



Comparison of the effects of weaning and castration when conducted separately or in combination on the behaviour of crossbred beef cattle



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ABSTRACT

The objective of the present study was to evaluate the behavioural effects of Burdizzo castration of crossbred beef calves when weaned and castrated separately (castrated 8 weeks after weaning) or in combination. Over two consecutive years a total of 111 Limousin × Simmental male calves were included in the study. At an age of 7 months calves were randomly assigned to 1 of 4 treatment groups and either weaned in week-8 (Bull-8; $N = 27$); weaned in week-8 and castrated in week 0 (Cas-8; $N = 26$); weaned in week 0 (Bull-0; $N = 29$); or weaned and castrated in week 0 (Cas-0; $N = 29$). The behaviour of the calves including the number of vocalisations and time spent feeding, lying and standing/walking was recorded during the first 3 days of week 0. Bull-8 and Cas-8 did not show any vocalisation activity during the observation period. In contrast, Bull-0 and Cas-0, showed more than 3 calls/10 min period on the first day, which decreased steadily until the third day in both groups. In all groups the time spent feeding increased from day 1 to 3. Bull-8 animals did not vary their standing/walking and lying behaviour, but Cas-8 increased the time spent standing/walking and decreased lying. Bull-0 decreased the proportion of standing/walking from approximately 60 to 40% and increased lying from 23 to more than 30%. A similar rate of change with standing/walking decreasing from 70 to 50% and lying increasing from 12 to 20% was noted in Cas-0. Compared to bulls, castrates spent more time standing/walking and less lying. From week-8 to 0, Bull-8 and Cas-8 gained about 700 g/d, whereas the 2 other groups gained more than 1.000 g/d. Average daily gains from week 0–3 of Cas-8 were lower than in the other groups ($P < 0.05$). In conclusion, Burdizzo castration did not cause considerable effects on the behaviour, whereas weaning had a pronounced impact. The combination of both management procedures did not intensify the behavioural responses. Therefore, it can be recommended for economical reasons (i.e. labour costs) to conduct castration and weaning in steer production systems at the same time.

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1. Introduction

Weaning and castration are the major management procedures in beef cattle production that cause stress for the calves. Weaning is commonly practiced by abruptly separating the calf from its mother without any further suckling and social contact between cow and calf

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(Stookey et al., 1997). At weaning calves are subjected to multiple stressors including the loss of the mother, withdrawal of the milk and changes in the social as well as physical environment (Weary et al., 2008). As a consequence, newly weaned calves have a suppressed immune system and their susceptibility to diseases is enhanced (Lefcourt and Elsasser, 1995). Usually, weaning is conducted in extensive production systems at an age of about 6 months (Enríquez et al., 2011), and therefore earlier compared to natural weaning (Reinhardt and Reinhardt, 1981).

The age of weaning affects the responses to the procedure (Bueno et al., 2003; Arthington et al., 2005), though no major effects on stress response between calves weaned at 90 and 150 days were observed by Blanco et al. (2009). Beside the age, stress responses are also influenced by the genetic background of the animals. Blanco et al. (2009) found breed differences for several physiological stress response parameters and the temperament.

As the other main stressor for male beef calves castration causes physiological and behavioural changes (Ting et al., 2003; Coetzee et al., 2008; Currah et al., 2009). Castrated beef calves are known for their less aggressive behaviour (Devant et al., 2012) and superior meat quality (Marti et al., 2013). Castration is generally done physically by removing the testes surgically or by damaging the testicles by interrupting the blood supply with a Burdizzo castration clamp, rubber ring or latex band (Stafford and Mellor, 2005). Castration by the Burdizzo method is frequently used in various countries (Stafford et al., 2000; Coetzee et al., 2010).

An increased vocalisation and changes in the behaviour expressed in increased agitation, walking activity and reduced feed intake and rumination are common responses to weaning (Haley et al., 2005; Veissier and Le Neindre, 1989) and castration (Robertson et al., 1994; Molony et al., 1995).

The objective of the present study was to evaluate the behavioural effects of Burdizzo castration of crossbred beef calves when weaned and castrated separately (castrated 8 weeks after weaning) or in combination.

2. Materials and methods

The study was conducted on a commercial beef cattle farm in Thuringia, Germany. The farm is located at an average altitude of 660 m above sea level, with an average annual rainfall and temperature of 842 mm and 5.9 °C, respectively. The experimental treatments met the ethical guidelines of the International Society for Applied Ethology.

2.1. Animals, treatments and management

Over two consecutive years, a total of 111 Limousin x Simmental crossbred male beef calves was included in the study. Sixty-six and 45 calves born between May and August were examined in year 1 and 2, respectively. The dams were Simmental cows and the calves were offspring from 18 (year 1) and 23 (year 2) different Limousin bulls. In each year at the end of the pasture season at an average age of 213 days (SE 3.3) and weight of 253 kg (SE 5.3) the calves were randomly assigned to a 2 × 2 factorial design

with the 2 factors weaning and castration. Calves were either weaned in week-8 (Bull-8; *N* = 27); weaned in week-8 and castrated in week 0 (Cas-8; *N* = 26); weaned in week 0 (Bull-0; *N* = 29); or weaned and castrated in week 0 (Cas-0; *N* = 29).

One week before weaning, the cow/calf pairs were housed in pens (up to 6 pairs/pen) in order to become acquainted to the feeding stuff and facilities of the stable. Calves had free access to concentrates (6.7 MJ NEL; 18.0% CP) offered in troughs (1 trough/pen). Water was available ad libitum. The forage ration consisting of grass silage (10.0 MJ ME/kg DM; 14.4% CP) was delivered by an automatic feeding belt twice a day.

After separation by abrupt weaning, calves were placed into a stable adjacent to their dams' stable, with vocal communication between calves and cows being possible. The two gonadal condition groups (bulls and castrates) of each treatment were allotted to adjacent equally designed pens. Feeding regime for the weaned calves and housing facilities were the same as described before for the cow/calf pairs.

The pens (4.2 × 9.7 m) were constructed of metal gates and concrete walls, a concrete partly slatted floor, a feeding and a lying area. The total lying area of a pen (approximately 40 m²) was built by two rows of lying boxes (8 boxes/row) with solid concrete surface and a concrete partly slatted pathway between the rows. The feeding area was defined as the area next to the feeder with a rectangular shape, one side as long as the feeder and the other side as long as a calf's body length. Until the following pasture period, which started 3.5–4 months after week 0, the feeding regimen as described above was maintained for all calves.

2.2. Castration procedure

Calves of groups Cas-8 and Cas-0 were castrated by the Burdizzo method on day 0 of week 0. The castration was performed in accordance to the German Animal Welfare law by an experienced veterinarian. The animals were restrained in a crush and after injection of xylazine (0.1 mg/kg BW) the castration was performed from behind through the legs of the calf. Each spermatic cord was crushed twice.

2.3. Behavioural observations

Direct observations were performed to determine the calves' behaviour on day 1, 2 and 3 of week 0. The animals were observed for a total duration of 5 h per day consisting of hourly observation periods (08:00–09:00 h, 10:00–11:00 h, 12:00–13:00 h, 14:00–15:00 h and 16:00–17:00 h). The instantaneous scan sampling technique with 5 min intervals was used to count the total number of vocalisations of each group. Two consecutive 5 min periods were summarized and the number of vocalisations per calf in a 10 min period was calculated.

Furthermore, the time spent feeding, lying (lying down in any resting position) and standing/walking was recorded, whereas it was not differentiated between standing (without locomotion) and walking (as a kind of

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