

SOME ADVANCED STUDIES OF CAPRINE PREGNANCY TOXEMIA WITH SPECIAL REFERENCE TO SOME HORMONAL AND ELECTROCARDIOGRAPH ALTERATIONS

By

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SUMMARY

A total of fourteen naturally pregnant toxemic does and ten clinically normal does were included in the field practical part of this investigation. The diseased animals were classified according to their clinical signs into mild, moderate and severe affected group. Biochemical analysis of affected does showed significant hypoglycemia, with significant increase in β -HBA, cortisol and thyroid stimulating hormone. Thyroid hormones showed higher value than control group animals. In the second experimental part of this investigation eight she goats were used in this study. Four of them used for induction of experimental pregnancy toxemia. The other goats used as control. ECG trace of experimentally pregnant toxemic does showed highly significant increase in both QRS and T waves amplitude, duration and in pulse rate with significant decrease of QT and ST segments. All changeable parameters returned within the normal range post-treatment. It can be concluded that caprine pregnancy toxemia disease can be classified clinically into mild, moderate and severe forms; β -HBA and cortisol have more diagnostic value than glucose level. ECG can be used as a helpful aid in diagnosis and prognosis of pregnancy toxemia among goats.

INTRODUCTION

Metabolic diseases among ruminants are highly complex group of conditions, including milk fever, grassy tetany, acetonaemia and a number of associated and

interrelated conditions, (Hungerford, 1990) Pregnancy toxemia is a fatal disease of goats usually occurs with multiple kids or a large single kid seen in the last month of pregnancy. It occurs wherever goats are raised but is more common in the metropolitan. In individual cases it can reach a level of incidence sufficient to be classed as an outbreak, (Timothy, 1998 and Radostits, et al 2000- a) Goats are little cows that die of enterotoxaemia if pregnancy toxemia doesn't get them first, (Wirth, 1973). Bovine ketosis classified clinically after Chakrabarti, (2000) according to the clinical sings into digestive form, spontaneous form, milk fever form and nervous form. One of the former references that deal with pregnancy toxemia is probably that described by Seaman (1854)

Ovine and caprine pregnancy toxemia characterized clinically by variable symptoms and clinical sings according to the progress of the disease. Listlessness, inappetence, anorexia, decrease of ruminal movement, increased both pulse and respiratory rates, rapid decrease of body weight, propping against obstructions, muscle twitching, head pressing, star grazing, blindness, and coma, were main clinical features of the disease recorded by (Smith, and Sherman, 1994, John, 1999 and Martin, and Aitken, 2000).

Pregnancy toxemia characterized biochemically by hypoglycemia, hyperketonemia and ketonuria, (Bostedt and Hamadeh, 1995; Scott et al, 1995 and Rook 2000). Numerous metabolic abnormalities developed subsequent to hypoglycemia and hyperketonemia and these affect the prognosis. Important secondary abnormalities include acidosis, dehydration, and renal failure (Marteniuk and Herdt 1988).

Furthermore Heitmann et al (1987), Sandner, et al (1990), Bickhardt et al (1998) and Henze, et al (1998), observed high levels of cortisol and 3- hydroxy butyrate in the pregnant toxemic ewes and does. Ewes with induced pregnancy toxemia developed hypertension, proteinuria, ketonuria, decreased glomerular filtration rate, decreased cardiac output and decreased left uterine artery blood flow. (Thatcher and Keith 1986). Much have been written about diagnosis, treatment, prognosis and control of pregnancy toxemia in sheep (Dakka, and Migalatiuk, 1975; Baird, 1981; Bostedt and Hamadeh, 1990; Winzap, et al 2000; and Van Saun, 2000).

Studies of electrocardiographs (ECG) in ruminant clinic are still up till now *infrequently reported* (Razakhani and Ejtehadi, 1980; and Tovar, 1987a,b), but William, (2000) recorded some ECG traces among normal and diseased ruminants. Reports deals with electrocardiography in goats are rare (Lumb, and Jones, 1984).

Mir et al, (2000) conduct comparative electrocardiography studies between young lambs and kids. Recently, electrocardiographs recorded to discriminate between induced metabolic disorders among goats (Hassan, 2001).

The goals of the present manuscript are:

- 1-Providing clinical sings associated with pregnant toxemic does.
- 2-Recording some hormonal profile in naturally pregnant toxemic does.

- 3-Application of suggested treatment protocol in both naturally and induced pregnant toxemic does.
- 4-Recording of ECG traces in experimentally induced pregnant toxemic does during progressing of the disease and after treatment.

