

THE EFFECT OF INJECTABLE IRON AND ORAL OXYTETRACYCLINE ON  
HEMOGLOBIN, PACKED CELL VOLUME, AND RATE OF GAIN  
OF BABY RANGE CALVES

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Experimental data is very limited on hemoglobin trends and other indices of anemia in baby range calves. Experiments with dairy calves restricted to whole milk diets have shown that anemia symptoms appeared from 2 months (Blaxter *et al.*, 1957) to 4 months of age (Matrone *et al.*, 1957). A mild anemia was found to exist at 40 to 80 days of age in Aberdeen Angus or Angus cross calves reared under commercial farm conditions in Scotland (Blaxter *et al.*, 1957). Since great difference normally exists between the gestation diets of dairy and beef cattle, it seems possible that the iron store of the newborn beef calf might be less than that of the dairy calf.

Feeding levels of chlortetracycline and oxytetracycline have been found to stimulate the growth rate of dairy calves from 10 to 30% during the first 16 weeks of age with most of the improvement occurring before 8 weeks of age (Lassiter, 1955). Little information is available on the influence of the addition of antibiotics to the diet of beef calves during the first few weeks of life. Obviously, the practical problem of providing an antibiotic in the diet of beef calves is more difficult to solve than is true with dairy calves. It does seem worthwhile, however, to determine what response might be obtained from including an antibiotic in the diet of beef calves for the first month after birth when they are managed under nearly practical range conditions.

The objectives of the work reported in this paper were:

1. To determine the normal hemoglobin and packed cell volume of range beef calves from birth to 4 weeks of age.
2. To determine the influence of an iron-dextran injection at birth and daily oral administration of oxytetracycline on growth rate and hematological response to 4 weeks of age.

#### PROCEDURE

Sixteen Hereford calves were randomly assigned, at birth, to 4 treatments in a 2 x 2 factorial study of the daily oral administration of 50 mg. oxytetracycline (water soluble Terramycin<sup>2</sup>) and the

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intramuscular injection within 24 hours after birth of 10 ml. of an iron-dextran preparation (Armidedexan<sup>1</sup>). The calves were born during the 4-day period of March 15-18, 1959.

The calves remained with their dams in an open lot and received a diet consisting of their dam's milk. No precautions were taken to prevent them from consuming hay or concentrate provided for the cows. The cows were fed a ration of meadow hay ad libitum and one lb. cottonseed meal daily during the experiment and for three months prior to its initiation. The early part of the gestation period was spent grazing on sagebrush-bunchgrass range and later on meadow stubble.

The antibiotic was provided as 2 ml. of water soluble oxytetracycline per day. The material was placed in the back of the animal's mouth with a 5 ml. syringe. The 10 ml. injection of iron-dextran on the day of birth provided 500 mg. of iron.

Body weights were taken at birth and at 2-week intervals thereafter.

Blood samples were collected within 24 hours after birth, again on March 24, and at weekly intervals thereafter. Packed cell volume determinations were made immediately by centrifuging 10 ml. of blood for 1 hour at 3000 r.p.m. in graduated conical centrifuge tubes. Hemoglobin determinations were made in duplicate by a direct photometric method (Hawk, Oser, and Summerson, 1949) using an Evelyn photoelectric colorimeter.

## RESULTS AND DISCUSSION

Hematology of Control Calves. The average hemoglobin content of the 16 calves at birth was 14.3 gm.% ( $\pm 1.4$ ) with a packed cell volume of 41.3% ( $\pm 4.7$ ). These values are slightly lower than similar values reported for dairy calves by Swenson et al. (1957) while Blaxter et al. (1957) found an average hemoglobin content of 10.9 gm.% for 6 Ayrshire calves at birth.

The hemoglobin concentration of the 4 calves allotted to the control treatment declined an average of 2.7 gm.% during the first week following birth (table 1). The rate of decline diminished during the second week but a minimum value of 9.8 gm.% was reached when the calves were three weeks of age. A slight increase in hemoglobin concentration had occurred by the time the calves were 28-days old. The packed cell volume followed a similar trend with the minimum value of 28.3% being reached at the third week. A decline in the hemoglobin content of the blood following birth is regarded as a normal phenomenon (Blaxter et al., 1957), therefore the important consideration is probably the extent of the decline.

Influence of Treatment on Hematology. The normal decline in hemoglobin concentration was significantly reduced at one week

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<sup>1</sup> Provided by Armour Pharmaceutical Co., Kankakee, Illinois.

