

SUPPLEMENTATION OF IRON SUCROSE IN SEVERE ANAEMIC GOATS

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ABSTRACT

Parasitic infestation is the primary aetiology of anaemia in goats. Chronic parasitic infestation being the most common cause for severe anaemia in addition to the elimination of aetiology, supportive therapy is necessary for the early regain of normal physiological and haemato-biochemical parameters. The present study was conducted at the Veterinary clinical complex, Veterinary College, Bidar. Six severely anaemic goats were selected for the present study to know the efficacy of iron sucrose as supportive therapy. Rectal temperature, heart rate and respiratory rate were recorded as per the standard procedures. Haemato-biochemical parameters were estimated on day 0 and day 15 of post therapy as per the standard procedures. Goats were promptly treated for the primary complaint, dipped, and dewormed to eliminate the Endecto parasites. Selected goats were supplemented with 50 mg of iron sucrose on every alternate day four times in 100 mL normal saline solution by slow intravenous route. A significant ($p < 0.05$) improvement was observed in physiological and haemato-biochemical parameters after 15 days of post therapy.

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Goat is a multi-purpose animal which produces milk, meat, hide, kid, fibre, and droppings, commonly known as the poor man's cow due to its immense contribution to the poor man's economy. In India, as per the 20th livestock census report, there is an increase of 10.3 per cent in the goat population compared to the 19th livestock census report (2012). This indicates that there is a progressive increase in the goat population and goat farming in India. Goat contributes 27.8% of the total

Livestock population of India. Goat farming has tremendous potential for employment generation and poverty reduction in the rural part of the country. Goat rearing is the backbone of economy of small and landless farmers in India. Goat farming acts as insurance against crop failure in Agriculture mixed farming practices (Rahane, 2020). Dey (2017) defined anaemia as a condition caused by a shortage of haemoglobin, or red blood cells when it is clinically suggested by pale or white mucous membrane, weakness, head down condition, exercise intolerance, tachypnoea, tachycardia and in extreme cases collapse. Shinde (2007) concluded that anaemia was the common and important clinical presentation in goats. Sarkar (1989) opined that mild parasitaemia causes moderate anaemia whereas severe parasitaemia causes severe anaemia in goats, after the elimination of aetiology additional haematological supplementation is essential to regain the haemato-biochemical parameters post therapy. In order to know the efficacy of iron sucrose (intravenous iron preparation) in the supportive therapy of severe anaemic goats, the present study was undertaken at VCC, Veterinary College Bidar.

Goats presented to VCC Veterinary College Bidar with various complaints were screened for anaemia. After screening and detailed clinical examination, six severely anaemic goats (Haemoglobin value less than 5 g/dL) were selected for the present study to know the efficacy of iron sucrose as supportive therapy. Goats were promptly treated for the primary cause/complaint and dipped

with cypermethrin at 2 mL per liter of water and dewormed with Albendazole at 10 mg per kg body weight orally to eliminate the Ectoendo parasites. Rectal temperature (°F), heart rate (beats per minute) and respiratory rate (breaths per minute) were recorded as per the standard procedures (Kelly, 1984). Body weight was measured using a weighing machine after the clinical examination. Anaemic goats with haemoglobin values less than 5 g/dL were considered severely anaemic (Santiago *et al.*, 1975). The total dosage of iron sucrose is calculated using the formula given in a study by Kavita (2017). Total dosage in mg = Body weight x (Target haemoglobin – Actual haemoglobin) x 2.4. At least 8 g/dL is considered as target haemoglobin in anaemic goats (Goklaney *et al.*, 2011). The required total dosage of iron sucrose is divided into 3-5 equal doses and administered in normal saline solution by slow intravenous route on an alternate day. After proper restraining of the goat, 2 mL blood was collected aseptically from the jugular vein in EDTA coated vial (1 mg/mL) for the determination of the following haematological parameters namely, RBC count ($\times 10^6/\mu\text{L}$), Haemoglobin (g/dL), Packed cell volume (PCV %), Mean corpuscular volume (MCV fL), Mean haemoglobin concentration (MCH pg), Mean corpuscular haemoglobin concentration (MCHC g/dL) and Platelet count (PLT $\times 10^3/\mu\text{L}$), using fully automatic haematology analyser and the results were recorded on day 0 and day 15 of the therapeutic protocol. 4 mL of blood was collected for serum separation and the collected serum stored

at -20°C for further biochemical evaluation. Serum was used for the determination of total protein, albumin and glucose using a semi-automated biochemical analyser using commercially available ERBA® kits as per standard procedure on 0th day and 15th day

of therapeutic protocol. Serum glucose was estimated by using ERBA® diagnostic reagent kits. Data obtained in the present study were analysed by Statistical methods described by Snedecor and Cochran (1994).

