The Old School, Brewhouse Hill, Wheathampstead,
Hertfordshire AL4 8AN, UK

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Human and animal behaviour in dairy buffalo at milking

F Saltalamacchia[†], C Tripaldi[†], A Castellano[†], F Napolitano[‡], M Musto[‡] and G De Rosa*[§]

[†] Istituto sperimentale per la Zootecnia , Via Salaria 31, 00016 Monterotondo, Roma, Italy
[‡] Dipartimento di Scienze delle Produzioni animali, Università degli Studi della Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italy
[§] Dipartimento di Scienze del Suolo, della Pianta, dell'Ambiente e delle Produzioni animali, Università degli Studi di Napoli 'Federico II', Via Università 133, 80055 Portici, Napoli, Italy
* Contact for correspondence and requests for reprints: giderosa@unina.it

Abstract

This study aims to investigate the relationship between human behaviour, buffalo behaviour and prevalence of oxytocin injection at milking. The research was carried out on 17 buffalo farms. On each farm the stockperson's behaviour toward the buffaloes and the buffaloes' behaviour were observed during one afternoon's milking. Stockperson's behaviour was observed from collection of the animals in the waiting area to exit from the milking parlour. The following variables were recorded: number of positive, neutral and negative interactions. The number of steps and kicks were recorded from the entrance to the milking parlour to the removal of cups whenever the stockperson was less than 0.5 m from the animal. The prevalence of oxytocin injection at milking was recorded on two separate occasions with a 5-month interval to obtain a measure of the long-term consistency of this variable. Significant correlations were found between stepping and kicking, stepping and prevalence of oxytocin injection, kicking and prevalence of oxytocin injection and stockperson positive interactions and kicking. These results indicate that stockperson behaviour is related to buffalo behaviour at milking and the latter to the use of oxytocin injections. In addition, prevalence of oxytocin injection proved to be highly reliable when re-tested five months later.

Keywords: *animal welfare, dairy buffalo, human-animal relationship, long-term consistency, milking, oxytocin*

Introduction

In Italy, buffaloes (*Bubalus bubalis*) are used as dairy animals. Their milk is used to make mozzarella cheese. Buffalo husbandry has long been considered a characteristic of depressed regions and conducted for centuries with extensive rearing systems in low-lying swampy areas. Recent intensification of buffalo rearing techniques has exposed these animals to a rapidly changing environment that imposes physical and psychological stressors so far unknown to this species. Machine-milking presents both physical (eg poor machine maintenance) and psychological (eg negative behaviour of the stockperson and calf separation) components which may result in milk let-down problems. In dairy cattle the presence of aversive handlers during milking induces increased heart rate, cortisol levels and residual milk (Rushen *et al* 1999). Empirical data on buffalo indicate that oxytocin injections are often performed to facilitate complete milk ejection. This is in direct contrast to dairy cattle milking where oxytocin only tends to be used very occasionally (for a review see Bruckmaier 2005).

Numerous studies have demonstrated that human-animal interactions can affect animal health, behaviour, production and welfare (for a review see Hemsworth 2003). Recently, the reliability of some animal-based parameters (avoidance distance, behaviour during milking, etc) have been evaluated for assessing buffalo welfare at farm level (De Rosa *et al* 2003). Winckler *et al* (2003) and De Rosa *et al* (2005) pointed out the need to develop a monitoring scheme for buffalo welfare which included measures of the quality of the human-animal relationship. However, this issue for the buffalo has never received scientific attention. The objectives of our study were to obtain preliminary data on the prevalence of oxytocin injection during the buffalo milking routine as well as to evaluate the possibility of including this parameter in a welfare assessment protocol as an indicator of the human-animal interaction. Therefore, we studied the relationship between stockperson behaviour, buffalo behaviour and prevalence of oxytocin injection at milking, as well as the long-term consistency of this latter variable.

Materials and methods

The research was carried out on 17 buffalo farms in the Latina province of Italy. Twelve farms were equipped with herring-bone parlours, with the remaining five farms using tandem parlours. The number of lactating animals ranged

Table 1 Median and ranges of buffalo and stockperson variables (n = 17 farms).

