



## The dehorning of dairy calves: Practices and opinions of 639 farmers

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### ABSTRACT

Calf dehorning is a routine husbandry practice on dairy farms that is justified by safety reasons for stockpersons and by a reduced risk of injuries among herd mates. In Europe, the practice is regulated by law but little is known about the methods applied or about farmers' attitude to the practice. This study aimed to broaden the existing information on dehorning in dairy holdings by processing results of 639 farm questionnaires gathered in a traditional dairy area of northeastern Italy. Farm questionnaires were stratified according to herd size, type of housing, and productive purpose of the predominant reared breed(s). Chi-squared tests were performed to verify the significant association between a given practice or opinion and the 3 classification factors, and odd ratios were calculated. The outcomes of the study showed that dehorning was carried out on 80% of the surveyed farms, and disbudding was the method reported by all the interviewed farmers. Hot-iron cauterization was the preferred method for disbudding (91%). On average, disbudding was performed at 32 d of age and it was more likely in farms with  $\geq 60$  cows than in smaller dairy holdings (OR = 7.3). The practice was carried out mainly by farm personnel, but the intervention of a veterinarian was far more likely (OR = 5.98) on farms with  $\leq 30$  cows than on larger dairies. Most farmers (70%) stated that they had not received any specific training on how to perform disbudding. Fifty-two percent of the respondents reported that disbudding causes prolonged postoperative pain ( $\geq 6$  h) but pain management was rare. Only 10% of the farmers used local anesthesia before cauterization, and 5% of the farmers provided calves with postoperative analgesia. Consistent with these results, farmers indicated limited willingness to pay the cost of analgesia or to call a veterinarian to perform the procedure. This low motivation of the respondents toward the adoption of practices able to reduce pain related to disbudding might arise from their insufficient knowledge on long-

term negative effects of early painful experiences on behavior and handling of dairy heifers. Farmers in favor of keeping horned cows were asked about the reasons for not carrying out dehorning. Aesthetic motivations (54% of respondents) and lack of time (24%) were the main reasons cited. Moreover, a large majority of these respondents (74%) reported no difficulty in handling horned cattle.

**Key words:** dairy calf, dehorning, pain, farmer opinion

### INTRODUCTION

The dehorning of cattle is a very common procedure in modern dairy production systems and it is considered necessary by most dairy farmers (Duffield, 2008). Handling and management of horned animals is deemed impractical for human and animal safety. Horned dairy cows pose a risk for stockpersons during routine management practices (milking, hoof trimming, calving) and veterinary examinations. Moreover, horned animals can cause injury to herd mates during aggressive interactions and competition at the feeding gate (NFACC, 2009; AVMA, 2010). In dairy holdings, dehorning is commonly carried out on female calves anytime from 1 to 32 wk of age (Misch et al., 2007; Fulwider et al., 2008). The use of appropriate anesthetic and analgesic protocols, although recommended, is generally not compulsory (New Zealand Government, 2005; AVA, 2009; AVMA, 2010). Together with other invasive husbandry procedures that have become common practice in modern animal husbandry (e.g., beak trimming of laying hens, castration of piglets), dehorning has been recently under the scrutiny of public opinion and nongovernmental organizations.

In Europe, because of the increased attention toward the welfare of farm animals, several Member States introduced restrictive legislation on livestock mutilation. Today, the practice of dehorning is regulated by the European Council Directive 98/58/EC (1998), which lays down the minimum standards for the protection of farm animals. According to this regulation, dehorning can be performed without anesthesia exclusively by means of cauterization (thermal or chemical) within the

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third week of the calf's life and, in any case, under veterinary supervision. However, information on the actual application of these recommendations is very scarce. Therefore, the present study aimed to describe the current state of dehorning practices in a traditional dairy farming area of Italy such as the Eastern Po Valley. Farmers' attitudes toward animal pain, as well as their interest in pain management, were also investigated.

The proposed outcome is to generate updated information on cattle dehorning that can be used in the future for the implementation of a code of recommended practices or legislation regulating the procedure.

## MATERIALS AND METHODS

### *Farm Sample*

The research considered a sample of 1,500 dairy farms randomly selected among the 2,351 dairy holdings operating in 7 of the northeastern provinces of Italy that take part in the Italian Dairy Herd Improvement Program. The survey covered an area with a high dairy producing profile in which about 20% of the 1.4 million officially recorded Italian dairy cow population is raised (AIA, 2009). This area was chosen because of its geographical features, which allow the coexistence of diverse dairy cattle rearing systems. Intensive rearing systems counting farms with 100 animals or more predominate in the flatland, where dairy herds are made up almost exclusively of Italian Holstein cows. Traditional, family-run holdings with mixed dairy and dual-purpose breeds or rustic dairy breeds (Italian Brown, Italian Simmental, Alpine Grey, and Rendena) are more frequent in mountainous areas. These farms reared, on average, 65 animals, which are often kept in tie stalls during the winter and graze on pastures during the summer.

