

# Suckling behaviour and fertility in beef cows on pasture

## 1. Suckling behaviour

Iona B. Stewart\* and B.P. Louw

Department of Agricultural Development: Natal Region, Private Bag X9059, Pietermaritzburg,  
3200 Republic of South Africa

A.W. Lishman

Department of Animal Science and Poultry Science, University of Natal, P.O. Box 375, Pietermaritzburg,  
3200 Republic of South Africa

Received 11 December 1991; revised 7 July 1992; accepted 13 November 1992

The suckling behaviour of one- to three-month-old calves, suckled by 66 Hereford, Simmentaler and Hereford  $\times$  Simmentaler cows, was studied. The most common frequency of suckling in 24 h was 4, and the mean duration of each suckling event was 9.6 min. Suckling events were not evenly distributed throughout the 24-h period. Regardless of suckling frequency or days *post partum*, the most common suckling period was between 04:00 and 06:00. The lowest frequency of suckling recorded was in the period from midnight to dawn. The longest interval between two suckling events in all cows over the 24-h period always occurred before dawn and became longer as the calf grew older ( $P < 0.01$ ). Once the mating season commenced, the onset of oestrus was positively correlated ( $P < 0.01$ ) with the length of the longest inter-suckling period.

Die sogingedrag van een tot drie maande oue kalwers van 66 Hereford, Simmentaler en Hereford  $\times$  Simmentaler koeie is bestudeer. Die mees algemene frekwensie van soging was 4 maal in 24 h, en die gemiddelde lengte van elke sogingsperiode was 9.59 min. Sogings was nie eweredig oor 'n 24 h-periode versprei nie. Ongeag die frekwensie van soging en dae na kalwing, was die mees algemene sogingsperiode tussen 04:00 en 06:00. Die minste sogingsperiodes is waargeneem tussen middernag en ongeveer 04:00. Die langste interval tussen twee sogingsperiodes binne 'n 24 h-periode het altyd voor 4:00 voorgekom en hierdie interval het langer geword met 'n toename in die ouderdom van die kalf ( $P < 0.01$ ). Na aanvang van die dekseisoen was die aanvang van estrus positief gekorreleerd ( $P < 0.01$ ) met die lengte van die langste interval tussen twee sogingsperiodes.

**Keywords:** Beef calves, beef cows, oestrus, suckling behaviour.

\* To whom correspondence should be addressed.

### Introduction

The calving percentage of non-dairy cattle in South Africa has been reported to be about 50% (Boulle, 1986; Lishman, 1988; RSA Livestock and Meat Statistics, 1990). One of the major reasons for the low calving rate in beef cows is the extended *post partum* anoestrous period exhibited by suckling cows (Williams, 1989).

Suckling is an external stimulus which exerts a major role in governing the reproductive cycles in female mammals (Edgerton, 1980). Suckling induces a delay in ovulation (Carruthers & Hafs, 1980). When cows suckle their calves, the release of gonadotrophin is suppressed, thus inhibiting ovarian activity (Convey *et al.*, 1983). The removal of the suckling stimulus increases the release of pulsatile luteinizing hormone (LH) (Walters *et al.*, 1982). In the cow suckling a calf, low levels of basal LH prevail for longer than in the non-suckling cow (Radford *et al.*, 1978).

The aim of this study was to observe suckling behaviour patterns in cows and their calves during the first 100 days *post partum* under intensive grazing conditions, in an effort to understand the effect of suckling behaviour on the onset of oestrus. Differences in suckling behaviour patterns have been consistently reported by investigators. These differences could possibly provide the reason why some cows exhibit longer

suckling-induced, *post partum* anoestrous periods than others; a possibility which was examined in this study.

### Materials and Methods

#### Suckling behaviour

All observations were made at the Cedara Agricultural Experiment Station, 29°32' latitude and 30°17' longitude, where relatively warm, wet summers and cool, dry winters prevail. Sixty-six cows, consisting of Herefords or Simmentalers or Hereford/Simmentaler crosses, calved down between mid-August and mid-October. Observations were taken during the spring of three consecutive years. The suckling events were recorded when the calves were between one and three months old.

Each calf observation period commenced at about 10:00 and lasted for 24 h. A suckling event constituted the period between the time that a calf first mouthed a teat to the time it stopped suckling. The times of these events were recorded to the nearest second.

