1000 magnification). Presence/absence and number of bacteria engulfed by neutrophils were evaluated on cytological examination using a 0–4 severity scale (0 = none seen; 1 = <1/HPF; 2 = 1–5/HPF; 3 = 5–10/HPF; 4 = >10/HPF).[15] Scores obtained for clinical lesions (range 0–20) and scores assigned for intracellular bacteria were analysed separately. A composite 'total pyoderma score' was then calculated by adding the clinical lesion score and the intracellular bacteria score for each dog (range 0–24), and statistical analysis was repeated. Severity of pruritus was assessed by the dog's owner using a visual analog scale (VAS, score 0–10) with clinical descriptors.[16,17]

Microbiology

Clinical specimens collected at the inclusion visit were subjected to culture and susceptibility testing to confirm staphylococcal infection and provide information on the antibiotic resistance profiles of the infecting strains. For each case, a sterile swab was used to collect exudate from an opened pustule or underneath an epidermal collarette. The swabs were sent by post in transport medium to the diagnostic microbiology laboratory at the University of Copenhagen (Sund Vet Diagnostik, Frederiksberg, Denmark) and processed within 4 days after collection. Swabs were inoculated onto meat agar (CM0055, Thermofisher Scientific; Waltham, MA, USA) supplemented with 5% bovine blood followed by overnight incubation at 37°C. Whenever present one putative *S. pseudintermedius* colony was subcultured from the primary isolation plate and identified to the species level using MALDI-TOF mass spectrometry (VITEK MS, BioMérieux, France). Antimicrobial susceptibility testing was performed according to the Clinical Laboratory Standards Institute[13] by broth microdilution method using COMPAN1F Sensititre plates (Trek Diagnostics; East Grinstead, West Sussex, UK). Oxacillin-resistant isolates were verified as MRSP by PCR using primers targeting the *mecA* gene.[14]

Statistical analyses

Data were expressed as mean ± Standard Deviation (SD) and range. Cross tabulations with the Chi-squared test were used to compare scores between groups T and S. The Wilcoxon signed-rank sum test was used to compare total scores and severity of pruritus in both groups. The Kruskal–Wallis test for nonparametric data was used to compare total and pruritus scores at days 1, 7, 28 and 56 for group T and group S, followed if necessary by the Wilcoxon signed-rank sum test. P values < 0.05 were considered significant for all tests. Intent-to-treat analyses were performed using data collected from all included subjects who received the topical or systemic therapy, whether or not they completed the study.

Results

Study population

Fifty three dogs with superficial pyoderma were included in the study. Thirty one dogs were assigned to group T and 22 dogs were assigned to group S. Dogs in group T had a mean age of 4.32 ± 2.89 years (range 0.41–11) and a mean weight of 20.8 ± 13.59 kg (range 2.5–53). The group consisted of 20 (64.5%) males (of which four were castrated) and 11 (35.5%) females (of which seven were spayed). In group S dogs had a mean age of 3.64 ± 2.71 years (range 0.41–9) and a mean weight of 22 ± 14.22 kg (range 3.8–50). This group comprised 11 (55%) males (of which two were castrated) and nine (45%) females (of which three were spayed). Overall, 27 breeds were represented. West Highland white terriers (11.7%), French bulldogs (7.8%), Labrador retrievers

(5.9%) and golden retrievers (5.9%) were the breeds most commonly enrolled. Six dogs (11.7%) were mixed-breed. Comparisons of age ($P = 0.52$) and weight ($P = 0.77$) confirmed that there were no significant differences between the two groups. Concurrent allergic skin diseases were suspected or diagnosed in 41 dogs (77.3%), whereas a predisposing disease was not identified in 12 cases.