### *Questionnaire*

Data were collected from May to October 2009 by means of a 2-page questionnaire delivered to dairy farmers by trained milk quality inspectors at the end of their routine monthly visits. The questionnaire was anonymous and consisted of 14 closed-ended questions with the option to add comments. The first questions gathered information on herd size (number of lactating and dry cows) and management practices such as predominant cattle breed and housing system. The subsequent questions were addressed to the dehorning practices. Disbudding was defined as removal of the horn buds in calves up to 2 mo of life, whereas dehorning was defined as removal of the horns in older animals. Information was gathered on calf age at dehorning, the

method used, the person in charge of the procedure, and his or her training. Use of pharmacological treatments pre- or post-dehorning was also recorded. The last 4 questions focused on the farmers' attitude toward the painfulness of the dehorning procedure and their willingness to spend money for anesthesia and analgesia. Farmers who do not dehorn their cattle were asked about the reasons for not carrying out the practice and about potential difficulties in handling horned cattle.

### *Statistics*

Data from the questionnaires were entered into a database. The respondent farms were categorized according to 3 classification factors: herd size, type of housing, and productive purpose of the breed. Five categories of farms were identified based on herd size:  $\leq 30$ , 31–60, 61–120, 121–200, and  $>200$  animals. These categories correspond to the average size distribution of dairy farms in the geographical area considered in the survey (AIA, 2009). Two categories were created according to the type of housing: tie stall and loose housing, and 2 categories were created based on the productive purpose of the predominant breed: dairy (Italian Holstein and Italian Brown) and dual-purpose (Italian Simmental, Alpine Grey, and Rendena). Statistical analyses were performed using the SAS program (SAS 9.1, SAS Institute Inc., Cary, NC). Chi-squared tests with Marascuilo procedure were performed to verify the association between responses (practices and opinions) and herd size, type of housing, and breed. When a significant association ( $P < 0.05$ ) was found between a given practice or opinion and one or more levels of a given classification factor, odd ratios and 95% confidence intervals were calculated to determine the odds of adoption of that practice or opinion.

## RESULTS AND DISCUSSION

### *Respondents*

In total, 639 questionnaires were returned over a 6-mo period, for a response rate of 42.6% of the farms (Table 1). Almost 52,000 cows were considered in the survey with an average herd size of 81 animals. No organic or biodynamic farms were included in the surveyed sample, and the distribution of respondents among herd size classes was consistent with the real distribution of herd sizes for this region (AIA, 2009). A large proportion of responses came from farms with  $\leq 30$  (23.6%), 31–60 (33.5%), and 61–120 animals (26.1%), whereas the response rate from farms with 121 to 200 (10.6%) and  $>200$  animals (6.1%) was more limited. However, if the number of animals is taken

**Table 1.** Distribution of the farm sample according to herd size, type of housing, and productive purpose

Item	Overall	Herd size, no. of cows					Type of housing		Productive purpose <sup>1</sup>	
		≤30	31–60	61–120	121–200	>200	Tie stall	Loose housing	Dairy	Dual purpose
Questionnaires returned, no.	639	150	214	166	67	39	327	312	424	215
Response rate, % of farms	42.6	23.6	33.5	26.1	10.6	6.1	51.2	48.8	66.3	33.7
Response rate, % of cows	39.2	5.7	19.3	27.9	20.1	27.0	24.6	75.4	75.6	24.4
Cows considered in the survey, no.	51,947	2,959	10,079	14,465	10,456	13,988	12,826	39,061	39,301	12,646
Average herd size, no. of cows	81	20	47	87	156	359	39	126	93	59

<sup>1</sup>Dairy = Italian Holstein and Italian Brown; dual purpose = Italian Simmental, Alpine Grey, and Rendena.

into account, farms rearing more than 120 animals accounted for 47.1% of the total cow sample considered in this study. The distribution of respondents according to type of housing is shown in Table 1. Although tie-stall farms represented 51.2% of the surveyed sample, they housed only 24.6% of the animals because tie-stalls are typically adopted in small, family-run holdings. When the productive purpose of the breed was taken into account, as expected, the majority of farms (66.3%) reared specialized dairy breeds, especially Italian Holstein, although a significant proportion of farms reared dual-purpose breeds (33.7%).

### Dehorning Practices

**Prevalence of Dehorning.** The practice of dehorning was carried out in 80.5% of the surveyed dairy farms and this result is consistent with the mean value reported by SANCO (2009) for the 27 European Union countries. The statistical analysis of our data set showed a significant effect of herd size on the frequency of dehorning (Table 2). Over 90% of farms rearing more than 60 cows dehorned their calves, whereas the practice was carried out at a lower frequency in the remaining 2 categories of smaller herd size [odds ratio (OR) 7.3 times greater for farms with >60 cows]. The greater prevalence of dehorning on large farms reflects the outcomes of recent surveys conducted in countries where the dairy industry comprises large productive units. Data from US and Canadian surveys reported a frequency of dehorning in dairy farms between 78 and 96% (Hoe and Ruegg, 2006; Misch et al., 2007; Fulwider et al., 2008).

