

Calf Scours As It Relates to Selected Nutritional Components of Colostrum

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The nutrition supplied by the dams' colostrum may be one of the many causes of scours in calves.

It has been demonstrated that the human neonate is dependent upon specific nutritional components such as protein, ascorbic acid, pyridoxine, riboflavin, thiamin, pantothenic acid, copper and cobalt, in addition to the natural passive immunities obtained through the placenta and the colostrum for immunological resistance to infectious diseases. Apparently, a deficiency of any of these nutritional components, and possibly others, may suppress cell mediated immunity and/or humoral immunity and/or phagocytic activity to the degree that the malnourished newborn is highly susceptible to infectious disease.

This has been documented by immunological techniques determining the specific immunological activity and by response of the newborn to the provision of what was thought to be adequate nutrition in children. It would be of value to know if the same relationship exists between the calf and the nutritional composition of colostrum. The major purpose of the research reported in this article was to determine the level of some selected nutrients in bovine colostrum and to ascertain if any relationship exists between any of these nutrients and the incidence of calf scours.

PROCEDURE

Colostrum was collected from 18 cows representing

six herds in 1979 and from 11 cows representing three herds in 1980. Colostrum was taken prior to nursing whenever possible. The first year, 13 cows had calves with scours and five did not. The second year, eight cows had scour-free calves and three had scouring calves, which were all from one herd. Feeds were sampled from each ranch and analyzed for dry matter, ash, fiber protein, *in vitro* dry matter digestibility, calcium and phosphorus. Feeding management information was obtained from the producers and approximate ration compositions were calculated from the feed analysis information. Colostrum samples were kept frozen until the time of analysis. The nutritional components of colostrum were analyzed according to standard published procedures (AOAC, 1980), either in commercial laboratories or in the Animal Science laboratories. Milk was analyzed for 11 vitamins, three minerals, dry matter, protein and ash in 1979 and five vitamins, four minerals, dry matter, protein, ash, butterfat and amino acids in 1980.

RESULTS AND DISCUSSION

The producers all used feeding management systems which met the suggested requirements (NRC, 1976) for the cows based on the feed and calculated ration analysis. Colostrum appeared to be higher in vitamins A, E and B₁₂ and lower in biotin from the dams with non-scouring calves (Table 1) in 1979, but these dif-

Table 1. Average Nutrient Composition of Colostrum of Six Herds (1979)

	Herds					
	1	2	3	4	5	6
Vitamin E (mg/1)	8.0	11.3	11.0	1.0	15.0	4.5
Vitamin A (IU/1)	9925	19237	20958	905	28000	9937
Vitamin C (mg/1)	52.5	40.0	37.5	15.0	10.0	26.67
Pantothenic Acid (mg/100g)	.31	.36	.41	.51	.25	.44
Biotin (ug/100g)	1.52	.45	.57	2.39	.18	8.07
Copper (ppm)	3.88	2.5	2.58	2.0	2.25	2.12
Zinc (ppm)	12.25	16.33	22.7	12.4	21.7	20.97
Iron (ppm)	5.13	3.88	3.0	2.5	2.5	2.63
Folic Acid (mg/1)	57.63	53.29	64.38	27.6	72.75	48.16
Riboflavin (mg/1)	6.24	4.82	7.82	5.0	5.52	7.76
Thiamin (mg/1)	.76	.64	.77	.63	.50	.81
Choline (mg/1)	241.43	230.56	232.0	208.8	158.78	185.23
Vitamin B ₁₂ (ppb)	7.0	2.7	8.3	5.0	6.0	9.0
Pyridoxine (ug/100g)	8.2	11.68	10.93	10.4	7.4	16.8
Selenium (ppm)	.16	.15	.18	.14	.14	.11
Number of Animals	3	4	3	1	1	6

There were no significant differences among herds for any nutrient.

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ferences were not significant because of the wide range of variation among the cows within treatment groups. Other nutritional components were similar in the colostrum of dams with either scouring or non-scouring calves. The nutrient component averages from each herd (1979) are shown in Table 2.