( $P < .05$ ) and 2 weeks ( $P < .01$ ) after birth by injecting 10 ml. of the iron-dextran preparation at birth. The effectiveness of the injection in preventing the hemoglobin decline had apparently worn off by the third week following birth. However, the hemoglobin content of the blood of calves receiving the injection remained at a higher level than the control group throughout the 4-week period.

Table 1. Hemoglobin, packed cell volume, and % hemoglobin remaining as compared to birth-levels

Treatment	Item	Age when sampled				
		Birth	1 wk.	2 wk.	3 wk.	4 wk.
Control	Hb (gm.%)	13.7	11.0	10.6	9.8	10.2
	P.C.V. (%)	41.8	29.6	28.8	28.3	29.0
	% birth Hb	100.0	81.5	78.7	73.3	75.2
" + Fe	Hb (gm.%)	15.4	13.6	13.1	12.0	12.3
	P.C.V. (%)	43.8	35.6	34.6	32.4	34.6
	% birth Hb	100.0	88.2	85.4	77.7	80.1
" + Tm	Hb (gm.%)	14.8	12.1	11.4	11.9	12.0
	P.C.V. (%)	39.9	31.4	33.2	32.6	33.9
	% birth Hb	100.0	81.3	77.0	80.0	80.7
" + Fe + Tm	Hb (gm.%)	13.0	12.4	12.8	11.9	11.6
	P.C.V. (%)	39.9	34.0	34.1	33.4	31.8
	% birth Hb	100.0	95.4	98.5	91.7	88.7

Oral administration of oxytetracycline alone had no influence on the trend in hemoglobin content during the first two weeks following birth. The hemoglobin content of the control group had declined 21.3% at 2 weeks of age as compared to a 23.0% decline for the antibiotic treated group.

The slightly higher hemoglobin concentration in the blood of the latter group was due to the fact that they had slightly over 1.0 gm.% more hemoglobin at birth. There was a slight increase in the hemoglobin content of the group receiving the oral antibiotic at the 3-week bleeding which was not apparent in any of the other treatment groups.

The group receiving both the iron-dextran injection and oral antibiotic daily had the least drop in hemoglobin content throughout the study. They also had the lowest hemoglobin concentration at birth, which might have influenced the magnitude of the hemoglobin decline to some extent.

The packed cell volume values followed essentially the same trends as hemoglobin concentration in all groups. The treatments studied

apparently had no influence on the hemoglobin content of the packed cells (table 2).

Table 2. Hemoglobin content of packed cells (gm. Hb/100 ml. packed cells)

Treatment	Age when sampled				
	Birth	1 wk.	2 wk.	3 wk.	4 wk.
Control	32.8	37.2	36.8	34.6	35.2
" + Fe	35.2	38.2	36.8	37.0	35.5
" + Tm	37.1	38.5	34.3	36.6	35.4
" + Fe + Tm	32.6	36.5	37.5	35.6	36.5

Growth Data. No statistically significant differences in average daily gain from birth to 4 weeks of age were found due to the treatments imposed. Variation among individuals, treated alike, is quite high because of considerable variation in the milk production of the cows during the early stages of lactation. It appears that there was some response in terms of average daily gain during the first 2 weeks of the calves' lives due to both the iron-dextran injection and the daily oral oxytetracycline treatment. Evidence of this response still existed at the end of the 4-week period.

Table 3. Summary of average daily gain from birth to 2 and 4 weeks of age

Treatment	Average daily gain	
	Birth-2 wk. (lb./day)	Birth-4 wk. (lb./day)
Control	1.59	1.69
" + Fe	2.24	2.02
" + Tm	2.34	2.07
" + Fe + Tm	2.28	1.98

#### SUMMARY

Sixteen Hereford calves were allotted at birth to 4 treatments in a 2 x 2 factorial study of daily oral administration of 50 mg. oxytetracycline and the intramuscular injection of 10 ml. of an iron-dextran preparation.

The 16 calves had an average hemoglobin value of 14.3 gm. per 100 ml. blood and an average packed cell volume of 41.3% at birth.

The hemoglobin concentration of the 4 control calves declined from 13.7 gm.% at birth to a low value of 9.8 gm.% at 3 weeks of age. A slight increase was apparent at 4 weeks of age. Packed cell volume followed essentially the same trends in all cases.

The normal decline in hemoglobin concentration was significantly reduced at one and 2 weeks of age by the 10 ml. injection of the iron-dextran preparation at birth.

Orad administration of oxytetracycline alone had no influence on the trend in hemoglobin during the first 2 weeks following birth.

There was some evidence of increased rate of gain during the first 2 weeks of life due to both the iron-dextran injection and oxytetracycline administration.

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