In the present study, almost all the dairy farms adopting the loose housing system (95.5%) dehorned their youngstock kept for replacement, whereas the prevalence of dehorning was significantly lower (66.4%) in tie-stall farms (Table 3). The likelihood of being dehorned for replacement calves was 4.1 times greater on dairy farms rearing Holstein and Brown cattle than on those with dual-purpose breeds (Table 3).

**Age of Calves at Dehorning.** Disbudding was the practice reported by all the interviewed dairy farmers who dehorn their replacement calves. Mean age at disbudding was 32 d and the 3 classification factors considered in this study had no significant effect on this variable (Tables 2 and 3). Only 24.5% of the surveyed farms dehorned their calves within the third week of life. In contrast, 26.8% of respondents declared that calves were dehorned at 40 d of age or later. These data are in line with a similar study by Fulwider et al. (2008), who reported that 32.8% of the farms in their sample disbudded by the fourth week of age (vs. 37% in the present survey), whereas 62% (vs. 59% in the present study) did it by d 32. In contrast, in a recent study, Vasseur et al. (2010) reported a calf median age of 6.4 wk at dehorning, with 25% of the surveyed farms dehorning calves after the third month of life. In our study, the maximum declared disbudding age was 16 wk (only one farm), and most of the farms (485 vs. 58) disbudded within wk 7 of life.

Age at disbudding is a critical factor to limit the pain related to this practice because the horn bud is free-floating in the skin layer above the skull up until about 2 mo of age. As the calf gets older, the horn bud attaches to the periosteum of the frontal bone overlying the frontal sinus and a small horn then starts to grow (Parsons and Jensen, 2006). At this later stage, the horn is best removed by amputation (dehorning), which requires pain management, careful restraint, hemostasis, and the use of antiseptics on the wound (Rebhun, 1995). For these reasons, and in view of the potential postoperative complications, this surgical practice is very infrequent in the European dairy industry (SANCO, 2009).

**Disbudding Methods.** Irrespective of herd size, type of housing, and productive purpose of the predominant breed, 90.6% of the responding farmers used hot-iron cauterization as the disbudding method, and the remaining 9% used caustic paste (Tables 2 and 3). This is in line with the results of a recent Canadian study reporting that 88.7% of the responders used the

**Table 2.** Dehorning practice according to herd size (percentage of responders)

Question	Overall	Herd size, no. of cows					P-value	Contrast	Odds ratio (95% CI) <sup>1</sup>
		≤30 (1)	31–60 (2)	61–120 (3)	121–200 (4)	>200 (5)			
Dehorn (Yes)	80.5	58.7 <sup>b</sup>	78.0 <sup>b</sup>	92.8 <sup>a</sup>	95.5 <sup>a</sup>	100.0 <sup>a</sup>	<0.001	(3+4+5) vs. (1+2)	7.3 (4.15–12.9)
Calf age at disbudding									
7–21 d	24.5	27.3	25.1	20.1	25.0	33.3	NS		
22–29 d	12.8	13.6	14.4	12.3	9.4	12.8	NS		
30–39 d	31.7	29.5	34.1	31.8	32.8	23.1	NS		
>39 d	26.8	19.3	21.6	33.1	32.8	28.2	NS		
Method of disbudding									
Hot-iron	90.6	89.8	91.0	89.0	93.8	92.3	NS		
Caustic paste	9.4	10.2	9.0	11.0	6.3	7.7	NS		
Reason for choosing the method									
External advice	8.9	9.1	6.0	7.9	15.9	12.8	NS		
Less painful	9.7	5.7	10.8	11.3	6.3	12.8	NS		
Practical reasons/habit	81.5	85.2	83.1	80.8	77.8	74.4	NS		
Person in charge of disbudding									
Farm personnel	75.0	63.6 <sup>b</sup>	74.3 <sup>ab</sup>	76.0 <sup>ab</sup>	81.3 <sup>ab</sup>	89.7 <sup>a</sup>	0.02	1 vs. 5	0.2 (0.07–0.58)
Veterinarian	9.6	27.3 <sup>a</sup>	10.2 <sup>b</sup>	3.2 <sup>b</sup>	1.6 <sup>b</sup>	5.1 <sup>b</sup>	<0.001	1 vs. (2+3+4+5)	5.98 (3.24–11.06)
Milk quality inspector	15.4	9.1	15.6	20.8	17.2	5.1	NS		
Who has trained the farm personnel									
Nobody	26.8	21.4	25.0	35.0	23.1	20.0	NS		
Other farmer	43.0	51.8	42.7	41.9	38.5	40.0	NS		
Milk quality inspector	4.2	1.8	4.0	5.1	7.7	0.0	NS		
Veterinarian	26.0	25.0	28.2	17.9	30.8	40.0	NS		
Preoperative treatments									
None	85.5	68.2 <sup>b</sup>	86.2 <sup>a</sup>	92.2 <sup>a</sup>	92.2 <sup>a</sup>	84.6 <sup>ab</sup>	<0.001	1 vs. (2+3+4+5)	0.26 (0.15–0.45)
Local anesthesia	10.4	27.3 <sup>a</sup>	10.8 <sup>b</sup>	5.2 <sup>bc</sup>	1.6 <sup>c</sup>	5.1 <sup>bc</sup>	<0.001	1 vs. (2+3+4+5)	5.11 (2.81–9.28)
Sedation	4.1	4.5	3.0	2.6	6.3	10.3	NS		
Postoperative treatments									
Antibiotic	32.0	21.6	34.1	32.5	40.6	30.8	NS		
Analgesic	5.0	10.2	6.0	0.6	3.1	5.1	NS		
None	63.0	68.2	59.9	66.9	56.3	64.1	NS		