Because primiparous cows show longer *post partum* intervals to oestrus than do multiparous cows, the data were categorized into first lactation cows and others. The stages *post partum* were chosen on the basis of the:

- (i) possibility of cows being anoestrus (<45 days *post partum*),
- (ii) likely onset of first oestrus (46 to 90 days *post partum*),
- (iii) possibility of cows having been bred (>90 days *post partum*).

### Oestrus

The herd was rebred by artificial insemination (AI) between November 1 and January 1 each year. Oestrus was detected by heat-spotting in the early morning (06:00–07:00) and late afternoon (17:00–18:00), which constituted the only record of ovarian activity.

### Statistical analyses

The frequency with which a cow suckled her calf was defined as the number of times that suckling occurred within a 24-h period. The duration of each suckling event was recorded as the time, to the nearest minute, that a calf suckled. Since the time at which suckling occurred was recorded, the distribution of the suckling events over 24 h and the length of the intervals between these events could be determined. The standard error of the mean ( $\pm$ ) for both the frequency and duration of suckling for the various cow/calf categories were calculated.

The Genstat 5 statistical programme was used to fit a log-linear model to the suckling frequency data and test for the goodness of fit of the Poisson distribution. The difference in means of the age classes was tested using this model. Frequency of suckling showed a significant Poisson fit with a mean of 5.03 over all calves ( $P > 0.95$ ). However, there are indications that this fit, although still Poisson, is different for the age groups <45 days and >45 days.

## Results

### Frequency of suckling

Of the 332 suckling events observed, the modal suckling frequency was 4 per observation period (Figure 1). Mean suckling frequency for calves younger than 45 days was  $5.8 \pm 2.1$ , and for calves 45 days and older, it was  $4.6 \pm 1.5$ , which is significant at the 5% level (Table 1).

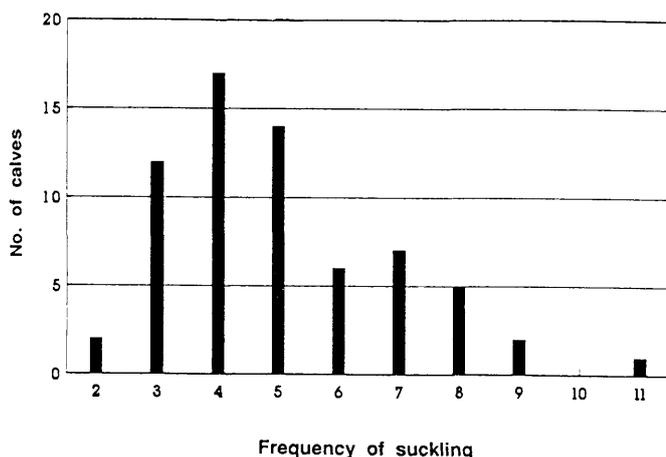


Figure 1 The frequency at which calves suckled over a 24-h period.

Table 1 Frequency and the duration of suckling events categorized according to age of cow and age of calf, data expressed as mean  $\pm$  SE

| Class of cow    | Duration of suckling |                | n  |
|-----------------|----------------------|----------------|----|
|                 | Frequency per 24 h   | (min)          |    |
| All cows        | 4.95 $\pm$ 1.9       | 9.6 $\pm$ 2.2  | 66 |
| 1st lactation   | 5.2 $\pm$ 2.1        | 8.7 $\pm$ 2.8  | 6  |
| >1st lactation  | 4.9 $\pm$ 1.6        | 9.6 $\pm$ 2.1  | 60 |
| <b>Calf age</b> |                      |                |    |
| <45 days        | 5.8 $\pm$ 2.1        | 9.88 $\pm$ 2.4 | 28 |
| 45–90 days      | 4.4 $\pm$ 1.3        | 8.72 $\pm$ 2.0 | 17 |
| >90 days        | 4.6 $\pm$ 1.5        | 9.92 $\pm$ 1.9 | 21 |

### Duration of suckling events

Over all stages *post partum*, the mean duration of the suckling events for individual cow/calf pairs varied from 5.6 to 14.8 min. The mean duration of suckling events was 9.6 min (Table 1). In certain cows that had been observed on three occasions in the one season and again the following season, the duration of suckling events varied from 7.6 to 10.1 min.

The period of suckling was not significantly different for first-lactation and multiparous cows (Table 1). Similarly, there was no significant difference between the duration of suckling in the younger and older calves.

The variation in duration of suckling events for all animals observed over 24-h periods is shown in Figure 2. A negative correlation ( $r = -0.2068$ ;  $P < 0.01$ ) between the duration and frequency of suckling was found.

