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Pain management with flunixin meglumine at dehorning of calves

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ABSTRACT

Dehorning (DH) of calves is a common procedure on commercial dairy farms. Pain management of calves has been investigated in several studies. It is generally accepted that the use of local anesthesia before DH is essential for pain management. Postoperative inflammatory pain should be treated by using a nonsteroidal antiinflammatory drug. The objective of this controlled, randomized, and blinded clinical trial was to determine the effects of the nonsteroidal antiinflammatory drug flunixin meglumine before DH on cortisol concentrations in sera of 5- to 9-wk old calves. Furthermore, selected behavioral characteristics and heart and respiratory rate were examined to assess pain in the hours after dehorning. A total of 80 calves were allocated to 4 groups. In each of 20 replicates, 4 calves were randomly assigned to the following groups: in 3 treatment groups, calves received a local anesthetic (10 mL of procain hydrochloride) and a first treatment (i.v.) with flunixin meglumine or a placebo 20 min before hot-iron dehorning, and a second treatment with flunixin meglumine or a placebo (0.9% saline) 3 h after DH. Calves in the control (CON) group were not dehorned and did not receive any treatment. Groups received 2.2 mg of flunixin meglumine/kg followed by a placebo (FP), 2.2 mg of flunixin meglumine/kg for both treatments (FF), or a placebo for both treatments (PP). Blood samples were collected from all calves, including CON calves, 20 min before restraint in a headlock for DH, 2 min after DH, as well as 30 min and 1, 2, 4, 6, and 8 h after DH. Samples were analyzed for concentration of cortisol by enzyme immunoassay. It was found that concentration of cortisol, calculated as area under the curve, was greater in PP compared with FF and tended to be greater compared with FP. Significant differences between PP and FF were detected at 30 min and 2 h after DH. Throughout the observation period, cortisol concentrations were in both flunixin meglumine-treated groups at a similar level as in the CON group. The heart and respiratory rates showed neither difference between the CON group and the 3 dehorned groups nor between the treatment groups.
Key words: dehorning, cortisol, pain management, flunixin meglumine

INTRODUCTION

Dehorning (**DH**) of calves is a routine management procedure on most dairy farms, performed to prevent injury to stockpeople and other cattle. With regard to animal welfare, it is important to reduce unnecessary suffering and pain caused by this procedure. The most common methods for DH of calves are heat cauterization as well as trephine or gouging the horn bud by the Roberts dehorner or Barnes dehorner (Sutherland et al., 2002). Other procedures such as the use of caustic paste are forbidden in Austria. Beside the technique of DH, the management of pain around this procedure is an important animal welfare issue. The use of local anesthesia (Doherty et al., 2007) is routinely carried out for dehorning of calves and is obligatory in Austria by the National Animal Welfare Act (Bundesministerium für Gesundheit, 2004). The additional treatment with nonsteroidal antiinflammatory drugs (**NSAID**) has been recommended by several authors. Studies with the NSAID ketoprofen or meloxicam have demonstrated the efficacy of these treatments with respect to the release of cortisol and the behavioral expressions of pain (Faulkner and Weary, 2000; Sutherland et al., 2002; Heinrich et al., 2009; Heinrich et al., 2010). The cortisol concentration in serum or plasma was used in several studies to assess pain (Milligan et al., 2004; Stafford and Mellor, 2005; Duffield et al., 2010). Some authors have described that despite the use of an NSAID before or at DH, a later increase in the concentration of cortisol occurred 3 to 8 h after DH, depending on the type of the local anesthetic and the half-life of the NSAID (McMeekan et al., 1998; Sutherland et al., 2002; Milligan et al., 2004; Stafford and Mellor, 2005). Thus, it is conceivable that a second dose of an NSAID after dehorning could suppress a subsequent rise of cortisol and contribute to calf welfare. The effect of the NSAID flunixin meglumine, which is approved for the treat-

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Table 1. Description of groups

Abbreviation of group	Local anesthesia	Treatment before dehorning	Treatment 3 h after dehorning
FP	Yes	2.2 mg of flunixin meglumine/kg (i.v.)	Placebo (i.v.)
FF	Yes	2.2 mg of flunixin meglumine/kg (i.v.)	2.2 mg of flunixin meglumine/kg (i.v.)
PP	Yes	Placebo (i.v.)	Placebo (i.v.)
CON	No	No dehorning and no treatment	No treatment

ment of inflammation and pain suppression, has not been previously described in the literature on pain relief after DH of calves.