Bacterial culture and susceptibility testing

In group T *S. pseudintermedius* was isolated in 29 of 31 samples, six of which were MRSP, and the two remaining samples produced no bacterial growth. In group S *S. pseudintermedius* was isolated in 19 of 22 samples, and the three remaining samples were either sterile ($n = 2$) or contaminated with *Bacillus* spp. ($n = 1$). Two dogs initially randomized to group S were found to be infected with MRSP and reassigned to group NR because no suitable antibiotic could be selected based on susceptibility testing. Hence group S was reduced from 22 to 20 dogs.

Evaluation of treatment outcomes

In group T 25 of 31 dogs completed the study and in group S 16 of 20 dogs completed the study. Reasons for not completing the study in the six dogs assigned to group T included loss to follow-up in two cases, concurrent disease (haemorrhagic cystitis) in one case, lack of improvement in one case and adverse effects (erythema, scaling and pruritus) in two cases. Reasons for not completing the study in the four dogs assigned to group S included protocol deviation in one dog and concurrent diseases (*Malassezia* dermatitis at day 28 and gastric disorder in two dogs, and worsening of pruritus in one dog). Evaluation of lesion severity scores and intracellular bacteria scores separately resulted in the same outcome as the composite 'total pyoderma score'. Therefore, results are reported only for analysis of the composite data. The Wilcoxon signed-rank sum test of total pyoderma scores showed no differences between groups on day 7 ($P = 0.96$), 28 ($P = 0.51$) and 56 ($P = 0.73$), whereas group S had significantly higher scores (11.25) than group T (9.76) on day 1 ($P = 0.03$). The same statistical analysis showed no differences between groups for pruritus on days 1 ($P = 0.7$), 7 ($P = 0.28$), 28 ($P = 0.81$) and 56 ($P = 0.36$) (Figures 1 and 2). Significant decreases in pruritus were detected in both groups between days 1 and 7, days 1 and 28, days 1 and 56, days 7 and 28, and days 7 and 56 ($P < 0.0001$). The results of the intention-to-treat analysis did not differ from those obtained with the per-protocol analysis.

Papules, pustules, crusts, collarettes and alopecia were observed in different combinations in all cases. In group T lesions were distributed on the abdomen and groin in ten dogs, on the trunk in 12 and were generalized in nine dogs. In group S lesions were distributed on the abdomen and groin in five dogs, on the trunk in nine and were generalized in six dogs. No significant difference between the two treatment groups for total pyoderma score was observed in response to therapy. Five dogs in each group showed a total pyoderma score on day 56 higher than the total score recorded on day 28, suggesting a possible relapse and/or the presence of an underlying allergic disease. The two MRSP-infected dogs reallocated from group S to group NR resolved with topical treatment without any signs of relapse at the final recheck.

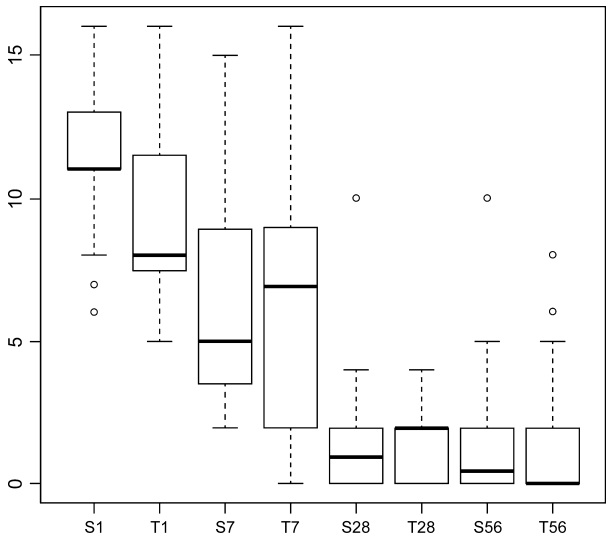

Figure 1. Total pyoderma scores for groups T (topical therapy) and S (systemic therapy) on days 1, 7, 28 and 56. (Box plot: median (line within box), 25th and 75th percentiles (box) and 10th and 90th percentiles (whiskers); circles indicate outliers).

