

A study of some biochemical variables for different stages of pregnancy and lactation in cows

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Abstract

The present study was undertaken to evaluate the effects of change in stage of pregnancy and lactation on blood metabolites and ions in cows. The animals (n = 38) were divided into three groups: the first group included lactating cows (n=12); the second group included pregnant cows (n =11); the third group included control cows (not pregnant and not lactating) (n=15). Serum samples were obtained and analyzed for glucose, urea, triglyceride and cholesterol and measured electrolytes were sodium, potassium, calcium and magnesium. Serum Ca⁺⁺ and Mg⁺⁺ concentration were determined by using commercial kits with spectrophotometer. Sodium (Na⁺) and potassium (K⁺) values were obtained with the use of a flame photometer. The results presented showed the least of glucose level in lactating and pregnant cows compared with control cows. Cholesterol level recorded higher level in pregnant and intermediary in lactating cows, while triglyceride level has Suffered a decline lower than control stage. The urea concentration did not differ significantly between the three stages. Serum calcium was lower in lactating and pregnant cows compared with control cow. The magnesium level did not differ significantly between the three stages. Sodium level recorded a highly level in lactating and intermediary in pregnant, the level of Na⁺ higher than the normal value. In contrast Na⁺, potassium level was least than normal value in lactating and pregnant stages. The results which confirmed in this paper show that the blood serum biochemical parameters considered in this paper were affected by the different stages of cows.

Key words: biochemical variables, pregnancy, lactation, cows.

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دراسة بعض المتغيرات الكيموحيوية لمراحل مختلفة من الحمل والرضاعة في الأبقار

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الخلاصة

أجريت الدراسة الحالية لتقييم تأثير التغير في مجاميع مختلفة من الأبقار الحوامل والحلابة على العمليات الأيضية للدم وأيونات المختلفة في الدم. تم تقسيم الحيوانات (ن = 38) إلى ثلاث مجاميع: المجموعة الأولى تضمنت الأبقار الحلابة (ن = 12)، واشتملت المجموعة الثانية الأبقار الحوامل (ن = 11) والثالثة مجموعة السيطرة (غير الحوامل وغير حلابة) (ن = 15). تم الحصول على عينات من مصل الدم وتحليلها لقياس سكر الدم والكوليسترول ودهن ثلاثي واليوريا، كما تم حساب تركيز الالكتروليتات المختلفة (الصوديوم والبوتاسيوم والكالسيوم والمغنسيوم). بينت النتائج انخفاض مستوى السكر في الأبقار الحلاب والحوامل مقارنة مع مجموعة السيطرة. سجلت مستويات الكوليستيرول ارتفاع في الأبقار الحوامل ومستوى متوسط في الحلابات، بينما سجل مستوى الدهون الثلاثية انخفاض في المجاميع المدروسة مقارنة مع مجموعة السيطرة. لم يظهر تركيز اليوريا أي اختلاف واضح في المراحل المختلفة. انخفض مستوى الكالسيوم في مجموعتي الحوامل والحلابة مقارنة مع مجموعة السيطرة، لم تظهر مستويات المغنسيوم أي اختلاف في المجاميع الثلاثة المختلفة. سجلت مستويات

الصوديوم أعلى تركيز في الأبقار الحلابة وتركيز متوسط في الحوامل, كان مستوى الصوديوم في هذه المجاميع أعلى من المستوى الطبيعي. على عكس الصوديوم انخفض تركيز البوتاسيوم اقل من القيم الطبيعية في مجموعتي الحوامل والحلابة. بينت نتائج البحث أن المتغيرات الكيموحيوية للدم قد تغيرت في اغلب المجاميع المدروسة.

الكلمات المفتاحية: المتغيرات الكيموحيوية, الحمل, الرضاعة, الأبقار.

