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Effects of Hematinics on Body Weight and Some Hematological Values in Sheep and Goats

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ABSTRACT

An experiment was carried out to study the effects of hematinics ($CuSO_4$, $FeSO_4$, $CoSO_4$) on general body condition and certain hematological parameters in sheep and goats. The results revealed that the body weight gain, total erythrocyte count, hemoglobin concentration, packed cell volume, mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration were increased significantly ($p<0.01$ and $p<0.05$) in animals administered with hematinics compared to those of the control. Results of this study indicate that use of hematinics is useful in improving the general health condition of both sheep and goats if they are supplemented in proper rate and ratio. The goat responded rapidly than the sheep.

Key Words: Sheep; Goat; Hematinics; General body condition; Hematology

INTRODUCTION

Sheep and goats are one of the most popular, economically important and easily reared animals in many countries of the world. These animals can survive better than other ruminants (cattle & buffaloes) on low level of nutrition and their browsing habit helps them for satisfying their nutrient requirements. Minerals are not only required for muscular movement and skeletal development but also they are essential as constituents of blood especially copper, cobalt and iron. Copper is an essential element for a number of biochemical functions such as iron utilization and hemoglobin formation (Davis & Mertz, 1987). McDonald *et al*. (1987) described that cobalt is a constituent of vitamin $B_{12,}$ which is necessary for the maturation of erythrocyte. On the other hand, cobalt is essential for maintenance of normal number and types of microbes in the rumen. Cobalt deficient ewes have been reported to produce fewer lambs and had more stillbirths and neonatal mortalities than cobalt sufficient ewes (Duncan *et al.*, 1981). Iron is a component of blood hemoglobin. The deficiency of iron causes anemia in rapid growing suckling kids / lambs due to low content of iron in the milk.

Recent studies in India (Chandra *et al.,* 2000) investigated that the supplementation of hematinics (Cu, Fe, Co & Vit-B_{12}) resulted in the removal of primary causes of anemia and subsequent treatment promoted erythropoiesis. Limited information is available of the hematological parameters of sheep and goats raised under grazing condition. Keeping this in view, the present experiment was carried out to study the effects of hematinic on general body condition and hematological parameters in sheep and goats.

MATERIALS AND METHODS

Eighteen each "Black Bengal" goats and unidentified breed of sheep of both sexes, aged between 12 and 15 months and body weight 8.4 to 13.0 kg were used for this experiment. The animals were allowed to graze regularly on the naturally grown weeds and grasses found within the university campus. Before starting the experiment, feces of all the animals were dewormed by using a broad spectrum anthelmintic "Levanid®" (The ACME Laboratories Ltd.) which was a commercial preparation of tetramisole and oxyclozanide. Eighteen sheep were randomly assigned into three equal groups (n = 6) and numbered as group A, B and C. Group A was considered as control; whereas, group B and C as treatment groups. All the groups were housed in separate pens. Eighteen goats were grouped similarly. Their body weight and hematological parameters were recorded prior to administration of hematinics.

Animals in group B (both sheep & goats) were treated with combination of $CuSO_4$ and $CoSO_4$ @ 50 and 1 mg/head/day, respectively. Group C was treated with combination of $CuSO_4$, $FeSO_4$ and $CoSO_4$ @ 50, 200 and 1 mg/head/day, respectively. $CuSO_4$, $FeSO_4$ and $CoSO_4$ were administered daily for 45 days orally and vitamin B_{12} was administered i/m every alternate 15 days (for three times on day 0, 15 and 30) throughout the experimental period.

The body weight (kg) of each of the animal (sheep and goat) was measured with the help of balance at 15 days interval during the experimental period (45 days). The body weight of the animal was taken before feeding in morning. For hematological study, blood samples were collected from the jugular vein in a sterile test tube containing anticoagulant (4% sodium citrate) and the examination were performed within five hours of blood collection at room temperature. Total erythrocyte count (TEC), hemoglobin (Hb) concentration, packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were determined as per technique described by Lamberg and Rothestein (1977).

Statistical analysis. Data obtained were subjected to

statistical analysis by SPSS package program according to the standard procedures of Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Effect on Body weight. The mean (±SE) body weight of each group of sheep and goat is presented in Table I and II, respectively. Sheep and goats administered with different combination of hematinics showed significant increase in body weight. The high weight gain was recorded from day 15 onwards in comparison to day 0.

The increased body weight gain might be due to the muscular and skeletal development. Increase of body weight after iron, cobalt and/or vitamin B_{12} supplementation has also been reported previously (Ali, 1992; Tauson & Neil, 1993; Lind & Blum, 1994; Vellema *et al.,* 1997; Vatn & Framstad, 2000).