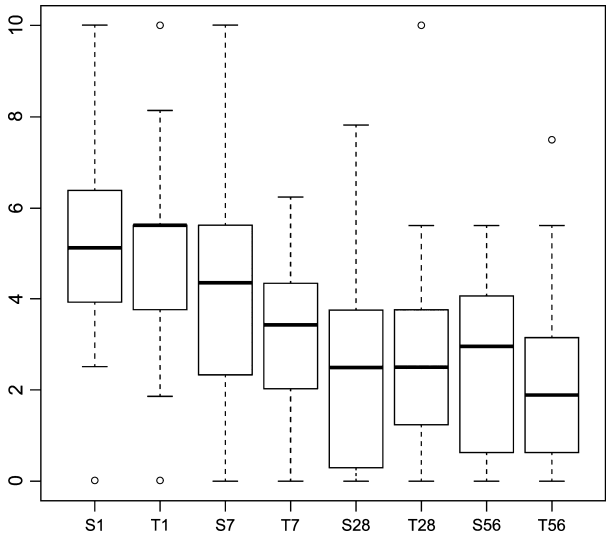

Figure 2. Pruritus scores for groups T (topical therapy) and S (systemic therapy) on days 1, 7, 28 and 56. (Box plot: median (line within box), 25th and 75th percentiles (box) and 10th and 90th percentiles (whiskers); circles indicate outliers).

Discussion

To the best of the authors' knowledge this is the first clinical trial comparing topical and systemic therapy in dogs with superficial bacterial infections of the skin. Although the sample size was not calculated to demonstrate lack of inferiority, the results of this pilot study suggest that topical therapy twice weekly with 4% chlorhexidine digluconate shampoo and daily 4% chlorhexidine digluconate spray for 4 weeks may be as effective as systemic antibiotic therapy with amoxicillin–clavulanic acid 25 mg/

kg twice daily for 4 weeks, in dogs with superficial pyoderma. In fact, clinical examination on day 28 did not reveal any signs of bacterial infection in any dog that completed the study, regardless of the treatment group. The active ingredient (chlorhexidine) contained in the two topical products used in this study has been previously shown to be effective against a variety of micro-organisms in *in vitro* studies.[18–22] Topical agents with 2–4% chlorhexidine have been compared to other antibacterial agents, such as ethyl lactate or 2.5% benzoyl peroxide, and found to be of equivalent or superior effectiveness in the treatment of bacterial overgrowth and superficial pyoderma.[10–12,23,24] Furthermore, a review on topical therapy for skin infections reported good evidence for recommending the use of chlorhexidine for superficial bacterial folliculitis.[25]

Topical chlorhexidine products are active against *S. pseudintermedius* at concentrations between 2 and 4%. An *in vitro* study showed that 4% chlorhexidine killed *S. pseudintermedius* in <1 min at both 1/5 and 1/25 dilutions, whereas 2% chlorhexidine was as effective only at 1/5 dilutions.[18] An *in vivo* study compared 2% chlorhexidine to 4% chlorhexidine, showing that the two concentrations were similarly effective in improving superficial pyoderma lesions when used twice weekly for 1 week.[11] In that study bathing with chlorhexidine shampoo was performed by owners at home, making the shampoo dilution impossible to assess. Moreover, the *in vivo* study did not prove effectiveness of 2% chlorhexidine with complete resolution of superficial pyoderma, possibly due to the shorter course of treatment (1 week) and the lower chlorhexidine concentration compared to this study. To date there are no published data showing occurrence of chlorhexidine resistance in *S. pseudintermedius*. Although an increasing number of studies suggest the development of reduced susceptibility to chlorhexidine in human *Staphylococcus aureus* isolates,[26] the observed MIC values (4–32 mg/L) are remarkably lower than the in-use concentrations of chlorhexidine. Reduced susceptibility to biocides such as chlorhexidine is generally associated with efflux pumps. Currently there are several genes known to encode efflux pump-mediated resistance; among them *qacA* is the gene commonly associated with staphylococci, especially with *S. aureus*.[27]