Variable	Median	Range
Buffalo behaviour		
Number of steps (buffalo per milking)	1.58	0.85 - 4.24
Number of kicks (buffalo per milking)	0.35	0.05 - 0.76
Stockperson behaviour		
Number of positive interactions (buffalo per milking)	0.04	0 - 1.06
Number of neutral interactions (buffalo per milking)	0.84	0.19 - 4.84
Number of negative interactions (buffalo per milking)	0.23	0 - 3.61
Total number of interactions (buffalo per milking)	1.59	0.41 - 6.06
Percentage of positive interactions	2.7	0 - 25.0
Percentage of neutral interactions	65.9	15.4 - 100
Percentage of negative interactions	24.5	0 - 84.6
Percentage of animals injected with oxytocin at milking*	9.5	5.9 - 46.6

* Analysis conducted on the average of two farm visits.

from 30 to 130. Nine farms practised the out-of-breeding-season-mating technique consisting of keeping the bulls with females from February to September, with calving occurring between the end of December and the first days of August, when the demand for mozzarella cheese is higher. The other farms kept the bulls with females throughout the year, with calving mainly concentrated from July to December. On each farm, the stockperson's behaviour toward the buffaloes and the buffaloes' behaviour were observed during one afternoon milking, since for Waiblinger *et al* (2002) one observation was seen as a reliable measure of human-animal relationship quality. Behavioural observations were conducted in October 2004 by two trained assessors. In all farms stockperson and buffalo behaviour in the milking parlour was recorded by the same observer, whereas the stockperson's behaviour when moving the animals from the barn to the waiting area was always observed by a second observer. The prevalence of oxytocin injection at milking, ie the number of treated animals relative to the total number of animals milked was recorded on two separate occasions with a 5-month interval; once in March and again in October 2004, to obtain a measure of the long-term consistency of this variable.

Stockperson behaviour

Stockperson's behaviour was observed from moving the animals to the waiting area to the exit from the milking parlour. The following variables were recorded: number of positive (talking quietly, petting, gentle touching), neutral (talking dominantly, gentle handling, gentle stick usage) and negative (shouting, talking impatiently, forceful stick and hand use) interactions, as indicated by Waiblinger *et al* (2002). The percentages of these three variables in relation to the total number of interactions were also calculated.

Buffalo behaviour during milking

The number of steps (the foot was raised less than the height of the udder) and kicks (the foot was raised at least to the height of the udder) were recorded from entering the milking parlour to cup removal, whenever the stockperson was within 0.5 m of the animals.

Production records

Records on total milk yield, protein and fat over the lactation period were collected from the local provincial breeder association. The records were based on monthly testing of each herd and expressed as a buffalo average per farm per annum basis.

Statistical analysis

The data were analysed using non-parametric statistical tests (Siegel 1956). Long-term consistency of the prevalence of oxytocin injections and correlations between variables were assessed using the Spearman rank coefficient. The average prevalence of oxytocin injection was calculated using the data of the two farm visits.

Results and discussion

Median and range of stockperson and buffalo behavioural variables recorded during milking are shown in Table 1. In this study, as also observed in dairy cows (Breuer *et al* 2000; Hemsworth *et al* 2000; Waiblinger *et al* 2002), each variable showed high variability.

The percentage of lactating buffaloes treated with oxytocin while being milked was 9.5. Within the treated animals the primiparous buffalo cows subjected to oxytocin injection were 24% (range 0–75%). For each farm, the number of lactating, primiparous buffaloes in relation to the total number of lactating animals was not recorded. However, from field studies it emerges that the culling rate for buffalo farms is around 15–20%. Thus, we may speculate that milk let-down difficulties were more prominent for primiparous than multiparous buffaloes. The prevalence of oxytocin injection proved to be highly reliable ($r_s = 0.76$, $P < 0.001$) when re-tested after a five month interval.

The average milk yield was 1993 ± 253 kg with 155 ± 21 and 93 ± 13 kg per buffalo per year, milk fat and protein, respec-

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Table 2 Spearman correlation coefficients between stockperson and buffalo behaviour and productivity variables (n = 17 farms).

	Buffalo behaviour and productivity variables				
Stockperson behaviour	**Step**	**Kick**	**Milk yield**	**Fat**	**Protein**
Positive interactions	-0.15	-0.47*	-0.02	0.07	0.09
Neutral interactions	0.09	0.27	0.26	0.10	0.03
Negative interactions	-0.18	0.25	0.12	0.11	0.08
Percentage of positive reactions	-0.08	-0.47*	-0.04	0.06	0.11
Percentage of neutral reactions	0.2	0.03	0.17	0.06	0.06
Percentage of negative reactions	-0.21	0.07	-0.09	-0.09	-0.11
Percentage of animals injected with oxytocin at milking	0.47*	0.55*	-0.15	-0.09	-0.19

* $P < 0.05$.

tively. There was no relationship between productivity variables and stockperson behaviour (Table 2).

As reported in Table 2, the behaviour of the animals in the milking parlour was significantly correlated with the frequency of oxytocin injections, whereas stockperson behaviour and frequency of oxytocin injection were unrelated. The higher the number of steps and kicks during milking, the higher the prevalence of oxytocin injecting at milking (r_s = 0.47 and r_s = 0.55, respectively).

