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Original Article

SUBCONJUNCTIVAL INJECTION OF FLORFENICOL FOR THE TREATMENT OF KERATOCONJUNCTIVITIS IN CATTLE

[Injeção subconjuntival de florfenicol para o tratamento da ceratoconjuntivite em bovinos]

Rinaldo Batista Viana^{1♣}, Bruno Moura Monteiro², Marcus Luciano Guimarães Rezende³ & Walberson Dias da Silva⁴, Verena Maciel da Costa⁴

Abstract

The objectives of present trial were to test the feasibility of subconjunctival via of florfenicol administration, and to test the efficacy of subconjunctival via of florfenicol for nonspecific keratoconjunctivitis in cattle. For this, 596 bovines diagnosed with keratoconjunctivitis were treated using 2.0 mL (adult) or 1.0 mL (calves) of florfenicol subconjunctival. Ophthalmic examinations were performed every 12h, followed by clinical testing at 96h after treatment. The cattle with keratoconjunctivitis showed complete cure at 96h after treatment. In summary, the use of subconjunctival injection for the administration of florfenicol was safe in cattle. The proposed treatment protocol for keratoconjunctivitis in cattle involving the use of subconjunctival florfenicol was effective, economical and required minimal animal handling.

Keywords: bovine; keratoconjunctivitis; ocular disease; treatment; florfenicol

Resumo

Objetivou-se com esse estudo testar a aplicabilidade da via subconjuntival, assim como a eficácia do florfenicol para tratamento da ceratoconjuntivite inespecífica em bovinos. Para tanto, 596 bovinos diagnosticados clinicamente com ceratoconjuntivite foram tratados com 2,0 mL (adulto) ou 1,0 mL (bezerro) de florfenicol subconjuntival. Os exames oftalmológicos foram realizados a cada 12 h, seguido por testes clínicos em 96h após o tratamento. Os bovinos com ceratoconjuntivite mostraram cura completa em 96h após o tratamento. Concluiu-se que a utilização da via subconjuntival para a administração de florfenicol é segura em bovinos. O protocolo de tratamento proposto para a ceratoconjuntivite que envolvem a utilização de florfenicol subconjuntival foi eficaz, econômico e de fácil manuseio.

Palavras-chave: bovinos; ceratoconjuntivite; doença ocular; tratamento; florfenicol

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INTRODUCTION

Keratoconjunctivitis is a seasonal and worldwide eye infection affecting cattle, goat and sheep, without the distinction of breed, age and sex, although young animals are more susceptible. The growing population of insects and fomites during rainy season acts as the source of disease transmission. Various predisposing factors are dust, dry grass, wind and ultraviolet rays¹. Keratoconjunctivitis, unilateral or bilateral, is manifested by excessive tears, epiphora, blepharospams, photophobia, scleral hyperaemia, follicular conjunctivitis, corneal opacity, corneal ulcers, iritis, ophthalmalgia, ophthalmorrhea, fever and anorexia^{2, 3}.

Topical antibiotic ointment and ophthalmic treatments are effective if keratoconjunctivitis is diagnosed at an early stage³. The most commonly treatment is based on systemic treatment with chloramphenicol, oxytetracycline, penicillin, streptomycin, neomycin, polymyxin B, corticosteroid, and oxytetracycline or tylosin^{1,3}. However, despite the subconjunctival via have been described for the treatment of nonspecific bovine keratoconjunctivitis^{4,5}, for reasons of fear and insecurity of staff, this form of treatment is not yet widespread in the cattle breeding Brazilian conditions.

Subconjunctival injection of antibiotic administration could be a cost-effective treatment for keratoconjunctivitis in cattle and requires minimal handling. However, its use is controversial due to debatable mode of action and potential risk in local administration of drugs in bulbar conjunctiva,

especially in restive animals³. Thus, the objectives of present trial were to test the feasibility of subconjunctival via of an antibiotic, florfenicol, administration, and to test the efficacy of subconjunctival via of florfenicol for nonspecific keratoconjunctivitis in cattle.

MATERIALS AND METHODS

Therapeutic efficacy of subconjunctival injection of florfenicol for the treatment of nonspecific bovine keratoconjunctivitis was assessed in 596 affected cattle (Figure 1) located in the State of Goiás (Anápolis: n = 18 Kiwi cross; Araguapaz: n = 130 Nelore; Goianésia: n = 120 Nelore; Jataí: n = 21 Holstein; Morrinho: n = 77 Nelore; Santa Bárbara: n = 10 Holstein), State of Mato Grosso (Barra do Garças: n = 200 Nelore) and the Federal District (Brasília: n = 20 Holstein).