Amoxicillin-clavulanate was selected for treatment of the control group due to its status as a first-line antibiotic for the treatment of canine pyoderma; this is based on its wide use, safety and low cost.[3] The dosage (25 mg/kg twice daily) was higher than the manufacturer's recommended dose (12.5 mg/kg twice daily), as previously suggested.[28]

In our study group S began the trial with a higher total 'pyoderma score' than group T, suggesting failure of randomization. However, dogs were assigned to different treatment groups using random table numbers and in order to avoid selection and allocation bias, allocation codes were kept in sealed opaque envelopes and investigators involved in the study were unaware of the identity of the intervention throughout the study period. Hence, the difference between the two groups on day 1 most likely occurred by chance. Furthermore, to preserve the statistical power of the small number of subjects and the non-normally distributed data, further statistical resampling methods to remove this bias could not be applied. Nevertheless, even if the presence of dogs with higher clinical scores did not negatively influence the response to therapy in group S, we cannot completely exclude that this could have lead to an overestimation of the treatment efficacy in group T. Although the total scoring system applied in this study has not been validated, statistical analyses of cytological and clinical scores separately produced the same results as using the composite pyoderma scores (data not shown).

Superficial pyoderma typically requires 3–4 weeks of treatment which must be continued for at least 7 days beyond clinical resolution.[1–3] Superficial pyoderma resolved within 28 days in all dogs completing this study. Five dogs in each group relapsed, with clinical and cytological examinations suggestive of superficial pyoderma at the final visit (day 56). Incomplete resolution of the previous episode was considered unlikely, because all dogs were re-examined on day 28 and showed no evidence of infection. However, recurrent superficial pyoderma is, in most cases, secondary to an underlying skin disease.[2] The presence of a primary disease is supported in this study by the pruritus scores obtained in both groups at the final visit. Despite reduction compared to day 1, pruritus scores on day 56 were 2.07 in group T and 2.55 in group S, suggesting that a pruritic disease other than superficial pyoderma may have been present. Indeed, an underlying allergic disease (flea allergy dermatitis, adverse food reaction, atopic dermatitis) was suspected and/or diagnosed in 41 cases.

Based on standard culture *S. pseudintermedius* was detected in 48 cases. In the remaining five cases one sample was contaminated with *Bacillus* and four samples yielded no growth despite observation of neutrophils and intracellular cocci on cytological examination. These culture-negative results are difficult to explain, although the relatively long time for transportation to the laboratory (up to 4 days) might have affected bacterial survival. MRSP was isolated from six dogs in group T and from two dogs initially allocated to group S, leading to a MRSP prevalence of approximately 17% (8 of 48 isolates). This prevalence is similar to two previous reports from Italy (19%, 21 of 113; 21%, 10 of 48) respectively,[5,6] even though both studies included isolates from infections other than superficial pyoderma.

Published data on *in vivo* chlorhexidine efficacy against MRSP are scarce. Based on the clinical efficacy of a surgical scrub containing 2% chlorhexidine acetate, it has been hypothesized that chlorhexidine may be a useful topical adjunct therapy to treat dogs affected by cefalexin-resistant *S. intermedius* infections (presumably were MRSP according to the current taxonomy).[11] In that study five dogs improved, one partially improved and two did not improve. However, these dogs were treated only for 2 weeks, which is generally not considered to be adequate for resolution of superficial pyoderma.[11] In our study a 4-week course of topical therapy with chlorhexidine products resulted in resolution of clinical signs in the eight dogs affected by MRSP infections. No differences in clinical efficacy and time-to-resolution

were observed between MRSP and MSSP infections, suggesting that the proposed topical treatment protocol may be effective in superficial pyoderma caused by MRSP.

