Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(3): 673-676
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Received: 23-03-2018
Accepted: 24-04-2018

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A comparative therapeutic study on subclinical ketosis of goat

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Abstract
The present study was carried out in Guwahati, Assam, July 2014-June 2015 to evolve a suitable therapeutic regime of sub-clinical ketosis in goat. 6 healthy goats were kept in Group I as healthy control and 24 diseased goats were equally divided in to four groups as Group II, Group III, Group IV and Group V as treatment group for use of different drugs 10% dextrose @ 10 ml/kg b.wt IV single dose, glycerine @ 60 ml twice daily orally for 5 days, 10% fructodex @ 10ml/kg b.wt. I/V as single dose and AV/KPC/10 @ 60 ml twice daily orally for 5 days respectively. All the treatment groups were administered supportive treatment of dexamethasone (4.4mg/ml) @ 1ml/per animal I/M for one day and Vit.B complex @ 3ml I/M once daily for three consecutive days. Blood ketone (β-hydroxybutyrate) > 0.4 mmol L^{-1} and glucose < 30 mg dl^{-1} in all treatment groups on pretreatment day were within normal range in comparison to healthy control group on 9th day of post treatment. All the groups of drug were found to be equally effective for the treatment of sub-clinical ketosis of goats.

Keywords: Goat, subclinical ketosis, comparative, therapeutic

1. Introduction
India possesses a huge population of Goats with many breeds. Goats are at risk of developing metabolic condition termed as "ketosis" also known as pregnancy toxaemia, twin lamb disease which occurs in two stages one at the end of gestation (pregnancy toxemia) and the other during early lactation (lactational ketosis) [1]. Pregnancy toxemia is more common in goat than lactational ketosis [1]. Pregnancy toxemia condition develop only on pregnant ewes in the late stages of gestation and in nearly all cases the ewes carrying twins or triplets [2]. Pregnancy toxemia in goat is observed in later part of pregnancy and is much more common in dam carrying multiple foetuses [3]. Subclinical ketosis is defined as high serum ketone body concentration without observed clinical sign [3]. Subclinical ketosis can be diagnosed by estimating Betahydoxy butyrate and glucose level in blood. However, reference value for Betahydroxy butyrate in goat has not been established but reference value of sheep can be considered for studies [1]. Urine Rothera's test for ketone bodies does not play important role in diagnosis of subclinical ketosis in goat [4] on the contrary it aids in the diagnosis of clinical form of ketosis. Subclinical ketosis can cause economic loss to the livestock owner by decreasing milk production, dead fetus and sometime death of the livestock if progresses to clinical ketosis [5]. Few reports of subclinical ketosis in goat are available worldwide. In Uttar Pradesh, the prevalence of sub-clinical ketosis in goats was reported to be 10.89 percent [6] and in Guwahati and nearby area in Assam it was reported to be 14.29% [7]. Haemato-biochemical change occurs in subclinical ketosis of goat [8-12]. Systematic study on therapeutic management of subclinical ketosis in goat in northeastern region of India has not been carried so far. Hence, in present investigation an attempt was made to study the therapeutic efficacy of different combination of drugs in goats suffering from subclinical ketosis under farm and individual rearing system.

2. Materials and methods
2.1 Experimental design
The present study was carried out in and around Guwahati city, Assam (26.1833° N, 91.7333° E) at Goat Research Station, Assam Agricultural University and few private farms for a period of one year (July 2014 to June 2015). The study procedure compiled with Institutional Animal Ethics Committee guidelines, Assam Agricultural University. Animals were selected based on the history of gestation and lactation.