Subconjunctival treatment in a single dose, was performed using 2.0 mL (600 mg) florfenicol¹ in adults and 1.0 mL (300 mg) in calves through subconjunctival injection in the middle third of lower left conjunctiva (Figure 2). The animals were kept in a containment brete, holding their heads with only the aid of a rope. The procedure was done in animals awake and without any sedation. Following florfenicol treatment, ophthalmological examination was carried out every 12h, followed by general physical examination at 96h. Ophthalmological examination included the staining of mucous membranes of eyes (white; light pink; light red; and red) and the eye lesions (no change, epiphora; mild epiphora and light blepharodema; epiphora, mild blepharodema with little secretion; epiphora, moderate blepharodema with moderate secretion; epiphora, intense blepharodema with marked secretion and blepharitis).

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Figure 1. Keratoconjunctivitis affected cattle featuring blue haze in the cornea and the peripheral vasculature (A), affected cattle with an opaque cornea at an initial stage of prolapsed (B), affected cattle with mucopurulent discharge and corneal opacity (C), and affected cattle with mucopurulent discharge and periocular crusting (D).

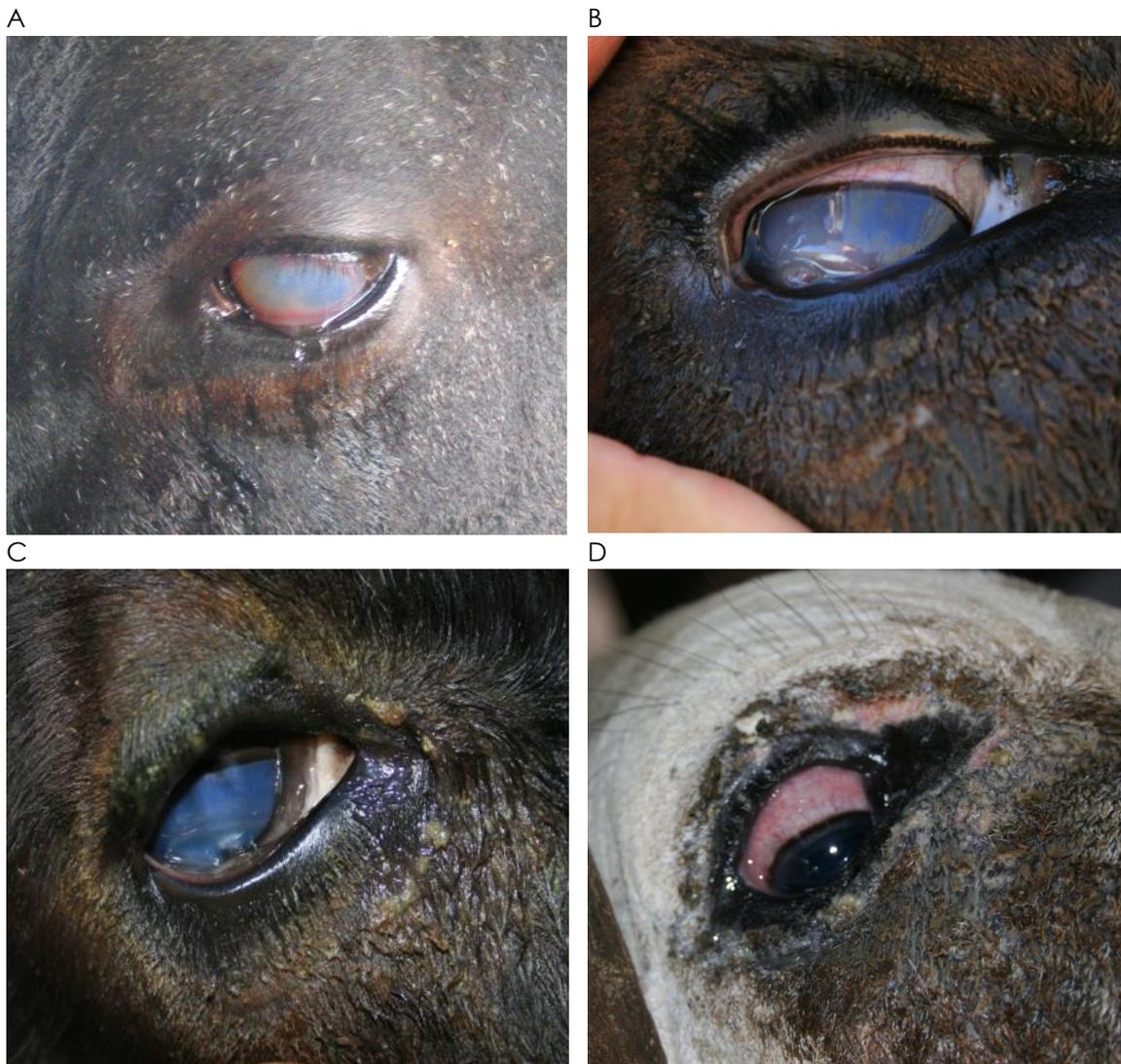


Figure 2. Lower subconjunctival administration of 1.0 mL of florfenicol in a calf with non-specific keratoconjunctivitis (A e B)

A. Start of administration

B. End of administration



RESULTS AND DISCUSSION

All the nonspecific bovine keratoconjunctivitis affected cattle exhibited 100% recovery within 96h after administration of a single dose of subconjunctival florfenicol. The clinical course of observations following the start of treatment at 0 h can be described as consisting of epiphora, intense blepharodema and mild haemorrhage at 12h, epiphora and intense blepharodema at 24h, intense, moderate and discreet blepharodema at 36, 48 and 60h respectively, followed by no change in 50% and 100% cattle at 72 and 84h, respectively. The clinical examination at 96h after treatment revealed healthy eyes in all cattle.