The advantages of shampoo therapy include mechanical removal of crusts, debris and bacteria from the skin,[1] regardless of the active ingredient contained in the shampoo. We cannot exclude that our results in the group treated with topical therapy may have been partly due to the nonbiocidal effects of bathing. Two previous studies, the first controlled by a whirlpool bath with water only and the second by the shampoo vehicle, have shown that cleansing the skin surface and removing debris may reduce pruritus in atopic dogs and lower surface bacterial count both in healthy and atopic dogs.[29,30]

With the rise of antimicrobial resistance in small animal clinical practice, topical therapy has become an important component of rational antimicrobial use for management of superficial bacterial infections.[31] Our study supports the current recommendation to use antiseptics as the sole treatment of uncomplicated superficial skin infections.[2,3] However, the sample size was limited by time and economic constraints; it was not large enough to assess noninferiority. Studies conducted on a larger sample size are warranted to demonstrate the noninferiority of topical antiseptic therapy to systemic antibiotic therapy. Considering the high frequency of these infections in dogs, management by topical therapy alone may contribute to the substantial reduction of oral antimicrobial consumption. Among the various advantages over systemic antimicrobial therapy, topical therapy with chlorhexidine-based products is likely to reduce the antimicrobial selection pressure that favours acquisition of multi-resistant MRSP and MRSA, because meticillin-resistant and -susceptible staphylococci are equally susceptible to chlorhexidine.[8,9] This aspect is of major importance in consideration of the rapid spread of MRSP and MRSA observed in dogs during the past decade, and the serious animal welfare and therapeutic challenges posed by these bacteria in small animal practice.

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Résumé

Contexte – Il existe un manque d'études comparant les antiseptiques topiques aux antibiotiques systémiques dans le traitement de la pyodermite superficielle canine.

Hypothèses/Objectifs – Comparer l'efficacité de chlorhexidine topique avec l'amoxicilline acide clavulanique pour le traitement de pyodermite superficielle canine.

Sujets – Une étude contrôlée randomisée a été menée chez des chiens atteints de pyodermite superficielle. Le groupe T (n = 31) a été traité avec un shampooing de digluconate de chlorhexidine à 4% (deux fois par semaine) et une solution (une fois par jour) pendant quatre semaines. Le groupe S (n = 20) a reçu oralement de l'amoxicilline acide clavulanique (25 mg/kg) deux fois par jour pendant quatre semaines.

Méthodes – Une culture bactérienne et un antibiogramme ont été réalisés sur des échantillons prélevés avant le traitement. La sévérité des lésions et le nombre de bactéries intracellulaires ont été évalués à l'aide d'une échelle en quatre points pour calculer un score total de pyodermite pour chaque chien. Le prurit a été évalué par les propriétaires à l'aide d'une échelle visuelle analogue (rang 0-10). Les scores ont été analyses pour différences statistiques entre les groups T et S.

Résultats – *Staphylococcus pseudintermedius* a été isolé pour 48 chiens, dont huit MRSP (meticllin resistant *Staphylococcus pseudintermedius*). Bien que le nombre de chiens soit petit, aucune différence significative dans les scores de pyodermite ou de prurit n'a été observée entre les groupes au cours de l'étude à l'exception du jour 1, le groupe S avait alors un score total significativement plus élevé que le groupe T (P = 0.03). Le traitement à la chlorhexidine a résulté en une résolution clinique pour tous les chiens y compris ceux infectés par MRSP.

Conclusions et importance clinique – Un traitement topique au digluconate de chlorhexidine peut être aussi efficace qu'un traitement systémique avec de l'amoxicilline acide clavulanique. Ces données supportent les recommandations actuelles d'utiliser les antiseptiques topiques seuls dans la gestion de la pyodermite superficielle.

Resumen

Introducción – hay una carencia de estudios comparando los tratamientos antisépticos tópicos con los antibióticos sistémicos en el tratamiento de la pioderma superficial canina.

Hipótesis/Objetivos – comparar la eficacia la clorhexidina tópica con el ácido clavulánico-amoxicilina para el tratamiento de pioderma superficial canina.