Effect on hematological values. In all treated groups of both sheep and goats, the values were increased significantly in proportion to the increased combination of hematinics (Table III & IV). MCV, MCH and MCHC are presented in Table V and VI. The MCV values of all the treated groups of sheep increased on day 15 and 30 but followed by decreased on day 45 compared with control group. The increased and decreased MCV value was not significant. In all the treated groups of goats, the MCV value increased significantly. In all treated groups of sheep except group B at 45 days, the MCH values increased significantly; whereas, in all the treated groups of goats, the MCH values increased significantly. The values of MCHC are changed significantly to the different combination of hematinics in different treated groups from that of control group.

Since, copper, cobalt and iron are the essential constituents of Hb and vitamin B_{12} helps for maturation of erythrocyte, which resulted in an increase in TEC. There is a positive co-relation among RBC, Hb, PCV, MCV, MCH and MCHC. Increase of hematological parameters after administration of iron, cobalt, copper and vitamin B_{12} has also been reported earlier (Martson *et al.,* 1938; Weissbecker & Maurer, 1946; Drowdy & Matrone, 1968;

Table I. Effects of hematinics on body weight (kg) in sheep

Days of Experiment	Groups of animals A (Control)	B ($CuSO_4$ and $CoSO_4$)	C ($CuSO_4$, $FeSO_4$, $CoSO_4$ and vitamin B_{12})
0	8.43 ± 0.54[a]	11.33 ± 2.30[b]	12.40 ± 2.35[b]
15	8.68 ± 0.51[b]	11.73 ± 2.28[b]	12.83 ± 2.17[b]
30	8.97 ± 0.52[b]	12.13 ± 2.11	13.23 ± 2.12[b]
45	9.37 ± 0.58[a]	12.67 ± 2.33[b]	13.57 ± 2.24[b]

The above values represent the mean standard error (SE) of 6 animals in each group.
[a] indicates significant at 1 percent level (P<0.01)
[b] indicates significant at 5 percent level (P<0.05)

Table II. Effects of hematinics on body weight (kg) in goat

Days of Experiment	Groups of animals A (Control)	B ($CuSO_4$ and $CoSO_4$)	C ($CuSO_4$, $FeSO_4$, $CoSO_4$ and vitamin B_{12})
0	12.90± 1.40[a]	12.97 ±3.79[b]	11.95±0.80[a]
15	13.08±1.38[a]	13.12±3.76[b]	12.17±0.88[a]
30	13.17±1.30[a]	13.30±3.73[b]	12.48±0.90[a]
45	13.70± 1.40[a]	13.57± 3.63[b]	12.83± 1.09[a]

The above values represent the mean standard error (SE) of 6 animals in each group; [a] indicates significant at 1 percent level (P<0.01)
[b] indicates significant at 5 percent level (P<0.05)

Table III. Effects of hematinics on TEC, Hb conc. and PCV in sheep

Days of Experiment	Blood parameter	Groups of animals A (Control)	B ($CuSO_4$ and $CoSO_4$)	C ($CuSO_4$, $FeSO_4$, $CoSO_4$ and vitamin B_{12})
0	TEC	8.50± 0.06[a]	8.36 ±0.17[a]	8.48±0.23[a]
	Hb conc.	8.18± 0.06[a]	8.17 ±0.09[a]	8.30±0.03[a]
	PCV	25.33±0.33[a]	26.00 ±0.58[b]	27.00±0.58[b]
15	TEC	8.60±0.06[a]	8.80±0.16[a]	9.10±0.20[a]
	Hb conc.	8.29±0.06[a]	8.60±0.06[a]	8.82±0.02[a]
	PCV	26.33±0.33[a]	27.00±0.58[b]	28.00±0.58
30	TEC	8.67±0.06[a]	9.22±0.16[a]	9.70±0.21[a]
	Hb conc.	8.27±0.07[a]	8.87±0.38[a]	9.48±0.02[a]
	PCV	26.00±0.58[b]	28.33±0.88	29.67±0.07
45	TEC	8.63± 0.09[a]	9.67± 0.22[a]	10.27± 0.25[a]
	Hb conc.	8.36± 0.07[a]	9.33± 0.42[a]	10.00± 0.06[a]
	PCV	27.00± 0.58[b]	29.00± 0.58[b]	30.00± 0.58

The TEC, Hb conc. and PCV values are expressed as million per cubic millimeter (10^6/cu mm), gram (gm%) and percent (%) respectively represent the mean standard error (SE) of 6 animals of each group;
[a] indicates significant at 1 percent level (P<0.01); [b] indicates significant at 5 percent level (P<0.05)

