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J. Ernest Minton

E.L. Knoppel

R.E. Stewart

See next page for additional authors

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Abstract

The "suckling response" maintains anestrus in beef cows for about 40 to 60 days postpartum. The suckling response remains intact in mastectomized cows, so stimulation of the inguinal area, and not milk flow or teat stimulation, must be part of the response. Cow-calf recognition is part of the suckling response because suckling by cross-fostered calves after nose-to-nose contact followed by suckling of an alien calf does not prevent cycling. We believe the suckling response involves a cow recognizing her own calf, followed by the calf stimulating her inguinal area. It may be possible to initiate estrus by simply blocking the cow's recognition of her own calf.

Keywords

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Authors

J. Ernest Minton, E.L. Knoppel, R.E. Stewart, S.D. Viker, G.H. Kiracofe, and Jeffrey S. Stevenson

HOW DOES COW-CALF ASSOCIATION INHIBIT THE ONSET OF ESTROUS CYCLES AFTER CALVING?

J. S. Stevenson, J. E. Minton, E. L. Knoppel, R. E. Stewart, S. D. Viker, and G. H. Kiracofe

Summary

The "suckling response" maintains anestrus in beef cows for about 40 to 60 days postpartum. The suckling response remains intact in mastectomized cows, so stimulation of the inguinal area, and not milk flow or teat stimulation, must be part of the response. Cow-calf recognition is part of the suckling response because suckling by cross-fostered calves after nose-to-nose contact followed by suckling of an alien calf does not prevent cycling. We believe the suckling response involves a cow recognizing her own calf, followed by the calf stimulating her inguinal area. It may be possible to initiate estrus by simply blocking the cow's recognition of her own calf.

(Key Words: Suckling, Mastectomy, Estrous Cycles, Beef Cows.)

Introduction

Generally, cows that nurse their calves at least twice daily, similar to cows that nurse their calves ad libitum, have longer intervals to first ovulation than nonsuckled or once daily suckled cows. Presence of a nonsuckling (muzzled) calf prolonged the interval to first postpartum estrus to 58 d compared to 35 d in cows whose calves were removed 72 h after birth. Cows whose calves were fitted with nose plates to prevent suckling after 30 d, averaged 72 ± 9 d to first postpartum estrus compared to 81 ± 11 d in controls or 43 ± 10 d in cows whose calves were weaned at 30 d postpartum.

Suckled cows in which the mammary glands were denervated to remove a neural component of the suckling stimulus had similar intervals to first postpartum estrus as intact cows with calves. Mastectomy (removal of the mammary glands) of heifers at 2 mo of age resulted in reduced postpartum intervals to ovulation during three parities compared to suckled controls (first: 32 vs 52 d; second: 21 vs 59 d; and third: 20 vs 46 d). Cows suckled by cross-fostered calves released less oxytocin during suckling than those nursing their own calf. Concentrations of luteinizing hormone (LH) were greater in cows whose calves were previously weaned or in those with cross-fostered calves. Incidence of ovulation by 12 d after onset of treatments was greater for cows with cross-fostered calves (71%) and those whose calves were weaned previously (67%) compared to cows nursed by their own calves (17%). Since 1987, our objectives have been to determine how the suckling stimulus inhibits the onset of estrous cycles after calving and what physiological components are part of this inhibitory signal. These studies were initiated by Dr. Guy Kiracofe and have continued since his departure from Kansas State University in 1991.

Experimental Procedures

Experiment 1 (1987). The objective of this study was to determine when mastectomized (Mast-X) cows would begin their estrous cycles following calf removal at birth. Bred heifers were mastectomized during early gestation after being confirmed pregnant. All mammary tissue was removed and the abdominal skin was sutured closed, with drainage catheters left in place during the postsurgical healing period. The cows were allowed to calve, and their calves were removed within 24 h of birth. Blood was collected daily to assess

changes in serum progesterone (indicative of postovulatory function of a corpus luteum), and cows were observed for signs of heat.

Experiment 2 (1988). The objective of this study was to determine whether the presence of their own calves would alter when Mast-X cows begin their estrous cycle after calving. Half of the calves remained in the presence of the cows (calf present), and the remaining calves were removed permanently at birth (calf removed). Those Mast-X cows maintained with their calves were allowed normal uninterrupted contact with their calves, except for a few minutes twice daily when calves were bottle-fed. Blood was collected daily to assess changes in serum progesterone, and cows were observed for signs of heat. In the absence of any heat activity, the calves in the calf-present group were removed permanently at 46 to 53 d of age.

Experiment 3 (1989). The objective of this study was to repeat Experiment 2 and include some normally suckled, udder-intact cows with their calves present. Additional cows were mastectomized during early gestation after confirmed pregnancy. The treatments included the same two treatments used in Experiment 2 (calf removed and calf present) plus four udder-intact cows with their calves (udder-intact + calf present). Those Mast-X cows maintained with their calves were allowed normal uninterrupted contact with their calves, except for a few minutes twice daily when calves were bottle-fed. Blood was collected daily to assess changes in serum progesterone, and cows were observed for signs of heat.