Literature suggests that subconjunctival injections used to treat cattle may not be strictly true subconjunctival, as these injections can also be made in the upper eyelid. In fact, these injections should form a small tank (1-2.0 mL) of drug injected into the junction between conjunctiva and sclera under the conjunctival flap³. In the present trial, due to the ease of exposure of conjunctiva and possibility of treating the contained animals, the middle third of the conjunctiva of lower eyelid was chosen to perform the injections (1-2.0 mL).

The current choice of florfenicol for subconjunctival injection was efficient, as indicated by the rapid recovery of all treated cattle without any damage to the eye structures of cattle. The leakage of drugs through the injection site, directly on the cornea, must be the most likely reason for its success³. The dose used in present trial was 10 times lower compared to the dose recommended for intramuscular via (20 mg Kg^{-1}). This dose proved to be economically and practically advantageous, since the cure was achieved with a single application (Table 1).

Subconjunctival via of antibiotic administration is under debate. The choice and via of antibiotic treatment shall be based on its cost, ease of administration, and period of milk and meat disposal³. Compared to topical applications of ointments and sprays, the systemic therapy provides ease of drug administration and has better impact due to drug diffusion in all the

animal tissues. Also, the duration of systemic treatment is more durable than subconjunctival^{6,7}.

However, systemic treatments are expensive due to greater amount of drug required as demonstrated in a study which required either single dose (40 mg Kg⁻¹) of florfenicol in a subcutaneous injection or two injections (20 mg Kg⁻¹) every 48 h to treat infectious bovine keratoconjunctivitis⁸. In comparison to single 2 ml (600 mg) dose of subconjunctival florfenicol, cattle of 400 kg would require approximately 53 mL (35 mL in new formulations) of florfenicol for a single subcutaneous dose^{9,10}. Therefore, the application of subconjunctival florfenicol in the present trial was economically advantageous as indicated by the comparison of the cost of present treatment with two different treatments proposed in the literature for adult cattle suffering from keratoconjunctivitis^{11,12}. The treatment with subconjunctival injections was 22.5 times less expensive than the systemic treatments (Table 1).

Table 1. Economical efficacy of florfenicol Intraconjunctival for the treatment of nonspecific infectious keratoconjunctivitis in cattle

Author	Treatment	Cost US\$	
		Individual (animal of 360 Kg)	Sick herd (n = 596)*
Mendes, Peiró & Feitosa (2002)	Two doses of florfenicol (20 mg Kg ⁻¹) at 48h interval	39.16	23,339.36
Costa et al. (2008)	Oxytetracycline LA (20 mg Kg ⁻¹) + Oxytetracycline spray at 48h interval	9.53**	5,679.88
Treatment proposed	Single dose of 2.0 mL florfenicol subconjunctival	1.76	1,048.96

* To treat a lot of 596 animals considering an average weight of 360 Kg.

** Not included to this value the cost of topical treatment with oxytetracycline spray, which costs approximately US\$ 16.05.

Moreover, subconjunctival treatment requires handling of animals only once in comparison to two to three handlings in the conventional treatments, thus reducing the stress and the use of farm staff. Oxytetracycline spray as topical treatment required more than twice daily application to have satisfactory results. The longer duration of conventional treatment was described in an outbreak of keratoconjunctivitis in Minas Gerais, Brazil, where treatment lasted for an average of one week to cure all the animals. In an outbreak of disease, the systemic and topical treatments would be difficult due to multiple handlings of large number of animals¹².

In addition, the cure time was much lower with subconjunctival treatment compared to conventional treatments, since all cattle had a cure within 96h after treatment. Literature suggests that penicillin G is the first choice antibiotic for subconjunctival injection in the treatment of keratoconjunctivitis, however relapses may occur more easily when using penicillin in severe infections³. Oxytetracycline is often the second choice, however, oxytetracycline appears to be irritating to tissue of upper eyelid leading to increased swelling⁷. The use of clindamycin subconjunctival injection as antimicrobial has produced encouraging results, with good cure rate and no recurrence of monitoring up to 15 days after treatment⁵.

Fluoroquinolones are not used as treatment of choice due to limited use in livestock in some countries, including the United States³. However, the use of enrofloxacin, a quinolone, through subconjunctival via successfully treated a herd with an outbreak of infectious bovine keratoconjunctivitis⁴.

CONCLUSION

In summary, the use of subconjunctival injection for the administration of florfenicol is safe in cattle. The proposed treatment protocol for keratoconjunctivitis in cattle involving the use of subconjunctival florfenicol is effective, economical and required minimal animal handling.

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