<sup>a-c</sup>Means within a row with different superscripts differ ( $P < 0.05$ ).

<sup>1</sup>Odds ratios calculated for significant associations between a given practice and a given herd size group.

NS =  $P > 0.05$ .

**Table 3.** Dehorning practice according to type of housing and productive purpose of the farms (percentage of responders)

Question	Type of housing				Productive purpose <sup>2</sup>				
	Overall	Tie stall	Loose housing	<i>P</i> -value	Odds Ratio <sup>1</sup>	Dairy	Dual purpose	<i>P</i> -value	Odds ratio (95% CI) <sup>3</sup>
Dehorn (Yes)	80.5	66.4	95.5	<0.001	0.09 (0.05–0.001)	88.4	65.1	<0.001	4.10 (2.72–6.17)
Calf age at disbudding									
7–21 d	24.5	25.8	23.5	NS		23.2	27.9	NS	
22–29 d	12.8	13.8	12.1	NS		12.8	12.9	NS	
30–39 d	31.7	30.9	32.2	NS		32.0	30.7	NS	
>39 d	26.8	22.6	29.9	NS		28.0	23.6	NS	
Method of disbudding									
Hot-iron	90.6	88.9	91.9	NS		90.7	90.7	NS	
Caustic paste	9.4	11.1	8.1	NS		9.3	9.3	NS	
Reason for choosing the method									
External advice	8.9	8.8	9.2	NS		9.9	6.6	NS	
Less painful	9.7	10.2	9.2	NS		9.7	9.5	NS	
Practical reasons/habit	81.5	80.9	81.7	NS		80.4	83.9	NS	
Person in charge of disbudding									
Farm personnel	75.0	71.4	77.5	NS		78.7	65.0	<0.01	1.98 (1.30–3.04)
Veterinarian	9.6	18.0	3.4	<0.001	6.31 (3.07–12.95)	6.7	17.1	<0.001	0.34 (0.19–0.63)
Milk quality inspector	15.4	10.6	19.1	<0.01	0.50 (0.30–0.84)	14.7	17.9	NS	
Who has trained the farm personnel									
Nobody	26.8	27.1	27.3	NS		25.1	34.1	NS	
Other farmer	43.0	45.8	40.7	NS		44.7	36.3	NS	
Milk quality inspector	4.2	3.2	4.8	NS		3.7	5.5	NS	
Veterinarian	26.0	23.9	27.3	NS		26.4	24.2	NS	
Preoperative treatments									
None	85.5	78.3	90.9	<0.001	0.36 (0.21–0.60)	88.0	79.3	<0.05	1.92 (1.15–3.20)
Local anesthesia	10.4	18.0	4.7	<0.001	4.44 (2.35–8.41)	7.7	17.1	<0.001	0.40 (0.23–0.72)
Sedation	4.1	3.7	4.4	NS		4.3	3.6	NS	
Postoperative treatments									
Antibiotic	32.0	29.0	34.2	NS		32.5	30.7	NS	
Analgesic	5.0	6.0	3.7	NS		3.7	7.1	NS	
None	63.0	65.0	62.1	NS		63.7	62.1	NS	

<sup>1</sup>Odds ratios calculated for significant associations between a given practice and a given type of housing (tie stall as reference term).

<sup>2</sup>Dairy = Italian Holstein and Italian Brown; dual purpose = Italian Simmental, Alpine Grey, and Rendena.

<sup>3</sup>Odds ratios calculated for significant associations between a given practice and a given farm productive purpose (dairy as reference term).

NS =  $P > 0.05$ .

hot iron and 6.1% the chemical method (Vasseur et al., 2010).