A significant correlation was found between stepping and kicking (r_s = 0.63, $P < 0.01$). Positive stockperson interactions both in absolute number and in percentage terms significantly and negatively correlated with the number of kicks during milking (r_s = -0.47 and r_s = -0.47, respectively), whereas negative and neutral interactions were not related to animal behaviour. Although it has been reported that for dairy cattle both interactions (positive and negative) are related to animal restlessness at milking (Hemsworth *et al* 2000; Waiblinger *et al* 2002), our results are consistent with the hypothesis that the stockperson's behaviour may have a great influence on animal behaviour during milking. Previous studies showed that stepping may be considered an indicator of agitation, whereas kicking is more related to aggressiveness (Hemsworth *et al* 2000; Munksgaard *et al* 2001). Animal restlessness at milking is a possible source of injury and may be caused by many different factors such as pushing of adjacent cows, lameness, low mineral intake, presence of haematophage insects, poor milking machine maintenance, etc. Even though avoidance distance is deemed to reflect, more appropriately, the human-animal relationship from the animals' perspective (Waiblinger *et al* 2002), in dairy cattle a correlation between human behaviour and cow restlessness during milking was found (Breuer *et al* 2000; Hemsworth *et al* 2000). Thus, suggesting that at least a component of this animal reaction to milking may be interpreted as a response to the stockperson. In particular, these authors observed that the use of negative tactile interactions, loud harsh vocalisations and quick movements had negative effects on animal calmness, whereas the use of soft and quiet vocalisations and movements produced opposite results. The presence of aversive handlers during milking also induced increased heart rate, cortisol levels and residual milk (Rushen *et al* 1999; Hemsworth *et al* 2000); all of which are expressions of fear and stress. According to Hemsworth *et al* (2002), practical opportunities exist in the form of training programmes targeting stockperson attitude and behaviour, to modify the human-animal relationship and improve dairy cow productivity.

Animal welfare implications

The results of this study indicate that stockperson behaviour is related to buffalo behaviour at milking and the latter to the use of oxytocin injections. In addition, prevalence of oxytocin injection proved to be highly reliable. Nevertheless, further studies on the relationship between avoidance/approach buffalo response to humans with both stepping/kicking during milking and prevalence of oxytocin injection are needed before the inclusion of this latter parameter in a monitoring scheme can be suggested.

References

Breuer K, Hemsworth PH, Barnett JL, Matthews LR and Coleman GJ 2000 Behavioural response to humans and the productivity of commercial dairy cows. *Applied Animal Behaviour Science 66:* 273-288

Bruckmaier RM 2005 Normal and disturbed milk ejection in dairy cows. *Domestic Animal Endocrinology 29:* 268-273

De Rosa G, Tripaldi C, Napolitano F, Saltalamacchia F, Grasso F, Bisegna V and Bordi A 2003 Repeatability of some animal-related variables in dairy cows and buffaloes. *Animal Welfare 12:* 625-629

De Rosa G, Napolitano F, Grasso F, Pacelli C and Bordi A 2005 On the development of a monitoring scheme of buffalo welfare at farm level. *Italian Journal of Animal Science 4:* 115-125

Hemsworth PH 2003 Human-animal interactions in livestock production. *Applied Animal Behaviour Science 81:* 185-198

Hemsworth PH, Coleman GJ, Barnett JL and Borg S 2000 Relationship between human animal interaction and productivity of commercial dairy cows. *Journal of Animal Science 78:* 2821-2831

Hemsworth PH, Coleman GJ, Barnett JL, Borg S and Dowling S 2002 The effects of cognitive behavioral intervention on the attitude and behavior of stockpersons and the behavior and productivity of commercial dairy cows. *Journal of Animal Science 80:* 68-78

https://doi.org/10.1017/S0962728600031183 Published online by Cambridge University Press

Munksgaard L, de Passillé AM, Rushen J, Herskin MS and Kristensen AM 2001 Dairy cows' fear of people: social learning, milk yield and behaviour at milking. *Applied Animal Behaviour Science 73:* 15-26

Rushen J, de Passillé AM and Munksgaard L 1999 Fear of people by cows and effects on milk yield, behaviour, and heart rate at milking. *Journal of Dairy Science 82:* 720-727

Siegel S 1956 *Nonparametric Statistics For The Behavioral Sciences*. McGraw-Hill: New York, USA

Waiblinger S, Menke C and Coleman G 2002 The relationship between attitudes, personal characteristic and behaviour of stockpeople and subsequent behaviour and production of dairy cows. *Applied Animal Behaviour Science 79:* 195-219

Winckler C, Capdeville J, Gebresenbet G, Hörning B, Roiha U, Tosi M and Waiblinger S 2003 Selection of parameters of on-farm welfare-assessment protocols in cattle and buffalo. *Animal Welfare 12:* 619-624

https://doi.org/10.1017/S0962728600031183 Published online by Cambridge University Press