Animales – se realizó una prueba controlada al azar en perros con pioderma superficial. El grupo T (n = 31) se trató tópicamente con un cuatro por ciento de digluconato de clorhexidina en forma de shampoo (dos veces por semana) y en solución (una vez al día) durante cuatro semanas. El grupo S (n = 20) fue tratado por vía oral con amoxiclina-ácido clavulánico (25 mg/kg) dos veces al día durante cuatro semanas.

Métodos – se realizaron cultivos bacterianos y pruebas de susceptibilidad en los especímenes clínicos recogidos antes del tratamiento. La severidad de las lesiones y el número de bacterias intracelulares se evaluó utilizando una escala de cuatro puntos para calcular un valor total de pioderma para cada perro. El prurito fue evaluado por los propietarios utilizando una escala visual análoga (rango de cero a 10). Los valores se analizaron para detectar diferencias estadísticas entre los grupos T y S.

Resultados – se aisló *Staphylococcus pseudintermedius* de 28 perros, incluyendo ocho con *Staphylococcus pseudintermedius* resitente a meticilina (MRSP). Aunque el número de perros fue pequeño, no hubo diferencias significativas en los valores de pioderma y prurito observadas entre los grupos a lo largo del estudio salvo en el día uno, cuando el grupo S tuvo un valor total significativamente más alto que el grupo T (P = 0,03). El tratamiento con productos de clorhexidina resultó en la resolución de los signos clínicos en todos los perros incluyendo aquellos afectados con en MRSP.

Conclusiones e importancia clínica – el tratamiento tópico con digluconato de clorhexidina puede ser tan efectivo como la terapia sistémica con ácido clavulánico-amoxicilina. Este hallazgo apoya las recomendaciones más recientes del uso de antisétpticos tópicos en solitario para el manejo de la pioderma superficial.

Zusammenfassung
Hintergrund – Es fehlen Studien, die topische Antiseptika mit systemischen Antibiotika bei der Behandlung der oberflächlichen Pyodermie des Hundes vergleichen.
Hypothese/Ziele – Ein Vergleich der Wirksamkeit von topischem Chlorhexidin mit systemischer Amoxicillin-Clavulansäure zur Behandlung einer oberflächlichen Pyodermie des Hundes.
Tiere – Eine randomisierte kontrollierte Studie wurde bei Hunden mit einer oberflächlichen Pyodermie durchgeführt. Gruppe T (*n* = 31) wurde topisch mit 4%igem Chlorhexidin Diglukonat Shampoo (zweimal wöchentlich) und Lösung (einmal täglich) vier Wochen lang behandelt. Gruppe S (*n* = 20) wurde mit Amoxicillin-Clavulansäure *per os* (25 mg/kg) zweimal täglich vier Wochen lang behandelt.
Methoden – Es wurde eine Bakterienkultur und ein Antibiogramm an klinischen Proben, die vor der Behandlung entnommen wurden, durchgeführt. Der Schweregrad der Veränderungen und die Anzahl der intrazellulären Bakterien wurden mittels Vier-Punkte-Skala untersucht, um einen Totalwert für die Pyodermie eines jeden Hundes zu kalkulieren. Der Juckreiz wurde von den BesitzerInnen mittels Visueller Analog Skala (Breite 0-10) beurteilt. Die Werte wurden auf statistische Differenzen hin zwischen den Gruppen T und S analysiert.
Ergebnisse – Es wurde *Staphylococcus pseudintermedius* von 48 Hunden isoliert, dabei inkludiert waren acht Methicillin-resistente *Staphylococcus pseudintermedius* (MRSP). Obwohl die Anzahl der Hunde gering war, wurden während der ganzen Studie keine signifikanten Unterschiede zwischen der Pyodermie und den Juckreizwerten zwischen den Gruppen beobachtet, außer am Tag 1, wo die Gruppe S einen signifikant höheren Wert als Gruppe T (*P* = 0,03) aufwies. Die Behandlung mit Chlorhexidin Produkten brachte bei allen Hunden, auch jenen mit MRSP Infektion eine Resolution der klinischen Symptome.
Schlussfolgerungen und klinische Bedeutung – Eine topische Behandlung mit Chlorhexidin Diglukonat Produkten kann ebenso effektiv sein, wie eine systemische Behandlung mit Amoxicillin-Clavulansäure. Dieses Ergebnis bestärkt die momentanen Empfehlungen topische Antiseptika alleine zur Behandlung einer oberflächlichen Pyodermie zu verwenden.

