Periparturient Events and Subsequent Fertility in Dairy Cows

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Considerable time, effort and money is invested in programs designed to optimize reproductive performance in dairy cattle. Metritis, endometritis, follicular cysts and heat detection are often the focus of attention. Antibiotics, hormones and synchronization schemes are frequently utilized in attempts to control these conditions. The actual occurence of these conditions is evidence that predisposing circumstances or risk factors precede them. Unfortunately, the little attention often given to these factors represents an underestimation of their important role in prevention and early detection of reproductive disease.

Complications at calving that are associated with decreased fertility include heat stress, dystocia, multiple births, milk fever, retained fetal membranes, metritis, fat cow syndrome and ketosis. An unsanitary calving environment and uncleanliness during obstetrical manipulations often compound the problem. Typically these complications present themselves as a complex, with more than one condition often present in a given cow. Prevalence of these complications varies with season, herd, cow groups and nutrition. Dystocia rates are frequently 5-10%, with higher rates in primiparous animals. Retained fetal membranes occur in 7-12% of all calvings under average conditions. Milk fever may be controlled at very low levels and can range up to 35% with uncontrolled calcium intake in the dry period.

Heat stress is a common complication in many geographic areas. Research has demonstrated altered prepartum hormonal profiles, decreased placenta and calf birth weights, decreased milk yield and increased numbers of stillbirths.[8] Increased incidence of retained placenta is commonly observed under conditions of heat stress in the southwestern United States. Provision of shade for dry cows and maternity pens is recommeded in warm climates.

Dystocia is associated with increased incidence of retained placenta; a 25X increased risk of metritis; prolonged average days open and calving intervals; and increased stillbirths, services per conception and culling rates.[9] [10] Twinning is associated with a 4-5X increased risk of retained placenta, and mediated through the retained membranes, a 54% incidence of metritis.[6] Milk fever increases risk of retained placenta, dystocia, metritis and mastitis. Incidence of retained placenta increases with age and is associated with follicular cysts, increased calving intervals, services per conception and average days in milk.[2] Relationships between primary metabolic and reproductive disorders and secondary associated disorders are summarized in Table 1.

Manual or computer records of complications should be maintained and summarized on a regular basis. Surveillance for complications at calving is indicated for two reasons. First, increased incidence of complications is an indicator for implementation of appropriate preventive measures. Secondly, complications at calving are risk factors that suggest submission of cows to more intensive observation and aggressive treatment than that provided when complications are absent. Veterinary examination lists should include cows with increased risk of reproductive failure as a result of periparturient complications. Examples of complications surveillance reports are listed in Tables 2 and 3[a].

Proper dry period nutrition is essential to control milk fever, retained placenta and fat cow syndrome. NRC requirements for energy, protein, calcium, phosphorus and trace minerals must be met. Calcium intakes should be limited to approximately 100 gm/head/day. High energy diets should be avoided to prevent fat cow syndrome. Selenium and Vitamin E supplementation should be practiced in problem areas. Cows with weight loss and lowered intakes during the dry period have increased mortality and are at higher risk for complications including fat cow syndrome, milk fever, mastitis, retained placenta and displaced abomasum.[12]

Nutritional status immediately postpartum is, under the best of circumstances, unbalanced. Milk yield in normal cows peaks at approximately seven weeks while maximum dry matter intake is not achieved until twelve weeks. The resultant energy deficit is observable as rapid weight loss (Diagram 1). The amount of body weight loss directly affects time to resumption of estrus cycles, progesterone profiles post-estrus and conception rates (Diagrams 2 and 3). Cows with clinical ketosis have lowered conception rates.[7] Absolute body weight may be less important than degree of body condition loss, the minimum weight and the duration of negative energy balance. A practical body condition scoring system (Table 4) has been developed that allows assessment of nutritional status on an individual cow, pen and herd basis (Diagram 4). Goals for body condition scores

a) Dairy Herd Management Program, Veterinary Software Group, Merced, California.

TABLE 1. Relationships Between Some Primary Metabolic and Reproductive Disorders and Secondary Associated Disorders+ (Britt, 1979).

Increased Secondary Disorders	Primary Disorder						
	Fat cow Syndrome	Milk Fever	Dystocia	Retained Placenta	Metritis	Displaced Abomasum	Ketosis
Dystocia	X	X					
Retained placenta	X	X	X				
Metritis	X	X	X	X		?	?
Displaced abomasum	X	X	X	X	?		
Mastitis	X	X	X	X	X		?
Reduced conception Rate	X	X	X	X	X	X	X

FIGURE 1. Schematic relationship between milk yield, feed intake, live weight change and energy balance in the high yielding cow. (Krohn and Andersen, 1978)