Experiment 4 (1990). The objective was to determine whether restricting the calf's contact to the head and neck of its dam (i.e., the calf could not attempt to nurse the Mast-X cow) would alter the onset of postpartum estrous cycles. Four treatment groups were formed: 1) Mast-X cow + calf present; 2) Mast-X cow + calf removed at birth; 3) Mast-X cow + calf restricted (the calf was kept in a pen adjacent to its dam so the calf could only touch and nuzzle the head and neck of its dam); and 4) udder-intact cow + calf present. Mast-X cows maintained with their calves were allowed normal uninterrupted contact with their calves (calf present), except for a few minutes twice daily when calves were bottle-fed. Calves in the calf-restricted group also were bottle-fed twice daily. Blood was collected daily to assess changes in serum progesterone, and cows were observed for signs of heat.

Experiment 5 (1992). The objective of this experiment (same treatments as Experiment 4) was to determine how restricting the calf to the head and neck area (i.e., the calf could not attempt to nurse the Mast-X cow) or allowing unlimited suckling-like activity of the calf to its Mast-X or udder-intact dam altered normal suckling-induced hormone secretion and altered the onset of postpartum estrus. Four treatment groups were formed: 1) Mast-X cow + calf present; 2) Mast-X cow + calf removed at birth; 3) Mast-X cow + calf restricted (the calf was kept in a pen adjacent to its dam so the calf could only touch and nuzzle the head and neck of its dam); and 4) udder-intact + calf present. Mast-X cows maintained with their calves were allowed normal uninterrupted contact with their calves (calf present), except for a few minutes twice daily when calves were bottle-fed. Calves in the calf-restricted group also were bottle-fed twice daily. Blood was collected daily to assess changes in serum progesterone, and cows were observed for signs of heat. In addition, at d 7 postpartum, the calves were separated from their dams and then returned to their dams 12 h later. During that time, blood samples were collected at frequent intervals to characterize changes in serum concentrations of suckling-induced hormonal secretions (cortisol, oxytocin, and prolactin).

Results and Discussion

Results of all five experiments are summarized in Table 1. In Experiment 1, Mast-X cows whose calves were removed at birth initiated estrous cycles from 7 to 28 d after calving.

In Experiment 2, Mast-X cows with their calves present cycled approximately 5 wk later than Mast-X cows with their calves removed at birth.

In Experiment 3, Mast-X cows with their calves removed at birth began their cycles from 14 to 22 d after calving, approximately 2 to 3 wk earlier than Mast-X cows or udder-intact cows with their calves present.

In Experiments 4 and 5, results obtained were similar to those in Experiment 3. In addition, in both Experiments 4 and 5, those Mast-X cows with their calves restricted so they could not suckle their dams, cycled as early as Mast-X cows whose calves were removed at birth. After feeding, calves in the calf-present group would return to their dams and attempt to nurse the inguinal area where the intact mammary glands had been. The duration of this suckling activity was similar for calves exposed to their Mast-X (13.0 ± 2 min) or udder-intact dams (15.3 ± 2 min). Concentrations of oxytocin, normally released at suckling, were increased in both Mast-X and udder-intact dams when calves rejoined their dams after a 12-h separation. Concentrations of prolactin also tended to increase in the Mast-X or udder-intact cows when exposed to their calves after this separation.

These results indicate that the presence of mammary glands was not essential for the suckling signal to prolong anestrus in beef cows. Furthermore, because Mast-X cows in the calf-restricted groups cycled as early as those whose calves were removed at birth, the calf must provide some tactile stimulation to the cow's inguinal area in order to prolong anestrus. We believe the suckling signal is two-part. For the suckling signal to be complete, the cow must recognize her calf, and her own calf must then attempt to nurse. This cow-calf recognition is a critical part of the inhibitory signal, because cross-fostered calves brought nose-to-nose with cows and then allowed to nurse, failed to complete the suckling signal (estrous cycles begin as if the cows were not nursed). Therefore, the process of cow-calf recognition must precede the suckling event in order to complete the inhibitory signal. It seems plausible that, if we can block cow-calf recognition, then the cow would begin to cycle despite continued suckling activity of her own calf. This hypothesis remains to be tested.

Table 1. Days to First Postpartum Ovulation Based on Progesterone in Serum

Treatment	Exp. 1 (1987)	Exp. 2 (1988)	Exp. 3 (1989)	Exp. 4 (1990)	Exp. 5[a] (1992)
Mast-X + calf removed	13.9 7 to 28[c] (n = 11)	16.0 14 to 22 (n = 4)	15.2 9 to 21 (n = 4)	17.0 12 to 30 (n = 7)	23.6 10 to 38 (n = 8)
Mast-X + calf restricted[b]				15.3 8 to 25 (n = 7)	29.1 17 to 41 (n = 7)
Mast-X + calf present		49.0[d] 50 to 54 (n = 4)	37.0 19 to 56 (n = 11)	30.4 15 to 42 (n = 7)	36.7 29 to 48 (n = 7)
Udder-intact + calf present			28.2 23 to 32 (n = 4)	28.6 18 to 44 (n = 7)	40.7 37 to 46 (n = 8)

[a]Calves were removed from their dams on d 35 postpartum.
[b]Calf was maintained in smaller pen within the individual cow pen with the cow receiving only access to the head and neck of its dam (i.e., calf could not suckle its dam).
[c]Range of days postpartum.
[d]Calves were removed from cows at 46 to 53 d postpartum and cows ovulated 1 to 4 d later.