The objectives of the present study were to test 2 hypotheses. First, the systemic administration of 2.2 mg of flunixin meglumine/kg before DH can reduce the pain response indicated by a decrease of cortisol in serum after DH. Second, a second dose of 2.2 mg of flunixin meglumine/kg 3 h after DH results in a further reduction of pain parameters.

MATERIALS AND METHODS

The study was approved by the institutional ethics committee and the national authority according to section 8ff of the Austrian law for animal experiments (reference number: bmwf GZ 68.205/0177-II/3b/2010) in compliance with the guidelines of Good Scientific Practice (GSP). The study was carried out as a controlled, randomized, and blinded study on the Teaching and Research Farm Kremesberg, University of Veterinary Medicine, Vienna (Vetmeduni Vienna), between October 2010 and February 2011.

Animals

Calves included in the study were between 5 and 9 wk of age and had to be clinically healthy. The calves were housed in groups on straw bedding and were fed with milk twice daily. They had free access to water, concentrates, and hay. The following data were documented: age (d), sex, breed (Simmental, Brown Swiss, or Holstein-Friesian), and weight (kg) using a weigh tape.

Randomization and Blinding

This study tested 3 different treatment regimens [flunixin meglumine/placebo (**FP**), flunixin meglumine/flunixin meglumine (**FF**), and placebo/placebo (**PP**); Table 1]. A fourth group of not dehorned calves served as an untreated control (**CON**). The study was conducted in 20 replicates. Within each replicate, 4 calves were randomly assigned to 1 of the 4 groups. A randomization list was created before the beginning of the trial (Excel 2010; Microsoft Corp., Redmond, WA) with blinded treatment groups A to C and an untreated and not dehorned CON. Flunixin meglumine (Finadyne; MSD Animal Health, Vienna, Austria) and placebo (0.9% saline) were bottled in identical 10-mL vials and labeled with serial numbers (1 to 60), blinded group (A to C), and order of treatment (1 = before DH; 2 = 3 h after DH). Personnel involved in DH of the calves were unaware of the randomization of the A to C treatment groups or the contents of the vials. Because flunixin meglumine and placebo were transparent and aqueous fluids, a blinding of the study was ensured. The randomization list with the assignment of each calf to treatment groups was stored in a sealed envelope at the Vetmeduni Vienna, and at MSD Animal Health. Unblinding was carried out after finishing all practical work, analyses in the laboratory, and entering all data in a database.

Treatments and Procedures

Dehorning was always performed 60 min after morning feeding (0730 h). The calves received a local infiltration anesthesia for DH (nerve block of ramus cornualis of the nervus maxillaris; McMeekan et al., 1998) with 10 mL of procaine hydrochloride (2% procaine hydrochloride; VMD NV, Arendonk, Belgium) on each side, midway along the lateral edge of the frontal bone crest. Calves in the CON group were only restrained and a blood sample was taken. At the time of administration of the local anesthestic, calves also received the first treatment of the assigned drug intravenously into the jugular vein. Dehorning was performed 20 min later by using a hot electric cautery iron (Kerbl Austria Handels GmbH, Klagenfurt, Austria) to remove the horn bud. Calves received a second treatment with flunixin meglumine or the placebo 3 h after DH.

To define initial values, the calves were observed and blood sampled 75 min before DH (i.e., approximately 15 min before morning feeding). Calves were restrained 20 min before DH in a head lock, the next blood sample was taken, and the calves received the first treatment and the local anesthetic. This second blood sample was used to assess the effect of restraint on cortisol concentration in serum. Further blood samples were taken