Introduction

Hematological and biochemical variables are most widely used medical decision making tool. Hematological and biochemical analyses of blood are very useful to get an insight in metabolic and health status of animal (1). There are numerous studies on the effects of different phases of the reproduction cycle on biochemical parameters in domestic animal species. In sheep and cow they were carried out, among others, in relation to oestrus cycle, pregnancy and lactation (2, 3). Pregnancy is one of the physiological conditions leading to remarkable and dramatic change in biochemical variables in all animal species. Preparation dairy cows are at high risk of metabolic and reproductive disorders and oxidative stress is considered to be involved in these events(4). Pregnancy and lactation are physiological statuses considered to modify metabolism in animals (5), during pregnancy the concentration of number of blood constituent are significantly altered in cattle (6). Blood biochemical parameters including glucose, triglycerides, cholesterol, urea and electrolytes are important indicators of the metabolic activity in pregnant and lactating animals (7). Early lactation in dairy cows resulted in negative energy balance, high mobilization of lipids from bodily fat reserves as well as hypoglycemia (8). During lactation, electrolytes Na^+ , K^+ , Cl^- and Ca^{++} are lost in milk, which puts an extra burden upon mechanisms regulating electrolyte balance. From data available on goats, it can be calculated that the amount of Na^+ secreted via milk is equal to that lost in urine (9). The sodium is the most important cation in extracellular fluid, where it is responsible for maintenance of osmotic pressure. Together with chlorine (Cl) collaborates in metabolism of water and regulation of acid-base balance in the organism (10). In ruminants the potassium is absorbed from rumen and small intestine and excreted over the kidney and with feces. The majority of calcium (99%) in organism is stored in bones and teeth. Calcium is important for activation of numerous enzymes and hormones (11), therefore; this study was aimed at examine biochemical parameters in healthy cows during different period of pregnancy and lactation.

Materials and Methods

The study was carried out In total 38 cows, they belong to different physiological stages of which (12 cows) were lactating, (11 cows) were pregnant and (15 cows) were control (not pregnant and not lactating). The cows varied in age from 3 to 7 years. Collection of Samples: Blood samples (10 ml) were collected aseptically by jugular vein puncture using plastic disposable syringes. 2 ml of blood was kept in a tube containing EDTA (Ethylene Diamine Tetra Acetic acid) as an anticoagulant and after centrifugation, using for biochemical parameter. The rest of the blood sample was left without anticoagulant then centrifuged and used in biochemical test (electrolytes), samples were harvested and immediately frozen at -20°C for subsequent analysis. Biochemical parameter: The plasma glucose concentration was determined by the enzymatic method using a kit (Randox Laboratories-London). Serum urea concentration was determined using a kit (SPINREACT, S.A. Spain). Serum cholesterol level was determined using a kit (SPINREACT, S.A. Spain). Serum triglyceride concentration was determined using the enzymatic method (Liner Chemical). Serum Ca and Mg concentration were determined by using commercial kits with spectrophotometer (12). Sodium (Na^+) and potassium (K^+) values were obtained with the use of a flame photometer (13).

Results and Discussion

The knowledge about normal values of biochemical variables in blood serum and other physiological variables is important for assessment of damage of organs and tissues in different diseases and for assessment of development from the welfare aspect (14). The biochemical and hematological parameter of the experimental cows had a profound influence on their blood profile as seen from table (1). The lactating cows recorded the least glucose level of (43.6±2.5 mg/ dl), pregnant cows recorded (53.2±1.7 mg/ dl) compared with control cows recorded the level of glucose as (76.6±3.4 mg/dl) of blood. These results similar with study in (15) that declare adaptation of glucose metabolism in early lactation leads to increased gluconeogenesis in the liver to direct glucose into the mammary gland for lactose synthesis. Other study showed the hypoglycemia are more common obvious biochemical features of pregnancy because during pregnancy, fetuses have a large glucose demand that is satisfied by the mother. If the fetal demand and the mother supply become imbalanced due to fasting of the mother or the increased nutritional demands of the rapidly developing fetal placental unit, females suffer from negative energy balance and resulting in severe hypoglycemia (16). The physiological state of the animal such as parturition, pregnancy and lactation had a profound influence on total plasma cholesterol levels (17). Such was the case with the experimental cows with highly significant difference between the stages such as control, lactating and pregnant. The cholesterol level was highest as (222.7 ± 8.46 mg/dl) in pregnant stage and in lactating intermediary as (179.17 ± 3.66 mg/ dl), while in the cows were control the cholesterol level was least as (167.91 ± 6.46 mg/dl). Triglyceride levels were lower during the lactating stage as (25.2±4.3 mg/dl) and intermediary in pregnant cows as (31.4±6.3 mg/dl) compared with control cows as (39.4±5.7 mg/dl). It was in close agreement with study declare that lipid mobilisation characterized by highly concentrated free fatty acids in blood starts in a high degree of pregnancy, reaching its maximum in early lactation. Free fatty acids are reesterified and accumulated in the form of triacylglycerols in the liver. As a result, lipid mobilisation intense ketogenesis and lipogenesis in the liver and consequently lower concentrations of glucose (18). The urea concentration did not differ significantly between the three stages, it recorded level as (38.5±7.2 mg/dl), the concentration of urea in blood depends from nutrition, diagnostically is important also at diseases of kidneys (19). The results presented in tables (1) show that the blood serum biochemical parameters considered in this report were affected by the different stages of cows.

