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Several Blood Constituents of Five Breeds of Dairy Cattle in Guatemala

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IN ORDER to increase the production of milk in countries of the American tropics, governments, agricultural organizations, and private breeders are importing increased numbers of purebred dairy cattle from the United States and Canada. Some of these cattle are maintained as purebred herds; others are crossed with selected native cattle.

Many of these imported animals die and, often, they produce less milk than the native cattle. Although the reasons for this high mortality and inefficient production are numerous and complicated, there is no doubt that the existing low plane of nutrition is an important factor. Rusoff and Piercy [13] have stressed the value of blood data as an aid in determining the nutritional status of dairy animals. This report, a study of 12 essential blood constituents of dairy cattle considered representative of better managed herds in Guatemala, concludes the series initiated by Squibb *et al.*[15] which were designed to provide reference data on farm animals of this tropical area.

TABLE 1—Levels of Several Blood Constituents of Five Breeds of Dairy Calves and Cows in Guatemala

Constituent		Native		Jersey		Brown Swiss		Holstein-Friesian		Ayrshire	
		Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s. d.
SERUM											
No. of animals	Calves	40		5		47		17		22	
	Cows	15		18		49		30		10	
Total proteins	Calves	6.21	0.62	6.33	0.21	6.19	0.28	6.75	0.11	6.50	2.00
(Gm./100 ml.)	Cows	.....	.....	7.27	0.18	7.23	0.13	.....	.....	.....	.....
Riboflavin	Calves	1.44	0.59	2.01	0.24	1.97	0.61	0.86	0.08	1.10	0.24
(μg./100 ml.)	Cows	1.39	1.03	1.67	0.57	3.00	1.02	2.56	0.74	1.59	0.97
Ascorbic acid	Calves	0.60	0.23	1.44	0.21	0.81	0.14	1.10	0.05	0.50	0.09
(μg./100 ml.)	Cows	.....	.....	1.20	0.08	1.06	0.11	.....	.....	.....	.....
Carotene	Calves	77.00	43.00	478.00	51.00	304.00	95.00	79.00	8.00	293.00	184.00
(μg./100 ml.)	Cows	900.00	225.00	1,097.00	101.00	666.00	152.00	886.00	31.00	893.00	214.00
Vitamin A	Calves	12.00	5.50	24.00	2.60	23.00	28.70	12.00	0.90	16.00	13.90
(μg./100 ml.)	Cows	51.00	26.60	58.00	9.70	34.00	12.80	47.00	7.00	40.00	14.40
Total tocopherols	Calves	0.45	0.16	0.27	0.02	0.50	0.12	0.16	0.03	0.33	0.18
(μg. 100 ml.)	Cows	.....	.....	0.60	0.34	0.91	0.04	.....	.....	.....	.....
Alkaline phosphatase	Calves	9.76	3.14	5.70	0.85	5.48	0.91	2.03	0.14	3.77	2.91
(mM./1/hr.)	Cows	2.30	0.46	1.54	0.58	2.31	1.00	2.62	2.10	4.62	3.21
Calcium	Calves	15.53	2.23	.....	.....	10.13	0.81	.....	.....	9.12	0.74
(mg./100 ml.)	Cows	.....	.....	6.89	0.75	10.61	1.58	10.15	1.21	9.32	1.14
Phosphorus	Calves	9.29	1.07	.....	.....	7.03	0.58	.....	.....	8.31	1.16
(mg./100 ml.)	Cows	.....	.....	4.15	0.34	6.17	1.04	6.90	0.85	6.03	0.86
WHOLE BLOOD											
No. of animals	Calves	27		.....	.....	10		17		.....	.....
Hemoglobin											
(Gm./100 ml.)	Calves	12.9	1.8	.....	.....	10.1	0.6	11.8	0.4	.....	.....
Erythrocytes (millions/mm.^{3})											
count	Calves	11.5	2.4	.....	.....	8.4	0.5	9.7	0.5	.....	.....
Hematocrit (%)	Calves	53.0	7.0	.....	.....	34.0	1.4	31.0	0.2	.....	.....

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MATERIALS AND METHODS

From April, 1952, to May, 1954, blood samples were obtained from several herds of Jerseys, Holstein-Friesians, and Ayrshires of highland areas (elevation over 3,000 ft.) and Brown Swiss and native breeds of lowland areas (from sea level to 1,500 ft.). All cattle had access to either green soilage or pasture. The cows were 3 to 5 years of age and were in the third to fifth month of lactation. The calves ranged from 2 to 5 months of age and were all nursing. There was no rela-

tionship between the cows and the calves used in this study.

Approximately 15 ml. of blood was drawn from the jugular vein and permitted to coagulate to yield the serum. An additional 2 ml. was collected in tubes containing an anticoagulant. All samples were immediately placed in a small ice box and shipped by air to the laboratory. Within five hours after blood samples were collected, analyses were begun for protein,[10] riboflavin,[4] ascorbic acid,[11] carotenoids, and vitamin A,[1] tocopherols,[12] alkaline phosphatase,[1] calcium,[8] and phosphorus.[8]

RESULTS AND DISCUSSION

Since only better managed herds were sampled, it was anticipated that the blood levels for the various constituents studied would be within normal limits. The serum protein values of the cows (table 1) would be even closer to those given by Dukes [5] for plasma protein if the fibrinogen content of the plasma were added. The vitamin A and carotene blood levels were adequate and similar to those reported elsewhere.[6, 14, 17] Obviously, these cattle, fed ample quantities of fresh green soilage or given access to green pastures, had an adequate intake of carotene. The relatively lower serum carotene and vitamin A levels of the native and Holstein-Friesian calves suggest that they were consuming poorer quality forage prior to the time the blood samples were drawn.

The ascorbic acid serum levels were, on the average, higher than those reported by Braun [3] for dairy cows on pasture. The serum alkaline phophatase and tocopherol values were similar to those previously reported [9, 15] as were the levels of calcium and phosphorus.[3, 13] The rumen and intestinal synthesis of riboflavin, which takes place in cattle, and dietary intake determine the serum levels (table 1) of this vitamin.

While the hemoglobin and hematocrit values and the erythrocyte counts of the purebred calves were similar to published values,[13, 18] the native calves had comparatively higher values for these blood constituents.

SUMMARY

Chemical analyses were made of several blood constituents of dairy cows and calves of five breeds which were considered representative of better managed herds in Guatemala. The data indicate that blood serum levels of total proteins, ascorbic acid, tocopherols, hemoglobin, erythrocytes, hematocrit, alkaline phosphatase, carotenoids, and vitamin A were similar to values published elsewhere as normal. Native calves raised in the tropic lowlands were observed to have higher hemoglobin and hematocrit values and erythrocyte counts.

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