There are considerable herd differences in some of the nutrients, such as vitamins A, E, C, biotin and folic acid. The wide nutrient variations among cows within each herd result in no real differences in any of the nutrient components among the six herds. Tables 3, 4 and 5 show the nutrients found in the colostrum for the scouring and non-scouring groups for 1979 and 1980 calving seasons. These tables also include other published values for some of the nutrients. There is little information on the nutritional composition of colostrum produced by beef cows. The composition of colostrum

Table 2. Average Nutrient Composition of Colostrum From Beef Cows With Scouring and Non-Scouring Calves (1979)

	Treatment		
	No scours ^a	No Scours (Pneumonia) ^b	Scours ^c
Vitamin E (mg/l)	11.7	12.5	6.3
Vitamin A (IU/l)	23167	17937	11902
Vitamin C (mg/l)	31.67	37.5	32.71
Pantothenic Acid (mg/100g)	.33	.42	.42
Biotin (ug/100g)	.33	.66	4.89
Copper (ppm)	2.17	2.13	2.65
Zinc (ppm)	16.33	18.55	19.31
Iron (ppm)	3.67	2.5	3.29
Folic Acid (mg/l)	68.55	71.8	46.80
Riboflavin (mg/l)	5.27	6.48	6.96
Thiamin (mg/l)	.58	.77	.76
Choline (mg/l)	290.5	243.6	205.4
Vitamin B ₁₂ (ppb)	3.4	4.3	8.0
Pyridoxine (ug/100g)	10.5	12.35	13.65
Selenium (ppm)	.16	.15	.14

^aThree cows.

^bTwo cows.

^cThirteen cows.

There were no significant differences among treatments for any nutrient.

changes very rapidly to that of normal milk after parturition.

The nutritional patterns of colostrum collected in 1980 were similar to those collected in 1979. Vitamins A, E, B₁₂ and folic acid levels were higher and biotin was lower in the colostrum of cows with non-scouring calves compared to those with scouring calves. Levels of thiamin, pantothenic acid, riboflavin and choline were similar between cows with either scouring or non-scouring calves. Vitamin C, pantothenic acid and riboflavin levels were all higher than those published normal values (Table 3).

The trace elements copper and iron were similar between the treatments but varied between 1979 and 1980. These values were near or above normal levels reported by other authors (Table 4). Zinc was lower in the colostrum of cows with scouring calves in 1980. The colostrum dry matter (9.14 per cent) of the three cows with scouring calves in 1980 was very low compared to the average of over 23 per cent for the other colostrum sampled (Table 5). There is no explanation for the low dry matter in 1980 and such was not the case in 1979 for the cows with scouring calves. This difference in dry matter might explain some of the average nutritional differences of colostrum between the scouring and non-scouring group in the 1980 samples. Potassium levels were similar and near the suggested normal level.

Table 4. Selected Minerals in Colostrum from Cows with Scouring and Non-Scouring Calves Collected in 1979 and 1980

Treatment	Year	Values Expressed on As Is Basis			
		PPM Copper	PPM Zinc	PPM Iron	% Potassium
Scoured ^a	1979	2.65	19.3	3.8	
Scoured ^b	1980	>1.00	10.2	8.4	.14
Non-scoured ^c	1979	2.15	17.2	3.2	
Non-scoured ^d	1980	>1.00	17.8	6.0	.17
Reference values		.60		2.0	.14

^aThirteen cows (five herds).

^bThree cows (one herd).

^cFour cows (two herds).

^dEight cows (two herds).