Table (1) the parameter in different stages (groups)

Blood constituents	Physiological stages		
	Lactating (12)	pregnant (11)	Control (15)
Glucose mg/dl	43.6±2.5	53.2± 1.7	76.6±3.4
cholesterol mg/dl	179.17± 3.66	222.7± 8.48	167.9±6.46
Triglyseried mg/dl	25.2± 4.3	31.4± 6.3	39.4±5.7
Urea mg/dl	38.4±7.1	38.6±6.9	38.5±7.2
Ca ⁺⁺ mg/dl	7.33± 0.73	7.6± 0.83	8.28±0.59
Mg ⁺⁺ mg/dl	1.99±0.02	1.91±0.03	1.98±0.02
Na ⁺ mmol/l	189±9.9	148.5±8.4	136± 0.04
K ⁺ mmol/l	3.28±0.17	3.55±0.52	3.75± 0.15

The result of the analysis of Ca⁺⁺, Mg⁺⁺, Na⁺ and K⁺ are shown in table (1). Serum calcium was lower in lactating cows than in pregnant cows, in both stages the level of calcium is less from control group. This result was similar with study (17) that declare Serum calcium was higher in late pregnant cows than in early lactating cows. The decrease in Ca⁺⁺ level in pregnant may also be associated with aemodilution which has been reported in cows (20). However, the study (21) reported increased Ca⁺⁺ level

during late pregnancy in cows and attributed this to increase of intestinal absorption of Ca^{++} and bone resorption because of hormonal changes. The magnesium level did not differ significantly between the three stages. This result was similar with observation in (22) that observed the same level of Mg^{++} in different stages in cow. Sodium and potassium concentrations in serum also differed between control, lactating and pregnant cows at a highly level in lactating and intermediary in pregnant, this level of Na^+ higher than the normal value. In contrast Sodium and potassium level was least than normal value in lactating and pregnant stages. Hypokalemia may result from depletion of body K^+ store or from loss of K^+ in large quantities to milk (23).

Conclusions:

1. Serum calcium was lower in lactating cows than in pregnant cows, in both stages the level of calcium is less from control group.
2. Sodium and potassium concentrations in serum differed between control, lactating and pregnant cows at a highly level in lactating and intermediary in pregnant, this level of Na^+ higher than the normal value.
3. Hypokalemia may result from depletion of body K^+ store or from loss of K^+ in large quantities to milk.
4. The physiological state of the animal such as parturition, pregnancy and lactation had a profound influence on total plasma cholesterol levels.

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Serological survey of Brucellosis in some areas of Baghdad city

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Abstract

A serological survey for brucellosis was conducted in some farm animals, farmers and veterinarians in Baghdad city during the period from October, 2012 to April, 2013. A total of 140 serum samples were taken from farm animals 24 cows, 14 sheep and 102 goats and 26 human serum samples were randomly collected from different ages and sexes in different area in Baghdad (Abo-Graib, Al-Radwania, Al-Gehad and Al-yosefia). Serological tests (Rose Bengal and tube agglutination test) were done on these serum samples and the prevalence in farm animals was 30% (12.5% in cattle, 28.57% in sheep and 34.31% in goats) by rose Bengal test and 19.28% (8.33% in cattle, 21.42% in sheep and 21.56% in goats) by tube agglutination test. The prevalence of brucellosis in human was 26.92% by rose Bengal test and 19.33% by tube agglutination test. The highest titers of antibodies were recorded between 1/80-1/640 in goats, while in human the titers were between 1/160-1/320. The high prevalence of brucellosis in human and animals indicates that the disease is endemic in this area and control programs should be implemented to reduce or eradicate brucellosis.

Keywords: Survey, Brucellosis, Farmers, RBPT.