Table 1. Dosage of iron sucrose required for the severe anaemic goats

S No	Goat details	Body weight (Kg)	Target Haemoglobin (g/dL)	Actual Haemoglobin (g/dL)	The total dosage of iron sucrose (mg)
1	Goat -01	15	8	4.5	131.5
2	Goat-02	16	8	5.0	120
3	Goat-03	15	8	4.3	138.75
4	Goat-04	18	8	4.4	162
5	Goat-05	15.5	8	4.0	155
6	Goat-06	14	8	3.5	157.5

Table 2. Haematological parameters on day 0 and day 15

S. No	Parameters	0 day (Mean ± SE)	15th day (Mean ± SE)
1	RBC Count ($\times 10^6/\mu\text{L}$)	3.88 ± 0.09^a	7.90 ± 0.19^b
2	Haemoglobin (g/dL)	4.28 ± 0.21^a	7.80 ± 0.17^b
3	PCV (%)	14.22 ± 0.21^a	24.05 ± 0.52^b
4	MCV (fL)	36.70 ± 0.90^a	30.49 ± 0.66^b
5	MCH (pg)	11.05 ± 0.55^a	9.90 ± 0.31^b
6	MCHC (g/dL)	30.14 ± 1.42^a	32.50 ± 0.91^b
7	Platelet Count ($\times 10^3/\mu\text{L}$)	119.17 ± 3.16^a	198.33 ± 4.05^b

Note: Mean ± SE with different superscripts (a, b) between groups differ significantly at ($p < 0.05$).

Table 3. Biochemical parameters on day 0 and day 15

S No	Parameters	0 day (Mean $\pm$ SE)	15th day (Mean $\pm$ SE)
1	Blood glucose (mg/dL)	35.00 $\pm$ 2.07 ^a	53.17 $\pm$ 1.22 ^b
2	Total protein (g/dL)	3.37 $\pm$ 0.12 ^a	5.38 $\pm$ 0.14 ^b
3	Albumin(g/dL)	1.30 $\pm$ 0.09 ^a	2.60 $\pm$ 0.12 ^b
4	Globulin (g/dL)	2.07 $\pm$ 0.12 ^a	2.78 $\pm$ 0.13 ^b
5	A: G Ratio	2.78 $\pm$ 0.13 ^a	0.95 $\pm$ 0.08 ^b

Note: Mean $\pm$ SE with different superscripts (a, b) between groups differ significantly at ($p < 0.05$).

The calculated dosage ranged from 120 – 162 mg of iron sucrose and the presentation is 50 mg (2.5 mL) and the body weight of the goats ranges from 14-18 kgs. Six goats with severe anaemia were supplemented with 50 mg of iron sucrose on an alternate day for 4 times in 100 mL normal saline solution (total 200 mg iron sucrose) by slow intravenous route (Table - 1).

After the administration of the third dose of iron sucrose all the goats returned to normal appetite and became active and alert. Physiological parameters regain the normal level. The hair coat returned to smooth and glistening. Faecal consistency changed to pellet form. Oral and conjunctival mucosa turned pale pink. Hemato-biochemical parameters showed significant ($p < 0.05$) improvement 15 days of post therapy. No adverse reactions were observed in goats over the period of therapy.

On clinical examination anaemic goats revealed tachypnoea, tachycardia and subnormal rectal temperature, anorexia, sternal to lateral recumbency, general weakness, dull, depressed, pale to paper white oral mucosa, paper white conjunctival mucus membrane, presence of ticks all over the body, rough hair coat, soiled hind quarters and hide bone condition. Faecal sample examination revealed mixed nematode infection. Endecto parasites are primary aetiological agents for anaemia due to chronic blood-sucking activity over a period causing the reduction in RBC count, haemoglobin concentration and PCV values in the blood (Anumol, 2011 and Rajendra *et al.*, 2021). In the present study chronic parasitism, prolonged inappetence and severe anaemia caused hypoglycemia, hypoproteinemia, hypoalbuminaemia, hypoglobulinemia and lowered Albumin: Globulin ratio, which is correlated with the

study conducted by Goklaney (2011) and Bhatane (2018).