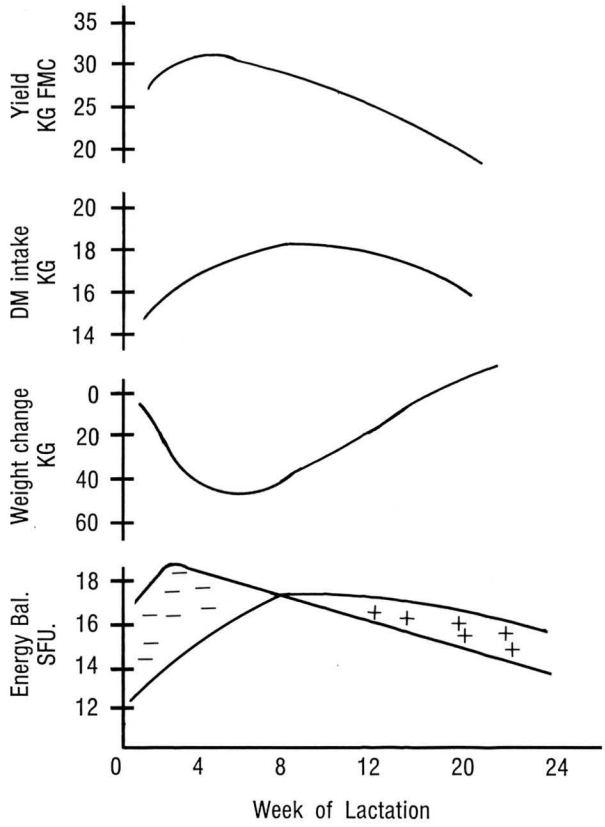

TABLE 2. Complications at Calving Surveillance — Dystocia

Calving Evaluation

By Type of Calving

	Norm Birth	Pro-long Birth	Dairy Help	Vet Help Pull	Multp. Birth	Unk	Total
	%	%	%	%	%	%	#
1st	100.0	0.0	0.0	0.0	0.0	0.0	4
2nd	76.9	23.1	0.0	0.0	0.0	0.0	13
≥3	37.5	50.0	12.5	0.0	0.0	0.0	16
Total	60.6	33.3	6.1	0.0	0.0	0.0	33

FIGURE 2

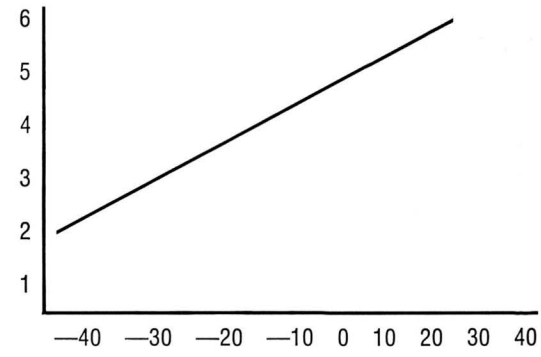

TABLE 3. Complications at Calving Surveillance — White Oaks Dairy 10/02/84

Time Period: Beg Date—8/22/84
End Date—9/19/84

By Complications at Birth

	None	Udder Edema	Downer Cow	Ret. Plac.	Repro. Injur.	Pro-Lapse	Mastitis	Other D.O.A.	Total
	%	%	%	%	%	%	%	%	#
1st	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4
2nd	84.6	0.0	0.0	15.4	0.0	0.0	0.0	0.0	16
≥3	56.3	0.0	37.5	12.5	0.0	0.0	0.0	0.0	16
Total	72.7	0.0	18.2	12.1	0.0	0.0	0.0	0.0	33

FIGURE 3

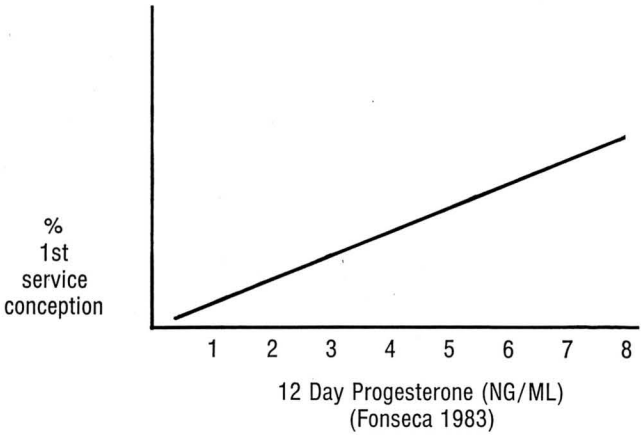

FIGURE 4. Body Condition Scores — White Oaks Dairy 8/7/84

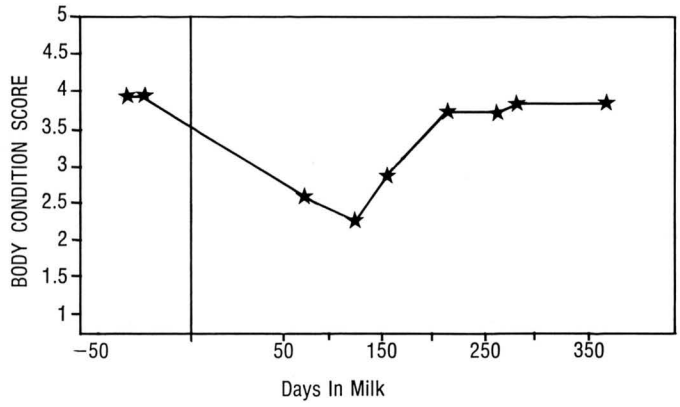

TABLE 4. Body Condition Scores (Wildman, J. Dai Sci (1982) 65:495-501)

BCS 1	Emaciated, sharp spinous processes; pins prominent; severe depression between hooks and pins.
BCS 2	Spinous processes visible, but not prominent. Transverse processes sharp with overhanging shelf.
BCS 3	Spinous processes easily palpable. No overhanging shelf. Smooth without signs of fat deposition.
BCS 4	Spinous processes detectable by deep palpation. Loin and Rump flat.
BCS 5	Boney structure not apparent. Evidence of subcutaneous fat.

are a score of 4 throughout the dry period, followed by a decline to just under 3 at 100 days in milk. Positive energy balance after this time should permit a gradual return to body condition 4 before drying.

In summary, nutrition in the dry and immediate postpartum period directly affect reproductive performance. Nutritional effects on fertility are mediated through a complex of complications at calving and metritis. Cows in negative energy balance during this period have increased incidence of metritis, altered hormonal profiles and delayed conception. Successful reproductive programs must recognize these early indicators of impaired fertility and, when indicated, implement control and treatment programs.

References

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