Table IV. Effects of hematinics on TEC, Hb conc. and PCV in Goat

Days of Experiment	Blood parameter	Groups of animals A (Control)	B ($CuSO_4$ and $CoSO_4$)	C ($CuSO_4$, $FeSO_4$, $CoSO_4$ and vitamin B_{12})
0	TEC	12.60±0.06[a]	13.07±0.11[a]	13.21±0.25[a]
	Hb conc.	8.50± 0.06[a]	9.14 ±0.18[a]	9.32±0.11[a]
	PCV	26.00± 0.58[b]	28.00 ±0.58	28.00±0.58
15	TEC	12.60±0.06[a]	13.17±0.09[a]	13.00±0.15[a]
	Hb conc.	8.50± 0.06[a]	9.50±0.12[a]	9.76±0.16[a]
	PCV	26.00± 0.58[b]	28.67±0.33	29.67±0.33
30	TEC	12.78±0.04[a]	13.72±0.17[a]	13.81±0.18[a]
	Hb conc.	8.68±0.02[a]	10.00±0.12[a]	10.32±0.90[a]
	PCV	27.33±0.88[b]	30.67±0.33	31.33±0.33
45	TEC	12.63± 0.09[a]	13.90± 0.12[a]	14.48± 0.26[a]
	Hb conc.	8.65± 0.05[a]	10.47± 0.13[a]	10.77± 0.12[a]
	PCV	27.00± 0.58[b]	31.67± 0.33	32.33± 0.33[b]

The TEC, Hb conc. and PCV values are expressed as million per cubic millimeter (10^6/cu mm), gram (gm%) and percent (%) respectively represent the mean standard error (SE) of 3 animals in each group; [a] indicates significant at 1 percent level (P<0.01); [b] indicates significant at 5 percent level (P<0.05)

Table V. Effects of hematinics on MCV, MCH and MCHC in sheep

Days of Experiment	Blood parameter	Groups of animals A (Control)	B ($CuSO_4$ and $CoSO_4$)	C ($CuSO_4$, $FeSO_4$, $CoSO_4$ and vitamin B_{12})
0	MCV	29.80± 0.24	31.10 ±0.19[b]	31.86±0.35[b]
	MCH	9.63± 0.05[a]	9.77 ±0.11[a]	9.81±0.29[a]
	MCHC	32.31±0.20[a]	31.43 ±0.37	30.77±0.77
15	MCV	30.62±0.23	30.68±0.16	31.44±0.92
	MCH	9.64±0.06[a]	9.78±0.12[a]	9.70±0.22[a]
	MCHC	31.47±0.19[b]	31.84±0.44	31.52±0.71
30	MCV	30.00±0.47	30.73±0.43	30.58±0.19
	MCH	9.54±0.03[a]	9.61±0.29[a]	9.79±0.23[a]
	MCHC	31.83±0.43	31.29±0.84	32.00±0.68
45	MCV	31.23± 0.34	29.99± 0.10	30.24± 1.06
	MCH	9.69± 0.03[a]	9.64± 0.26[a]	9.75± 0.20[a]
	MCHC	30.97± 0.43	32.26± 0.83	32.28± 0.53[b]

The MCV, MCH and MCHC values expressed as cubic micron (μ^3), micro micro gram(μμ gm) and percent (%) respectively represent the mean standard error (SE) of 3 animals in each group; [a] indicates significant at 1 percent level (P<0.01); [b] indicates significant at 5 percent level (P<0.05)

Table VI. Effects of hematinics on MCV, MCH and MCHC in goat

Days of Experiment	Blood parameter	Groups of animal A (Control)	B ($CuSO_4$ and $CoSO_4$)	C ($CuSO_4$, $FeSO_4$, $CoSO_4$ and vitamin B_{12})
0	MCV	20.63±0.36[a]	21.41±0.27[a]	21.74±0.20[a]
	MCH	6.75± 0.01[a]	6.99 ±0.01[a]	7.24±0.06[a]
	MCHC	32.71± 0.51[b]	32.65 ±0.27[a]	33.312±0.32[a]
15	MCV	21.31±0.31[a]	21.76±0.11[a]	21.97±0.21[a]
	MCH	6.78±0.01[a]	7.21±0.06[a]	7.23±0.01[a]
	MCHC	32.81±0.59[b]	33.14±0.20[a]	32.91±0.18[a]
30	MCV	21.38±0.66[a]	22.35±0.08[a]	22.05±0.11[a]
	MCH	6.79±0.03[a]	7.29±0.02[a]	7.26±0.05[a]
	MCHC	31.83±0.96	32.61±0.19[a]	32.92±0.07[a]
45	MCV	21.37± 0.38[a]	22.78± 0.12[a]	21.88± 0.16[a]
	MCH	6.85± 0.02[a]	7.53± 0.05[a]	7.28± 0.05[a]
	MCHC	32.06± 0.54	33.05± 0.08[a]	33.30± 0.09[a]

The MCV, MCH and MCHC values expressed as cubic micron (μ^3), micro micro gram (μ gm) and percent (%) respectively represent the mean standard error (SE) of 3 animals in each group; [a] indicates significant at 1 percent level (P<0.01); [b] indicates significant at 5 percent level (P<0.05)

Bostedt, 1979; Ismail, 1983; Wenzlaf & Erhardt, 1991; Ali, 1992; Tauson & Neil, 1993; Mburu *et al.*, 1994; Yao *et al.*, 1994).

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