MATERIALS AND METHODS

This study was planned in two parts, field practical and experimental parts:

Field practical part:

This part was planned to study the effect of pregnancy toxemia on some hormones of naturally affected does.

1- Animals and clinical examination:

A total of fourteen toxemic and ten clinically healthy late pregnant does were investigated in private flocks. The diseased animals were examined clinically according to (Kelly, 1984 and Radostits, et al 2000 b) and classified according to severity of clinical signs into three groups

1- Mild affected does: This group includes four does showed Listlessness, inappetence, decrease of ruminal movement, slightly increased both pulse and respiratory rates.

2- Moderate affected does: This group includes six does showed anorexia, rapid decrease of body weight, hurried respiration, moderate tachycardia, muscle twitching incoordination, and sternal recumbency.

3- Sever affected does: This group showed observed increased both pulse and respiratory rates, hypothermia and nervous manifestation represented by propping against obstructions, head pressing, star grazing, blindness, and coma.

2- Blood samples:

Blood and serum samples were collected from the investigated animals before and after treatment according to Benjamin (1984).

3- Biochemical profile:

3.1-Serum glucose and beta- hydroxybutyrate (β - HBA) were determined colorimetrically by using available kits supplied by Bio- Merieux lab. And Sigma according to Trinder (1961) and Mercer et al (1986), respectively.

3.2-Serum cortisol was estimated by using radioimmune after Rijnberk et al (1968).

3.3- Thyroid stimulating hormones (TSH) was measured using the RIA technique assay of Coat-A- Count kits from Diagnostic Products Count kits obtained from Diagnostic Products Corporation, USA according to Jackson (1982). Thyroid hormones, Thyroxin (T4) and triiodothyronine (T3) were measured by using micro-well reader and EIA test kit supplied by Medix Biotech, INC. after Walker (1977), and Schall et al (1978), respectively.

II) Experimental Part:

This part was planned to study the ECG traces in case of induced pregnant toxemic does during progressing of the disease and after treatment.

1-Animals:

Eight non- pregnant female, Balady goats were used in this study, they were classified equally into two groups. The first one included four animals to induce pregnancy toxemia and the second group was used as a control group.

2- Induction of pregnancy toxemia: Once subcutaneous injection of insulin at dose rate 2U / Kg body weight, as cited by Radostits et al. (2000 a).

3- Electrocardiographic pattern:

Base- apex lead system was applied according to the method described by (Hilwing, 1977 and William, 2000) by using EC 60 monitor (cardiac and respiratory monitor, England). The left forelimb electrode was placed above the ventral midline under the apex of the heart. The right forelimb electrode was fixed over the jugular groove one third of the way up the neck from the torso at the right side of the neck. The ground cable was putted at any site from the heart (Both hindlimb electrodes were remained attached to the stifle). Alligator used clips were moisten with alcohol.

4- Therapeutical Diagnosis and Treatment Strategy:

All affected and experimentally induced animals were treated by:

4.1- Initial injection of 100- 200 ml Dextrose 5% by intravenous route.

4.2- Followed by slowly oral drench of glycerin (as glycogenic agent) at dose rate 120 ml in an equal quantity of warm water twice daily until the doe commences to eat voluntarily. Usually two or three doses are sufficient according to (Hungerford, 1990).

5- Statistical analysis:

Statistical analysis of the obtained data were performed by using "t" as mean \pm stander error (SE) according to Selvin (1996).

RESULTS

Biochemical profiles associated with pregnancy toxemia compared with normal control one were illustrated in table (1).

Pulse rate and traces of the recorded ECG were illustrated in table (2). ECG traces of lead II on control group was illustrated in fig. (1). The traces of 2 and 8 hours of binging of clinical sings in diseased group of goat and 24- 48 hours post-treatment were represented in fig., 2,3, 4 and 5, respectively.

The clinical sings were subsided and the altered parameters in affected does retained to some extent toward the control group level after treatment.

DISCUSSION

From the clinical point of view the severity of clinical symptoms of caprine pregnancy toxemia could be classified into mild, moderate and sever form. The mild

form is characterized by Listlessness, inappetence, decrease of ruminal movement; slight increased both pulse and respiratory rates. This sings similar to sings of digestive form type of bovine ketosis. The moderate affected does characterized clinically by anorexia, rapid decrease of body weight, hurried respiration and pulsation, muscle twitching incoordination, and sternal recumbency. This sings nearly similar to milk fever form of bovine ketosis. Severely affected does characterized by sever takycardia, polypnea, and nervous manifestation represented by propping against obstructions, head pressing, star grazing, blindness, and coma. These sings were nearly similar to the nervous form of bovine ketosis. The same classification was nearly observed by El- Agawany et al (1998).