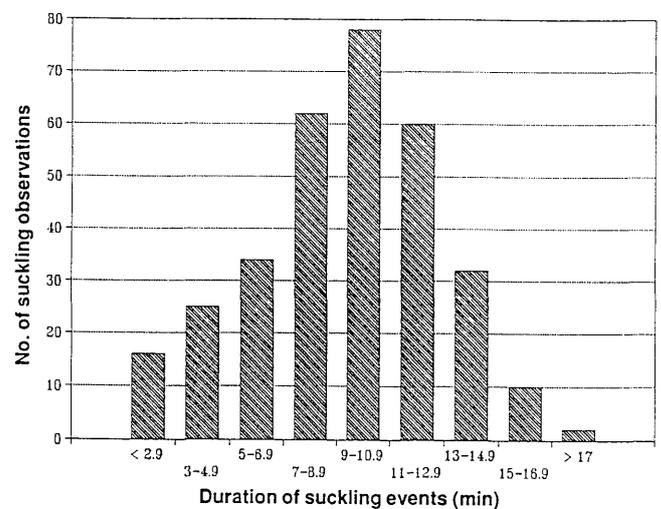


Figure 2 Variation in the duration of suckling events in beef cows.

### Total suckling time

The frequency with which a calf suckled in a 24-h period, multiplied by the mean duration of each suckling event, yielded the total suckling time. The mean total time spent suckling in a 24-h period was 47.4 min, covering a wide range, i.e. from 28 to 80 min.

Distribution of suckling events

The most common suckling time (17% of all events) was between 04:00 and 06:00 (Figure 3). The second most common (16%) suckling time was from 17:00 to 19:00. The distribution of suckling events throughout the 24-h period for calves less than 45 days old and over 90 days of age is illustrated in Figure 4. Younger calves (<45 days old) which fed slightly more frequently (5.8 times a day) than older calves, had a more even distribution of suckling events throughout the 24-h period, although early morning remained the most favoured time. With the exception of two calves out of 95, no suckling occurred between midnight and dawn (Figure 4).

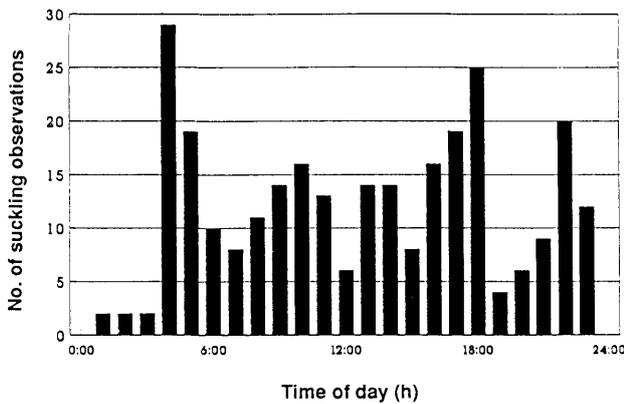


Figure 3 Daily distribution of suckling bouts in beef cows on cultivated pastures.

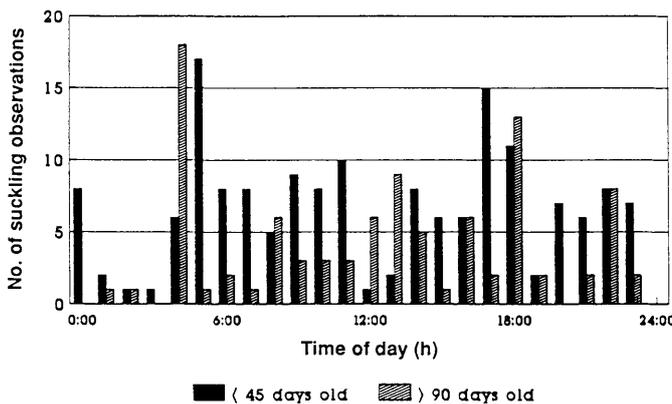


Figure 4 Daily distribution of suckling bouts among beef cows prior to 45 days and subsequent to 90 days post partum.