Table 3. Selected Vitamins in Colostrum from Cows with Scouring and Non-Scouring Calves Collected in 1979 and 1980

Treatment	Year	Values Expressed on As Is Basis										
		E mg/l	A IU/l	Biotin ug/100g	Folic Acid mg/l	Thiamin mg/l	B ₁₂ ug/100g	C mg/l	Panto. Acid ¹ mg/100g	Ribo-flavin mg/l	Choline mg/l	B ₁₂ ppb
Scoured ^a	1979	5.08 ^e	10,987	4.13	43.2	.699	13.7	28.5	.42	6.96	205	8.0
Scoured ^b	1980	>1.0	987	3.36	27.9	.836						
Non-scoured ^c	1979	12.0	20,075	.46	69.9	.652	11.24	34.0	.37	5.76	175	4.0
Non-scoured ^d	1980	4.4	8,146	1.68	58.3	.982						
Reference values	5.3 ²	6,750 ²	5.00 ²	—	.800 ²	—	25.0 ²	.20 ²	4.50 ²	530 ²	16.0 ²	

^aThirteen cows (five herds).

^bThree cows (one herd).

^cFour cows (two herds).

^dEight cows (two herds).

^eAverage of 13 cows but five cows had level too low to record.

¹Pantothenic acid.

²The Calf - Management and Feeding, Roy 1970.

The protein content expressed on the "as is" basis were all near normal levels, except in the colostrum of cows with scouring calves in 1980, but when protein was expressed on the dry basis all the values were similar (Table 5). The same relationship is shown with the ash content. Butterfat was considerably higher in the colostrum consumed by non-scouring calves. Colostrum amino acid levels were similar between cows with scouring or non-scouring calves.

It is difficult to make definite conclusions from the data concerning relationships of the nutritional components of colostrum to the incidence of calf scours because of the wide variations of each nutrient among cows and between years within (scours and non-scours)

groups. The data suggest that calves consuming colostrum with low vitamins A, E and B₁₂ and high in biotin would probably be more likely to scour. It must be emphasized that the differences were not significant when statistical measures were applied. In order to make valid conclusions, larger numbers of cows, both with scouring and non-scouring calves, would be required. Colostrum sampling time would have to be closely controlled as the nutritional composition changes rather rapidly after calving. It also would be desirable to have several colostrum samples from one herd with both scouring and non-scouring calves. These data will be useful in establishing expected normal nutrient levels of colostrum of beef cows.

Table 5. Proximate Fractions in Colostrum from Cows with Non-Scouring and Scouring Calves Collected in 1979 and 1980

Treatment	Year	%						
		Dry Matter	Protein (As Is)	Protein (Dry)	Ash (As Is)	Ash (Dry)	Butterfat (As Is)	Butterfat (Dry)
Scoured ^a	1979	23.17	14.9	64.3	1.14	4.92		
Scoured ^b	1980	9.14	5.79	63.3	.82	8.97	1.17	12.8
Non-scoured ^c	1979	24.7	14.3	57.9	1.08	4.37		
Non-scoured ^d	1980	21.28	14.05	66.0	1.11	5.22	3.67	17.25
Reference values		19.01 ¹	14.36 ¹		.97 ²		3.6 ²	

^aThirteen cows (five herds).

^bThree cows (one herd).

^cFour cows (two herds).

^dEight cows (two herds).

¹Physiology of Lactation, Smith 1959.

²The Calf - Management and Feeding, Roy 1970.

Table 6. Average Nutrient Composition of Colostrum of Three Herds (1980)

	Herds		
	1 ^a	2 ^b	3 ^b
Vitamin E (mg/1)	>1.0	4.6	4.45
Vitamin A (IU/1)	518	9527	6766
Biotin (ug/100g)	3.36	1.83	1.52
Folic Acid (mg/1)	27.9	60.2	56.4
Thiamin (mg/1)	.836	.985	.979
Copper (ppm)	>1.0	>1.0	>1.0
Zinc (ppm)	10.2	16.2	19.4
Iron (ppm)	8.4	5.5	6.5
Potassium (%)	.136	.153	.189
Protein dry (%)	63.3	65.9	64.3
Ash dry (%)	8.97	5.51	4.95
Butterfat dry (%)	12.8	11.1	23.8

^aColostrum from three cows with scouring calves.

^bColostrum from four cows in each herd with no scouring calves.

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