Hot-iron disbudding, or thermal cauterization, is a simple method that does not require hemostasis; postoperative complications are minimal (Rebhun, 1995). Nonetheless, the American Veterinary Medical Association recommends the use of local anesthesia and analgesia with nonsteroidal antiinflammatory agents (NSAID) to minimize postoperative pain (AVMA, 2010). The dehorner should be routinely checked and preheated to the correct temperature (600°C) before use to avoid the need for repeated applications that may cause unnecessary distress to the animals. Caustic substances (in the form of sticks or paste) are corrosive compounds that cause liquefactive necrosis of the horn-producing tissue. The incorrect application of caustic

substances is not uncommon and may cause serious tissue damage to the animals (Stafford and Mellor, 2005) as well as accidental injuries to operators. Sedation is recommended to restrain the calves and reduce the pain associated with chemical necrosis (Vickers et al., 2005). According to Vickers et al. (2005), local anesthesia was not effective with caustic paste disbudding. Stilwell et al. (2009) showed that with this disbudding method good pain control could be achieved by the combined use of local anesthesia and NSAID.

Only a small percentage of the interviewed farmers chose a given method of disbudding because it was less painful for the animal (9.7%), whereas a large share adopted a method for practical reasons or habit (81.5%).

**Person Performing the Procedure and Training Received.** Similar to what was reported by Misch

et al. (2007), most interviewed farmers (75%) indicated that calf disbudding was performed by farm personnel. This intervention without the direct involvement of a veterinarian is allowed by the General Recommendation Concerning Cattle adopted by the Standing Committee of the European Union (Council of Europe, 1988). However, significant differences regarding the person in charge of dehorning were recorded according to herd size, housing system, and farm productive purpose. A direct involvement of the veterinarian was far more likely (OR = 5.98) in dairy holdings with  $\leq 30$  cows (Table 2), which is in contrast with the results of Fulwider et al. (2008), which showed that large dairy producers had more access to veterinary care compared with smaller producers. Calves from herds housed in tie-stall farms were more often disbudded by a veterinarian (OR = 6.31) than those from herds kept in loose housing systems, where calves were more often disbudded by milk quality inspectors (Table 3). Dairy herd calves were more likely to be disbudded by farm personnel than calves of dual-purpose herds (OR = 1.98). Moreover, the direct intervention of a veterinarian was less frequent in dairy than in dual-purpose herds (OR = 0.34; Table 3).

Proper training of the person in charge of the procedure is crucial, because incorrect use or maintenance of the dehorner or improper application or dosage of the caustic paste may cause injuries or unnecessary pain. Veterinarians and milk quality inspectors receive specific training on the correct disbudding techniques, but for farm personnel, only a small portion of the farmers in our sample reported that they had been trained by specialized personnel (26.0% by a veterinarian and 4.2% by a milk quality inspector, respectively). The remaining 70% reported that they had learnt the technique on their own (26.8%) or from another farmer (43.0%). The frequency of the different answers was not affected by the 3 classification factors considered in the survey (Tables 2 and 3). In this scenario, mandatory training of all end users should be a basic step of a code of recommended practices on disbudding procedures.

**Use of Medications Before and After the Procedure.** Although disbudding by heat or chemical cauterization is currently considered the less invasive and most humane method for dehorning cattle, the procedure has been shown to be painful (Faulkner and Weary, 2000; Stafford and Mellor, 2005; Stilwell et al., 2010). Consequently, the use of analgesia and anesthesia is recommended by many veterinary and governmental bodies worldwide (New Zealand Government, 2005; AVA, 2009; AVMA, 2010). Overall, 10% of the interviewed farmers reported that their calves receive local anesthesia before disbudding and this result is in line with the findings by Fulwider et al. (2008), who

reported the use of local anesthesia by 12.5% of US dairy producers. Hoe and Ruegg (2006) found similar results, with 18% of Wisconsin farmers reporting the use of either local anesthesia or tranquilizers when disbudding or dehorning. More recently, Vasseur et al. (2010) reported the use of anesthesia among 44.7% of the sampled Québec dairy producers.

In the survey, sedation was reportedly used by only 4% of farmers. Vickers et al. (2005) showed that the  $\alpha$ -2 agonist xylazine was effective in reducing head-rubbing and head-shaking behaviors in calves disbudded with caustic paste. However, if not combined with local anesthesia, sedatives have been shown to be insufficient in controlling postoperative pain caused by hot-iron disbudding (Stilwell et al., 2010).

The limited use of preoperative treatments in our survey is justifiable because it is not required by law if disbudding by cauterization is performed within the third week of life of the calf. A further obstacle against the use of drugs in Italy is that only veterinarians can keep and administer local anesthetics. In this regard, our data clearly show that in farms where calf disbudding was more often delegated to the veterinarian ( $\leq 30$  cows, tie-stall and dual-purpose farms), use of local anesthesia increased significantly (Tables 2 and 3).