要約
背景 — イヌの表在性膿皮症の治療における外用殺菌剤と全身性抗菌剤の比較を行った研究はない。
仮説/目的 — イヌの表在性膿皮症の治療としての外用のクロルヘキシジンと全身性アモキシシリン–クラブラン酸の効果を比較すること。
供与動物 — ランダム化比較試験が表在性膿皮症のイヌにおいて実施された。グループT(n = 31)を4%クロルヘキシジングルコネートシャンプー(週2回)の外用および外用液(1日1回)で4週間治療した。グループS(n = 20)をアモキシシリン–クラブラン酸(25 mg/kg)、1日2回で4週間治療した。
方法 — 治療前に回収した臨床材料の細菌培養および感受性検査を実施した。病変の重症度および細胞間の細菌数をそれぞれのイヌで4点スケールを計算した総膿皮症スコアを用いて評価した。掻痒をビジュアルアナログスケール(範囲0–10)を用いて飼い主が評価した。グループTとSの間の統計的な差をスコアを解析した。
結果 — Staphylococcus pseudintermediusを48頭のイヌから分離し、8検体のメチシリン耐性Staphylococcus pseudintermedius (MRSP)を含んでいた。イヌの数は少なかったが、グループSがグループTより有意に高いトータルスコア(P = 0.03)が認められた1日目を除き、試験中にグループ間で膿皮症とそう痒スコアの有意差は認められなかった。クロルヘキシジン製剤を用いた治療はMRSPに感染していたイヌを含めたすべてのイヌにおいて臨床症状の消失をもたらした。
結論および臨床的な重要性 — クロルヘキシジングルコネート製品を用いた外用療法はアモキシシリン–クラブラン酸を用いた全身療法と同様に効果的である可能性がある。この所見は表在性膿皮症の管理のために、外用消毒剤を単独で使用するという最新の提言を支持する。

摘要
背景 — 在治疗犬浅表脓皮病时，缺乏外部抗菌剂和全身性抗生素的对比研究。
假设/目的 — 对比外部氯已定和全身阿莫西林克拉维酸治疗犬浅表脓皮病的效果。
动物 — 对浅表脓皮病患犬进行随机对照试验。T组(n = 31)使用4%葡萄糖酸氯已定香波(每周2次)和溶液(每日一次)，治疗4周。S组(n = 20)口服阿莫西林克拉维酸钾(25 mg/kg)每日两次，治疗4周。
方法 — 治疗前采集样本，进行细菌培养和药敏检测。病变严重度和细胞内细菌的数量，通过四分法评估，然后计算每只犬的脓皮病总分。主人用直观类比标度法(范围为0–10)评估瘙痒程度。分析T、S两组的统计学差异。
结果 — 分离自48只犬的假中间型葡萄球菌，包括8株耐甲氧西林假中间型葡萄球菌(MRSP)。虽然犬数量少，除第一天S组总分明显高于T组(P = 0.03)，其他时间T、S两组在瘙痒和脓皮病指数上无明显不同。使用氯已定产品的所有犬，临床症状均缓解，包括感染MRSP的患犬。
总结与临床意义 — 外部使用葡萄糖酸氯已定产品，与阿莫西林克拉维酸钾全身性治疗一样有效。本报告支持目前推荐的外用抗菌剂，用来单独管理浅表脓皮病。