A total of 210 samples were collected from 180 pregnant and 30 lactating goats. Goats having β-hydroxy level more than 0.4 mmol L^{-1} and blood glucose level less than 30 mg dl^{-1} were considered positive for sub-clinical ketosis. Six healthy animals were kept in one group as healthy control and twenty-four sub-clinical ketotic goats were divided in four treatment group with six goats in each group and. Details of grouping dose of drug, route of administration and schedule of treatment with drugs are presented in Table 1

Table 1: Grouping of goats under study with different treatment schedules

Sl. No	Group	Drugs used	No. of Goats	Dose	Route	Treatment
1.	I	Healthy control	Six	Nil	Nil	Nil
2.	II	Dextrose[a] (10%)	Six	10 ml/ kg b.wt.	I/V	Single dose
		Dexamethasone[b] (4.4 mg/ml)		One ml	I/M	Single dose
		Vit. B complex[c]		Three ml	I/M	Once daily for 2 consecutive days
3.	III	Glycerin[d]	Six	60 ml	Orally	Twice daily for 5 days
		Dexamethasone[b] (4.4 mg/ml)		One ml	I/M	Single dose
		Vit. B complex[c]		Three ml		Once daily for 2 consecutive days
4.	IV	Fructose [e] (10%)	Six	10 ml/ kg b.wt.	I/V	Single dose
		Dexamethasone[b] (4.4 mg/ml)		One ml		Single dose
		Vit. B complex[c]		Three ml		Once daily for 2 consecutive days
5.	V	AV/KPC/10[f]	Six	60 ml	Orally	Twice daily for 5 days
		Dexamethasone[b] (4.4 mg/ml)		One ml	I/M	Single dose
		Vit. B complex[c]		Three ml	I/M	Once daily for 2 consecutive days

[a] Marketed as D 10- Parental Drugs (India) Ltd. Indore-453331
[b] Marketed as Curadex- Concept Pharmaceuticals Ltd. Mumbai-400098
[c] Marketed as Conciplex- Concept Pharmaceuticals Ltd. Mumbai-400098
[d] Marketed as Glycerin I.P.- Selab India, Tarun Nagar, Guwhati-5
[e] Marketed as 10% Fructodex in water- Raptakos Brett & Co. Ltd., Thane
[f] Marketed as ketoroak by Ayurvet Limited, Himachal Pradesh, Baddi-173205

Biochemical parameters (β-hydroxy butyrate in blood and serum glucose) were assessed to evaluate the efficacy of the affected treatment groups.

2.2 Analytical procedure
The β-Hydroxybutyrate analysis was carried out using commercial available β-ketone meter (Nova Biomedical). Two to three drops of blood were get in touched to the end of the meter strip of the β-ketone meter. Consequently, the concentration of Beta hydroxy butyric acid was read in a moment on display screen of the device. Consecutively blood glucose, was carried out by commercially available kit [13].

2.3 Statistical analysis
All the data obtained were subjected to standard statistical procedures using Split Plot (repeated over time) design and with the help of software *viz*., SPSS 15.0 & jmp 10.0 of SAS 9.3. Software available at Biostatistics Unit, CVSc, Khanapara under NAIP (Comp-1), ICAR, Govt. of India.

3. Results and Discussion
3.1 Comparative efficacy of drug
In Group II, which was treated with 10% dextrose, dexamethasone and Vit.B complex the pretreatment blood ketone mean ± S.E. was significantly higher (1.05 ± 0.27) mmol L^{-1} and blood glucose (28.01 ± 0.58) mg dl^{-1} was significantly lower as compared to healthy control group (0.27 ± 0.03) mmol L^{-1} and (41.88 ± 0.06) mg dl^{-1} respectively. The blood ketone level declined from 3rd day onward, reaching normal level on 9th day and blood glucose level increased after 3rd day onward, reaching normal level on 6th day after treatment. Similar finding was reported in treatment of subclinical ketosis in crossbred cattle [14] buffaloes [15, 16]. Some other reviewer similarly reported successful treatment of bovine ketosis with glucose source [16, 17].