Intervals between suckling events

It was evident (Figure 4) that the suckling events were not evenly distributed throughout a 24-h period. As the age of the calf increased, the longest interval between suckling events was extended ( $P < 0.01$ ; Table 2). There was also a significant ( $r = 0.2167$ ;  $P < 0.01$ ) correlation between calf mass and length of the longest interval between two suckling events. With the exception of the two aforementioned cow/calf pairs, all the longest intervals occurred in the early hours of the morning. The younger calves, nursed by cows less than 45 days into lactation, averaged longest intervals of 345 min. This time-span increased until at three months and over, the average

Table 2 The longest interval between suckling events. Data expressed as the mean  $\pm$  SE

| Calf age (days) | n  | Longest interval (min) |
|-----------------|----|------------------------|
| All ages        | 57 | 380 $\pm$ 105.2        |
| <45             | 25 | 345 $\pm$ 69.8         |
| 46-90           | 13 | 363 $\pm$ 32.2         |
| >90             | 19 | 458 $\pm$ 140.5        |

Table 3 A comparison of suckling patterns and post partum intervals to oestrus

| Interval: calving - oestrus (days) | Suckling patterns                  |                                       |  | n  |
|------------------------------------|------------------------------------|---------------------------------------|--|----|
|                                    | Av. frequency of suckling per 24 h | Av. duration of suckling events (min) | Av. long interval between events (min) |    |
| 55-80                              | 4.8 $\pm$ 1.9                      | 8.5 $\pm$ 2.4                         | 422 $\pm$ 130.7                        | 12 |
| 81-100                             | 4.2 $\pm$ 1.1                      | 9.3 $\pm$ 2.6                         | 433 $\pm$ 140.8                        | 12 |

length of the longest interval was 458 min. Cows which exhibited oestrus as early as 55 days post partum had longest inter-suckling periods of 422 min (Table 3). During the longest interval between suckling events, the calves rested and their dams were also mostly inactive. Occasionally a cow lay chewing the cud, but for four or five hours, late at night, there was marked inactivity, not seen at any other time during the 24-h period.

The mean period between parturition and first AI was 72.5 days ( $n = 24$ ). The relationship between post partum interval to first oestrus during the mating period and suckling behaviour variables is described in Table 3.

Discussion

The results show that it is possible to devise a management strategy whereby cows and their calves are separated to stimulate ovarian activity with little disruption to the animals.

Wells (1987) expressed the opinion that the frequency of suckling per 24-h period was the only component likely to be correlated with post partum reproduction. In this study, relatively young calves suckled more frequently than did those nearly two months of age. The negative correlation between frequency and duration of suckling events was expected. The total time spent suckling over a 24-hour period varied considerably (Figure 3). This characteristic is not considered to be of importance because of its variability and because it bore no relation to the onset of oestrus.

The negative correlation between the frequency of suckling events and the longest interval between successive events (Table 3) is logical, since the less frequent the suckling events, the greater the time interval between these.

The daily pattern, or distribution of suckling events throughout a 24-h period, warrants careful evaluation. Firstly, as shown in Figure 4, the most marked pattern was the concentration of suckling events between 04:00 and 05:00 and then

between 17:00 and 18:00, followed by late night (20:00) and then more variably, late morning (10:00). These results differ considerably from those of Odde *et al.* (1985) and others who reported a concentrated nursing time at dawn, and then at 20:00. Their results were obtained in the northern hemisphere, with longer day lengths than encountered in Natal, which may account for this discrepancy. Nevertheless, in the present study, the intensity of the early morning suckling activity was very marked (17.3% of all observations), followed by 15.8% in the late afternoon. The period of least activity was between midnight and 04:00 (2.2% of sucking events observed). The *post partum* interval to oestrus in suckling cows has been reported to vary from 52 to 88 days (Short *et al.*, 1972; Dobson & Kamonpatana, 1986). Of all the suckling behaviour characteristics examined, the longest interval between suckling events was the most significant when comparing or relating suckling behaviour patterns to the anticipated onset of oestrus, at about 50 days *post partum* (Table 3).

It has been established that once-a-day suckling can promote ovarian activity (Odde *et al.*, 1986; Wells, 1987). This raises a number of questions, viz.

- (i) What is the minimum interval between sucklings required to trigger ovarian activity, in other words, what is the minimum time needed for daily cow-calf separation at any particular time in the 24-h suckling cycle?
- (ii) Is the longest natural interval between sucklings a natural clue or cue to the answer?
- (iii) Would ovarian activity be stimulated by artificially manipulating the longest interval just before the breeding season?
- (iv) Was it significant that the longest interval was always before the early morning feed, and that little physical activity occurred during this interval?

In relating suckling behaviour patterns to oestrus or ovarian activity, it appears from this study that an as yet, unknown minimum interval, when no suckling occurs, is required to trigger oestrus. This minimum interval between suckling events probably occurs in normally-suckled calves when the cow is about 70 days *post partum*.

## Acknowledgements

The authors are greatly indebted to Alvin van Niekerk and Trevor Dugmore for their time and assistance during the course of this investigation.

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