Generally the observed clinical sings were alike that recorded by (Hungerford, 1990; Smith, and Sherman, 1994; Martin, and Aitken, 2000 and Radostits, et al 2000- a)

Regarding to the biochemical findings (table, 1), all over serum glucose showed significant decrease in affected does. The hypoglycemia might be attributed to impairment of glucose utilization by affected does. This result agrees with that obtained by (Bostedt and Hamadeh 1995, Scott et al 1995 and Rook 2000).

The serum level of beta- hydroxybutyrate (β - HBA) showed significant higher level in affected does compared with control group. This result might be attributed to reduced food intake; anorexia, hypoglycemia and acidosis that associated with pregnancy toxemia. The results and attribution were in agreement with (Marteniuk and Herdt 1988, and Rook 2000). Gradual increase of (β - HBA) synchronous with the severity of the case was also observed. The same observation was obtained by El- Agawany et al (1998).

Table (1) showed also high cortisol level in diseased does. Nearly the same result obtained by Heitmann et al (1987), Sandner, et al (1990), Bickhardt (1998) and Henze, et al (1998). This result could be due to consequence of increased adrenal output or reduced excretion by the liver (Ford et al 1990).

Thyroid hormones (T3 & T4) and thyroid stimulating hormone (TSH) (table 1) showed slight higher value than control group. These higher values might be attributed to compensatory mechanism to increase endogenous energy requirement by increasing metabolic rate. The obtained result was disagreement with the result obtained by Abdou, (1995). On the other hand the higher value of these hormones might be due to anorexia and decreased rumen size and its motility that leads to cobalt deficiency that probably affects the function of hypothalamus in goats, (Mgongo, et al 1981).

Regarding to ECG traces, The pregnant toxemic group showed highly significant increase in both QRS and T waves amplitude and duration with significant decrease of QT and ST segments (Table 2 and Fig 2 & 3). The changes

of QRS complex suggested an excessive load of right heart. The lowering of ST and QT intervals might be due to significant tachycardia (Table 2). Similar results were obtained by (Hassan, 2001).

All these changes could be attributed to focal degenerative changes in contractile and conductory myocardial cells may occur in animals affected by pregnancy toxemia. Tontis, and Zwahlen (1987), higher level of volatile fatty acids in both rumen and blood in toxemic does than normal animals Blal et al (1993) and Radostits et al. (2000- a). All these modifications returned to normal trace following treatment (Table 2 and Fig 4 & 5).

From this results we can concluded that does must be feed in relation to their changing energy needs throughout the reproductive cycle. Determination of beta- hydroxybutyrate (β - HBA) and cortisol is more specific than glucose for diagnosis of pregnancy toxemia. We confirmed that uses of electrocardiography can be used as an aid in diagnosis and prognosis of pregnant toxemic cases among affected animals.

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Table (1): Biochemical results of pregnant toxemic does and control ones

Criteria	Glucose	β- HBA	T3	T4	TSH	Cortisol
Unite	mg / dl	mg / dl	ng / ml	µg / dl	µIU / ml	µg / dl
Control	61.65 ± 0.32	3.44 ± 0.66	2.6 ± 0.1	1.5 ± 0.1	2.95 ± 0.09	0.5 ± 0.08
Mild pregnant toxemic does	58.29 ± 5.31	7.73 ± 1.36	2.7 ± 0.08	1.3 ± 0.12	4.1 ± 0.04	1.9 ± 0.25
Moderate pregnant toxemic does	47.73 ± 5.73 *	7.12 ± 1.75	3.3 ± 0.09	1.1 ± 0.06	2.8 ± 0.06	1.6 ± 0.15
Sever pregnant toxemic does	53. ± 5.73	10.64 ± 0.16	3 ± 0.12	1.4 ± 0.16	3.4 ± 0.16	6.9 ± 0.12
Over all mean of Pregnant toxemic does	52.49 ± 4.1**	8.3 ± 0.66**	3 ± 0.24	1.2 ± 0.04*	3.41 ± 0.1**	6.9 ± 0.12 **

* Significant (P <0.05)

** Highly significant (P < 0.01)

Table (2): Electrocardiography traces in pregnant toxemic does compared by control group