In Group III, which was treated with glycerin, dexamethasone and Vit.B complex the pretreatment blood ketone was significantly higher (0.80±0.09) mmol L^{-1} and blood glucose (29.69 ± 1.50) mg dl^{-1} was significantly lower as compared to healthy control group (0.27 ± 0.03) mmol L^{-1} and (41.88 ± 0.06) mg dl^{-1} respectively. The blood ketone level declined from 3rd day onward, reaching normal level on 9th day after treatment. This might be due to conversion of glycerol (active component of glycerin) to glycerol-3-phosphate by enzyme glycerol-3-phosphate dehydrogenase. This glycolytic intermediate is further oxidize to yield energy that might have fulfilled the energy demand of goat [18]. Similar report for oral glucose source for treatment of ketosis and milk production increase during pre-partum and post-partum in cattle and sheep is available [16, 19].

In Group IV, which was treated with 10% fructodex, dexamethasone and Vit. B complex the pretreatment blood ketone was significantly higher (1.03 ± 0.22) mmol L^{-1} and blood glucose (27.15 ± 0.47) mg dl^{-1} was significantly lower as compared to healthy control group (0.27 ± 0.03) mmol L^{-1} and (41.88 ± 0.06) mg dl^{-1}respectively. The blood ketone level declined from 3rd day onward, reaching normal level on 6th day and blood glucose level increased after 3rd day onward, reaching normal level on 6th day after treatment. The fructose upon being administered is converted to fructose-1-phosphate by the enzyme fructokinase in liver. The fructose-1-phosphate is further converted to glyceraldehyde-3-phosphate (an intermediate of glycolysis) that is further oxidized to generate energy and thereby fulfilling the energy [20]. This finding was in accordance with successful use of 10% fructodex for treatment of subclinical ketosis in cattle [14] buffaloes [21].

In Group V, which was treated with Ayurvedic preparation A/KPC/10, dexamethasone and Vit.B complex the pretreatment blood ketone was significantly higher (0.85±0.06) mmol L^{-1} and blood glucose (27.78 ± 0.31) mg dl^{-}

[1] was significantly lower as compared to healthy control group (0.27 ± 0.03) mmol L^{-1} and (41.88 ± 0.06) mg dl^{-1} respectively. The blood ketone level declined from 3rd day onward, reaching normal level on 6th day and blood glucose level increased after 3rd day onward, reaching normal level on 6th day. This might be due to salient herbs viz. *Phyllanthus niruri* which have been well documented to be effective in ketosis [22]. *Tephrosia purpuria*, which is also constituent ingredient of AV/KPC/10 has been known to possess significant anti- oxidant and free radical scavenging properties and may extend its benefits through reduction in oxidative stress [23]. Studies have also shown that *Asparagus racemosus*, another constituent ingredient of AV/KPC/10, possesses glucogenic property and causes a significant increase in blood glucose levels thereby negating the deficit produced during ketosis [23, 24].

The efficacy of glucocorticoid (Dexamethasone) in the treatment of bovine ketosis has been demonstrated in both experimental and field cases [25, 26]. Dexamethasone induces hyperglycemic effect within four to six day in ketotic animal [25].

Role of vitamin B complex cannot be clearly defined. Some reports of Vitamin B_{12} and Cobalt indication were reported where it's deficiency is risk factor for ketosis [25, 8]. Also these preparations are sometimes administered to cattle with ketosis in region where cobalt deficiency does not occur, but their therapeutic value is not proved [25]. Nictonamide has antlipolytic action which may be beneficial in prevention of ketosis [27].

On the basis of improvement in biochemical parameters, all the four treatment schedule of drugs were equally effective in treatment of sub-clinical ketosis of goat.

4. Conclusion

On the basis of results, it was concluded that all the primary drugs for raising glucose either through parental or oral route in combination a with supportive treatment of dexamethasone and vitamin B complex in this study can effectively cure subclinical ketosis in goat. Goats in later part gestation and early lactation should be screened for subclinical ketosis and if positive should be treated with any of the above discussed treatment schedule to prevent goats to progress to clinical ketosis and prevent economic loss to the farmer.

5. Acknowledgements

The authors are very thankful to Ayurvet PVT.LTD. Himachal Pradesh, India for providing funds for the project.

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