Postoperative use of medications was more frequent than preoperative use, without significant differences across the different farm classification factors (Tables 2 and 3). Farmers, however, mostly reported the use of local antibiotics (32%) that have no direct pain relief effect. The administration of analgesics was declared by a very small proportion of interviewees (5%). This could be due to the perceived low painfulness of the procedure or to a lack of knowledge of the beneficial effects of postoperative analgesia. Nonsteroidal anti-inflammatory agents such as meloxicam, carprofen, and ketoprofen, in association with local anesthesia, have shown to be effective in controlling post-disbudding pain (Stewart et al., 2009; Heinrich et al., 2010; Stilwell et al., 2011), and treated calves tend to have a higher feed intake compared with controls (Faulkner and Weary, 2000; Duffield et al., 2010; Heinrich et al., 2010).

### **Farmers' Opinion Regarding the Painfulness of Disbudding**

The second part of the survey aimed at gaining insight into the farmers' subjective opinions on the postoperative pain associated with the practice of disbudding as well as their willingness to pay for analgesic drugs.

**Perception of Pain Duration.** According to Dockès and King-Eveillard (2006), dairy farmers embracing industrial-type production systems are often more fo-

cused on their working conditions and incomes than on the welfare of their cattle, whereas farmers with smaller dairy holdings pay more attention to well-being of the individual animal. The results of the present study show that this was not the case for calf disbudding because farmers' opinions on the painfulness of the procedure were independent of herd size as well as of type of housing and farm productive purpose (Tables 4 and 5).

Almost half of the interviewed farmers perceived that postoperative pain in calves lasts only a few minutes. More than 40% of the farmers perceived that post-disbudding pain was moderate, lasting up to 6 h and a further 9% extended the duration of pain to up to 12 h. These results appear to be in close agreement with opinions gathered from a sample of Wisconsin dairy farmers likely operating under different environmental and management systems. Indeed, Hoe and Ruegg (2006) reported that 43% of the farmers in their sample thought that disbudding caused "little or no pain," another 40% of the farmers considered that disbudding caused "moderate pain," and the remaining 9.7% "a lot of pain." Fajt et al. (2011) found that veterinarians raised on a farm in their youth deemed the pain associated with several surgical procedures in cattle, including dehorning, to be less severe compared with veterinarians not raised on a farm.

**Calf Behaviors Associated with Postoperative Pain.** Behavior has been commonly used to identify painful husbandry procedures in farm animals (Hay et al., 2003; Weary et al., 2006; Paull et al., 2008). Head shakes, ear flicks, tail swishes, and rubbing or scratching of the dehorned area are the main behaviors that have been observed and validated in previous works as being indicative of postoperative inflammatory pain in calves after disbudding (Graf and Senn, 1999; Grøndahl-Nielsen et al., 1999; Faulkner and Weary, 2000). Regardless of herd size, type of housing, and farm productive purpose, a large proportion of interviewed farmers in our survey was able to recognize at least one of the typical behavioral alterations related to post-disbudding pain in calves. Forty-five percent of respondents observed a high frequency of head shaking, 29% indicated that the animals appear depressed and had a decreased appetite, and another 8% indicated both loss of appetite and head shaking as the main pain-related behaviors of calves after disbudding (Tables 4 and 5).

**Willingness to Pay for Analgesic Drugs or for Veterinarian Intervention.** Less than half of the interviewees (45%) stated their willingness to spend some money for using analgesia; again, this result was not affected by herd size, type of housing, or farm productive purpose (Tables 4 and 5). Within this group, 42% of responders set to \$1.40/calf their maximum contribution to the total cost of the treatment, whereas 29% would

**Table 4.** Farmers' opinion on the painfulness of disbudding according to herd size (percentage of responders)

Question	Herd size, no. of cows					P-value	Contrast	Odds ratio (95% CI) <sup>1</sup>
	Overall	≤30 (1)	31–60 (2)	61–120 (3)	121–200 (4)			
Postoperative pain duration								
A few minutes	48.0	51.1	44.9	48.3	46.0	NS		
≤6 h	43.0	38.6	48.5	42.4	44.4	NS		
≤12 h	9.0	10.2	6.6	9.3	9.5	NS		
Behaviors associated with postoperative pain								
Head shaking	45.0	47.7	42.2	49.3	45.3	NS		
Loss of appetite and head shaking	8.0	5.7	10.2	7.9	3.1	NS		
Depressed and loss of appetite	29.0	29.5	33.7	24.3	28.1	NS		
Never observed anything	18.0	17.0	13.9	18.4	23.4	NS		
Willing to pay for analgesia								
Yes	44.5	40.9	50.3	44.7	34.4	NS		
Up to \$0.35/calf	12.9	13.6	15.6	11.8	9.4	NS		
Up to \$0.70/calf	12.7	5.7	16.2	14.5	10.9	NS		
Up to \$1.40/calf	18.9	21.6	18.6	18.4	14.1	NS		
Willing to pay a veterinarian to dehorn								
Yes	34.0	47.7 <sup>a</sup>	38.9 <sup>a</sup>	27.6 <sup>ab</sup>	18.8 <sup>b</sup>	0.001	(1+2) vs. (3+4+5)	2.16 (1.48–3.14)
Uncertain	16.7	21.6	16.8	11.8	20.3	NS		

<sup>a,b</sup>Means within a row with different superscripts differ ( $P < 0.05$ ).