Animals ECG trace	Control does	Pregnant toxemic does		Post- treatment does	
		2 hours	8 hours	24 hours	48 hours
P wave Amplitude Duration	0.098 ± 0.009 0.06 ± 0.006	0.14 ± 0.013 0.05 ± 0.01	0.13 ± 0.013 0.07 ± 0.009	0.11 ± 0.02 0.07 ± 0.009	0.11 ± 0.011 0.08 ± 0.004
QRS complex Amplitude Duration	0.34 ± 0.01 0.05 ± 0.01	0.43 ± 0.01** 0.1 ± 0.01**	0.65 ± 0.031** 0.13 ± 0.02**	0.35 ± 0.018 0.1 ± 0.01**	0.34 ± 0.021** 0.12 ± 0.014**
T wave Amplitude Duration	0.24 ± 0.02 0.06 ± 0.01	0.53 ± 0.01** 0.15 ± 0.02**	0.61 ± 0.02** 0.11 ± 0.01**	0.24 ± 0.02 0.12 ± 0.014	0.26 ± 0.012 0.12 ± 0.005
PR interval	0.14 ± 0.01	0.14 ± 0.01	0.13 ± 0.009	0.17 ± 0.011	0.19 ± 0.011
QT segment	0.27 ± 0.009	0.24 ± 0.02*	0.23 ± 0.02*	0.26 ± 0.013	0.25 ± 0.013
ST interval	0.24 ± 0.016	0.19 ± 0.01*	0.14 ± 0.01**	0.23 ± 0.009	0.37 ± 0.011
Pulse rate / minute	105 ± 1.87	113 ± 1.08**	142 ± 1.83**	100 ± 2.08	98 ± 2.97

* Significant (P <0.05)

** Highly significant (P < 0.01)

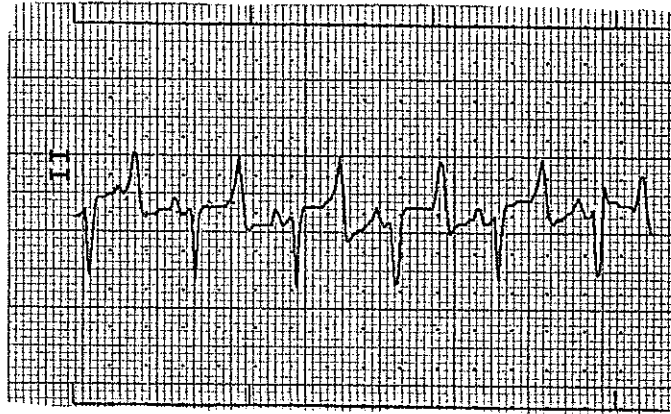


Fig. (1) ECG trace of control goats

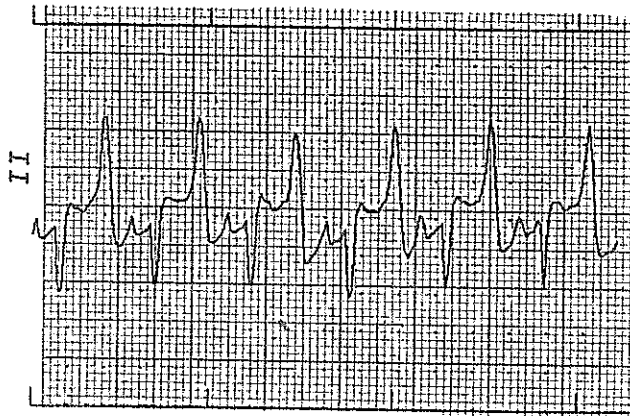


Fig. (2) ECG trace of 2 hours pregnant toxemic goats showed increase in amplitude of QRS complex, T wave and decrease of QT, ST.

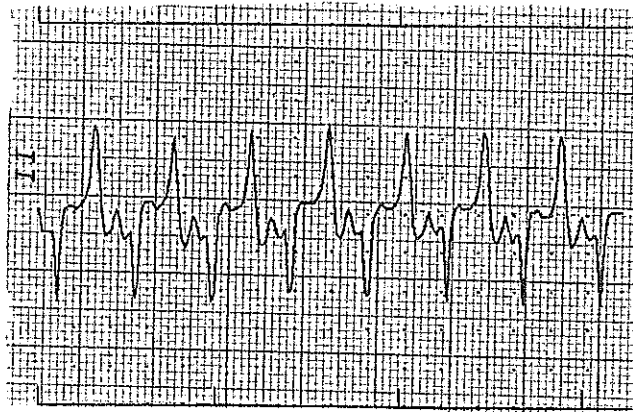


Fig. (3) ECG trace of 8 hours of pregnant toxemic goats showed increase in both QRS and T waves amplitude and duration with decrease of QT and ST segments.