Iron sucrose complex is low molecular weight and more stable and safer hematinic preparation for intravenous administration and does not contain any type of polymers, and will not cause adverse reactions. It can be safely administered in anaemic patients without a test dose. Iron sucrose is an approved medicine for severe anaemia and iron deficiency anaemia in human medicine. After the administration of iron sucrose by the intravenous route, it will be rapidly eliminated from plasma and utilized by the bone marrow for erythropoiesis. The study conducted by Cancado *et al.* (2011) and Giesser and Burckhardt (2011) showed that 97% iron will be utilized by the body in a short period of time with a negligible amount of excretion from the body in humans. After iron supplementation, there will be the maturation of normoblasts from rubricyte stage which causes increased release of RBC into circulation and iron supplementation has been found to regulate the synthesis of haemoglobin (Pophale, 2002) (Table 1, 2 and 3).

It is concluded that the iron sucrose complex is a safe and effective preparation for the supportive therapy of severe anaemia in goats. Iron sucrose has shown its better efficacy in the treatment of severe anaemia in goats. Therapy can be easily practiced in rural veterinary dispensaries without any special instrumentations and techniques. Iron sucrose supportive therapy can be used as a life saving protocol in severely anaemic goats

where blood transfusion is not possible due to technical issues and other limitations.

REFERENCES

- Anumol, J. (2011). Epidemiological investigations of anaemia goats with special reference to haemoparasites. M.V.Sc Thesis, KVASU, Wayanad, Kerala, India.
- Bhatane, S.C. (2018). Clinico pathological studies of anaemia in goats. M.V.Sc Thesis, MAFSU, Nagpur, Maharashtra, India.
- Cancado, R.D., Figueiredo, P.O., Olivato, M.C. and Chiattonne, C.S. (2011). Efficacy and safety of intravenous iron sucrose in treating adults with iron deficiency anaemia. *Revista Brasileira de Hematologiae Hemoterapia*, **33**(6): 439-43.
- Dey, T. (2017). Blood transfusion in Goats. M.V.Sc Thesis, CVASU, Chittakong, Bangladesh.
- Geisser, P. and Burckhardt, S. (2011). The pharmacokinetics and pharmacodynamics of iron preparations. *Pharmaceutics*, **3**(1): 12-33.
- Goklaney, D. (2011). Clinico-therapeutics studies on anaemia in goats with reference to copper, cobalt, and iron. M.V. Sc Thesis, RAJUVAS, Bikaner, Rajasthan, India.

- Kavita, K.S. (2017). Intravenous iron sucrose. *World Journal on Anemia*, **1**(1): 20-22.
- Kelly, W.R. (1984). Veterinary clinical diagnosis (No. Edition 3). Bailliere Tindall.
- Pophale, P.D. (2002). Evaluation of some drugs from different systems of medicine against Caprine anaemia. M. V. Sc Thesis. MAFSU, Nagpur, Maharashtra, India
- Rahane, A.S. (2020). Economics of goat rearing business in Ahamad Nagar district of Maharashtra. M. Sc Thesis, VNMVK Parbhani, Maharashtra, India.
- Rajendra, B.P. Sivaraman, S. Senthil, K.G. and Balachandran, P. (2021). Demographic study of incidence and etiologies of anaemia in sheep and goats in and around Namakkal, Tamil Nadu. *International Journal on Current Microbiology and Applied Sciences*, **10**(2): 1177-1183.
- Santiago, T.V. Edelman, N.H. and Fishman, A.P. (1975). The effect of anaemia on the ventilatory response to transient and steady-state hypoxia. *Journal on Clinical Investigation*, **55**(2): 410 – 418.
- Sarkar, S. (1989). Studies on anaemia in goats with special reference to minerals and trace elements deficiencies in relation to soil and plant. Doctoral Thesis, West Bengal University of Animal and Fishery Sciences, West Bengal, India.
- Shinde, S.B. (2007). Prevalence, Clinico-pathology and treatment of parasitic anaemia in goats., M.V.Sc Thesis, MAFSU, Nagpur, Maharashtra, India.
- Snedecor, G.W. and Cochran, W.G. (1994). Statistical methods. 8thedn Iowa State University Press. Unites States.