<sup>1</sup>Odds ratios calculated for significant associations between a given opinion and a given herd size group. NS =  $P > 0.05$ .

**Table 5.** Farmers' opinion on the painfulness of disbudding according to type of housing and productive purpose of the farms (percentage of responders)

Question	Type of housing			<i>P</i> -value	Odds Ratio <sup>1</sup>	Productive purpose <sup>2</sup>		<i>P</i> -value	Odds ratio (95% CI) <sup>3</sup>
	Overall	Tie stall	Loose housing			Dairy	Dual purpose		
Postoperative pain duration									
A few minutes	48.0	10.0	7.5	NS		47.0	51.4	NS	
≤6 h	43.0	49.8	47.1	NS		43.8	41.3	NS	
≤12 h	9.0	40.0	45.4	NS		9.1	7.2	NS	
Behaviors associated with postoperative pain									
Head shaking	45.0	46.7	44.4	NS		44.0	49.3	NS	
Loss of appetite and head shaking	8.0	8.0	8.0	NS		8.8	5.8	NS	
Depressed and loss of appetite	29.0	28.5	29	NS		28.4	29.7	NS	
Never observed anything	18.0	16.8	18.5	NS		18.8	15.2	NS	
Willing to pay for analgesia									
Yes	44.5	49.3	40.9	NS		44.8	43.5	NS	
Up to \$0.35/calf	12.9	51.0	59.0	NS		13.3	11.6	NS	
Up to \$0.70/calf	12.7	49.0	41.0	NS		14.7	7.2	<0.05	2.20 (1.09–4.45)
Up to \$1.40/calf	18.9	16.0	10.0	NS		16.8	24.6	NS	
Willing to pay a veterinarian to dehorn									
Yes	34.0	40.9	28.2	<0.01	1.80 (1.25–2.61)	31.2	39.9	NS	
Uncertain	16.7	21.4	13.1	<0.05	1.88 (1.18–3)	17.3	14.5	NS	

<sup>1</sup>Odds ratios calculated for significant associations between a given opinion and a given type of housing (tie stall as reference term).

<sup>2</sup>Dairy = Italian Holstein; dual purpose = Italian Brown, Italian Simmental, Alpine Grey, and Rendena.

<sup>3</sup>Odds ratios calculated for significant associations between a given opinion and a given farm productive purpose (dairy as reference term).

NS =  $P > 0.05$ .



**Table 6.** Farmers' opinion on the reasons for not dehorning according to herd size (percentage of responders)

Question	Overall	Herd size, no. of cows					<i>P</i> -value	Contrast	Odds ratio (95% CI) <sup>1</sup>
		≤30 (1)	31–60 (2)	61–120 (3)	121–200 (4)	>200 (5)			
Dehorn (No)									
Reasons for not dehorning									
Aesthetic	54.0	62.9 <sup>a</sup>	48.9 <sup>a</sup>	41.7 <sup>a</sup>	0.0 <sup>b</sup>	—	<0.01	(1+2+3) vs. 4	NE <sup>2</sup>
Lack of time	24.0	14.5 <sup>b</sup>	26.7 <sup>b</sup>	41.7 <sup>a</sup>	100.0 <sup>a</sup>	—	<0.01	(3+4) vs. (1+2)	4.68 (1.57–14)
Tradition	7.0	3.2	13.3	0.0	0.0	—	NS		
Horns are not a problem	7.0	8.1	2.2	16.7	0.0	—	NS		
Not responding	9.0	11.3	8.9	0.0	0.0	—	NS		
Difficulties in handling horned cattle									
None	74.0	77.4	73.3	66.7	33.3	—	NS		
Dangerous for stockmen	22.0	19.4	22.2	33.3	33.3	—	NS		
Injuries to herd mates	4.0	3.2	4.4	0.0	33.3	—	NS		

<sup>a,b</sup>Means within a row with different superscripts differ ( $P < 0.05$ ).

<sup>1</sup>Odds ratios calculated for significant associations between a given opinion and a given herd size group.

<sup>2</sup>Not estimable.

NS =  $P > 0.05$ .

spend up to \$0.70/calf and another 29% only \$0.35/calf, with no significant difference across categories. The current cost of a standard cornual block (5 mL of 2% lidocaine on each side; Duffield, 2008) in Italy is about \$2.90 per animal; consequently, the sums indicated by the interviewed farmers are insufficient even for such a basic pain management protocol. Moreover, only 33.5% of farmers showed interest in regularly calling a veterinarian to disbud their calves. It was not surprising to see a greater interest by farmers with herds ≤60 cows (OR = 2.16) as well as by farmers with tie-stalls (OR = 1.88), because in these types of dairy holdings direct

involvement of the veterinarian already exists (Tables 4 and 5).