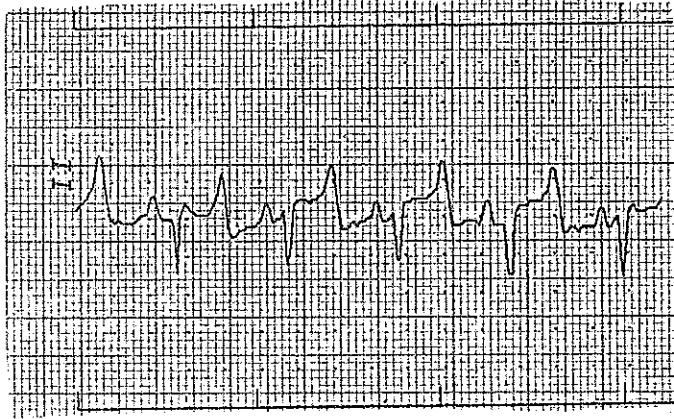


Fig. (4) ECG trace of 24 hour post- treated pregnant toxemic she- goats showed significant improved of the amplitude of QRS complex and T- wave while ST interval returned to its normal level.

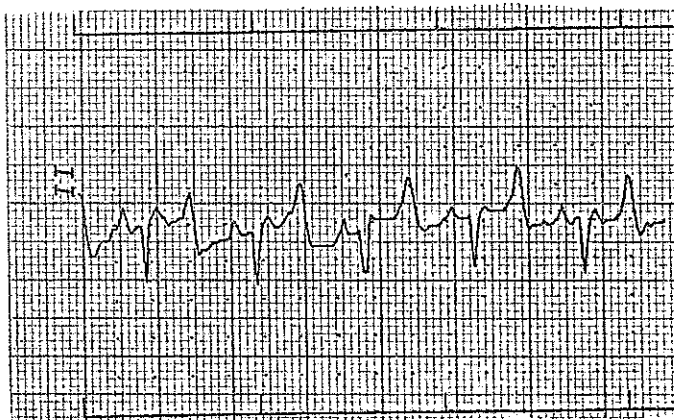


Fig. (5) ECG trace of 48 hour post- treated pregnant toxemic she- goats showed significant improved of all waves duration and strength and duration of all segments

الملخص العربي

بعض الدراسات المتقدمة عن تسمم الحمل بالماعرز مع مرجعية خاصة لبعض تغيرات الهرمونات و رسم القلب

حسن عبد الرحمن ، هاني يوسف حسن*

أشتمل هذا العمل إلى جزئين. الجزء الأول عبارة عن جزء عملي حقلّي أشتمل على عدد ١٤ من إناث الماعز المصابة بتسمم الحمل و عدد ١٠ إناث عشائر أصحاء استخدموا كمجموعة ضابطة. قسمت الحيوانات المصابة بناء على الأعراض الإكلينيكية إلى مجموعة لطيفة و مجموعة متوسطة و مجموعة سيئة. أوضحت التحاليل البيوكيميائية نقص ملحوظ في سكر الدم مع زيادة معنوية في تركيز البيتا- هيدروكسي بيوترات و كورتيزول الدم و الهرمون المحفز للغدة الدرقية و تغير غير معنوي في هرمونات الغدة الدرقية.

أشتمل الجزء التجريبي الثاني من هذا العمل على ٨ من إناث الماعز البلدي لاستحداث مرض تسمم الحمل في (٤ حيوانات) مقارنة بالمجموعة الضابطة (٤ حيوانات) و ذلك لاستخدام رسم القلب الكهربائي في الحالات المرضية و مقارنتها بالحيوانات السليمة. أظهر رسم القلب زيادة معنوية في شدة و طول كلا من الموجة QRS; T مع زيادة معنوية في معدل النبض و نقص معنوي في طول فترة كلا من QT , ST
تم علاج جميع الحالات المرضية و المستحدثة و رجعت جميع المتغيرات في مصل الدم و رسم القلب بعد العلاج.

من هذه النتائج نستنتج أنه من الممكن تقسيم مرض تسمم الحمل إلى ٣ أشكال لطيفة، متوسطة و سيئة و أن القيمة التشخيصية للبيتا- هيدروكسي بيوترات و كورتيزول الدم أدق في تشخيص هذا المرض كما أن استخدام رسم القلب الكهربائي يمكن أن يستخدم في التشخيص السريع و الحكم على حالات تسمم الحمل بالماعرز .