In a recent study, Hewson et al. (2007) investigated the factors affecting the use of analgesics by Canadian veterinarians in the dehorning of both beef and dairy calves. The authors found that one of the main reasons against the use of analgesics was the cost of the treatment and the potential unwillingness of the farmer to pay for it. This reluctance of the producers to pay for analgesia might arise from the fact that no detrimental effect of disbudding on calf growth performance has been documented so far (Grøndahl-Nielsen et al.,

**Table 7.** Farmers' opinion on the reasons for not dehorning according to type of housing and productive purpose of the farms (percentage of responders)

Question	Overall	Type of housing			<i>P</i> -value	Odds Ratio <sup>1</sup>	Productive purpose <sup>2</sup>			Odds ratio (95% CI) <sup>3</sup>
		Tie stall	Loose housing	<i>P</i> -value			Dairy	Dual purpose	<i>P</i> -value	
Reasons for not dehorning										
Aesthetic	54.0	56.0	38.5	NS		35.4	66.2	<0.001	0.28 (0.13–0.60)	
Lack of time	24.0	19.3	61.5	<0.01	0.15 (0.04–0.50)	29.2	20.3	NS		
Tradition	7.0	7.3	0.0	NS		14.6	1.4	<0.001	12.46 (1.48–15)	
Horns are not a problem	7.0	7.3	0.0	NS		10.4	4.1	NS		
Not responding	9.0	10.1	0.0	NS		10.4	8.1	NS		
Difficulties in handling horned cattle										
None	74.0	76.1	53.8	NS		72.9	74.3	NS		
Dangerous for stockmen	22.0	21.1	30.8	NS		22.9	21.6	NS		
Injuries to herd mates	4.0	2.8	15.4	<0.05	0.16 (0.02–0.98)	4.2	4.1	NS		

<sup>1</sup>Odds ratios calculated for significant associations between a given opinion and a given type of housing (tie stall as reference term).

<sup>2</sup>Dairy = Italian Holstein and Italian Brown; dual purpose = Italian Simmental, Alpine Grey, and Rendena.

<sup>3</sup>Odds ratios calculated for significant associations between a given opinion and a given farm productive purpose (dairy as reference term).

NS =  $P > 0.05$ .

1999). However, recent studies showed that calves treated with NSAID after disbudding consumed more starter feed than controls (Duffield et al., 2010; Heinrich et al., 2010). Furthermore, the long-term effects of early painful or fearful experiences on the productive performance of dairy heifers are likely underestimated. Negative handling can lead to fear of humans in young replacement stock (Breuer et al., 2003), and fear has been shown to have a potential negative effect on milk yield and quality in commercial dairy herds (Breuer et al., 2000).

### **Reasons for Not Dehorning and Difficulties in Handling Horned Animals**

Farmers in favor of keeping horned cows were asked about their reasons for not carrying out this practice. Aesthetic motivations (54% of respondents) and lack of time (24%) were the main reasons reported. However, a clear interaction between herd size and productive purpose of the farm was found. Aesthetic reasons, such as preserving cattle integrity or the beauty of the natural appearance of a horned cow, were chosen in particular by farmers who reared dual-purpose cattle in farms with  $\leq 60$  cows (Tables 6 and 7). Some of these farmers stated that horned animals were more attractive to consumers when milk and dairy products are sold directly at the farm. Moreover, local buyers of dual-purpose breed cattle prefer horned animals because of their natural look. Lack of time was the predominant reason for farmers who ran holdings with  $> 60$  cows (OR = 4.68) that mainly used a loose housing system (Tables 6 and 7).

Among farmers who did not dehorn their calves, a majority of the respondents (74%) reported no difficulty in handling horned cattle. Twenty-two percent of the farmers emphasized the increased risk of injuries for the stockmen during routine management practices (milking, hoof trimming, calving) and veterinary examinations. On tie-stall farms, a lower risk of injuries among herdsmates was also reported (OR = 0.16).

### **CONCLUSIONS**

The outcomes of the survey showed that the practice of disbudding was commonly used for the dehorning of young dairy calves kept for replacement. Disbudding was mainly carried out by farm personnel using a hot iron without anesthesia or analgesia. However, only a small percentage of the stockpersons in charge of the procedure received specific training. Therefore, with a view to improving the welfare of dairy calves, specific training programs on disbudding should be offered to farmers, focusing on the maintenance and

use of dehorning tools as well as on the proper age for cauterization of the calf. Farmers were aware that disbudding is a painful procedure but they showed a limited willingness to cover the costs for analgesia or the support of a veterinarian. This low motivation of the respondents toward the adoption of practices able to reduce pain related to disbudding might arise from farmers' unrealistic assumptions about the amount of pain calves experience.

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