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مسح مصلي لداء البروسيلات في بعض مناطق بغداد

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الخلاصة

اجري مسح مصلي لداء البروسيلات في بعض الحيوانات والمزارعين والأطباء البيطريين في مدينة بغداد خلال الفترة من تشرين الثاني 2012 وحتى نيسان 2013. جمعت بشكل عشوائي 140 عينة مصل من حيوانات المزرعة 24 أبقار و14 أغنام و102 ماعز و26 عينة مصل من أناس وبأعمار وأجناس مختلفة وفي مناطق مختلفة من بغداد (أبو غريب والرضوانية والجهاد واليوسفية). أجريت الاختبارات المصلية (اختبار الروزبنجال واختبار التلازن الأنبوبي) على هذه العينات وكانت نسبة الإصابة بالحيوانات اعتمادا على اختبار الروزبنجال هي 30% (12.5% في الأبقار و28.57% في الأغنام و34.31% في الماعز) أما باختبار التلازن الأنبوبي فكانت نسبة الإصابة 19.28% (8.33% في الأبقار و21.42% في الأغنام و21.56% في الماعز). كانت نسبة الإصابة في الإنسان 26.92% باختبار الروزبنجال و19.33% باختبار التلازن الأنبوبي. كانت النسب العالية للمعيار الحجمي للأجسام المضادة بالماعز وتراوح بين 80/1 و640/1 أما في الإنسان فكان المعيار الحجمي للأجسام المضادة يتراوح بين 160/1 و320/1. ان النسبة العالية للإصابة بداء البروسيلات في الإنسان والحيوانات تشير إلى ان المرض مستوطن في هذه المناطق ويجب تطبيق برامج السيطرة للحد من انتشار هذا المرض.

الكلمات المفتاحية: مسح, داء البروسيلات, مزارعين, اختبار الروزبنجال.

Introduction

Brucellosis is an important zoonotic and endemic disease in human and various animal species, although several control and eradication programs have been established, the disease continues to produce a large economic losses especially in cattle and small ruminants (1, 2). The major economic importance of brucellosis includes loss of production, abortion, preventive programs and restriction in internal trade in animals and their products (3). Brucellosis is prevalent in some middle-eastern countries such as Iran, Iraq, Saudi Arabia, Egypt and Syria (4). Farmers, veterinarians and others involved in animal handling are at a higher risk of direct infection and individuals who ingest unpasteurized dairy products especially from area of endemic infection are at risk of food-borne brucellosis (5). Diagnosis of clinical brucellosis in humans and animals is made by the use of an appropriate serological tests such as Rose Bengal plate test (RBPT), tube agglutination test (TAT), ELIZA test, coombs test and complement fixation test (CFT) (6, 7). In this study, we aimed at determining the seroprevalence of brucellosis in some areas of Baghdad city due to the importance of this disease in both human and farm animals.

Materials and Methods

A total of 140 blood samples were taken from farm animals 24 cows, 14 sheep and 102 goats and 26 human blood samples from farmers and veterinarians. All samples were randomly collected from animals of different ages and sexes in different area in Baghdad city (Abo-Graib, Al-Radwanian, Al-gehad and Al-yosefia) during the period from October, 2012 to April, 2013. Serum then separated from each blood sample and kept at -20c until serological test were performed. Rose Bengal plate test (RBPT) was done on all serum samples according to (8) by using antigen prepared from *B. abortus* (Omega diagnostic company). All positive serum samples to RBPT were tested with tube agglutination test (TAT) according to (9) by using antigen supplied by (Snbiotic Corporation, France).

Results

Prevalence of brucellosis in farm animals was 30% by RBPT 12.5% in cattle, 28.57% in sheep and 34.31% in goats and it was 19.28% by TAT 8.33% in cattle, 21.42% in sheep and 21.56% in goats as in table (1).

Table (1) Prevalence of brucellosis in farm animals by RBPT and TAT

Animal species	Total no. of animals	RBPT	TAT
Cattle	24	3 12.5%	2 8.33%
Sheep	14	4 28.57%	3 21.42%
Goat	102	35 34.31%	22 21.56%
Total	140	42 30%	27 19.28%

There was a fluctuation in antibodies titers recorded in farm animals and humans by using TAT and a high titers were found in cattle between 1/160 to 1/320, in sheep between 1/320 to 1/640 while in goats was the highest titers between 1/80 to 1/640, but in human the titers were 1/160-1/320 Table (2).

Table (2) Titers of brucella antibodies in farm animals and human by TAT

Species	No. of serum samples	No. of positive	Titers				
			1/40	1/80	1/160	1/320	1/640
Cattle	24	2	-	-	1	1	-
Sheep	14	3	-	1	-	1	1
Goat	102	22	3	4	6	4	5
Human	26	5	-	-	4	1	-

The prevalence of brucellosis in human by RBPT was 26.92% while it was 19.23% by TAT as in table (3).

Table (3) Prevalence of brucellosis in human by RBPT and TAT

No. of samples examined	Tests	No. of positive samples	Percentage%
26	RBPT	7	26.92%
	TAT	5	19.23%

Discussion

In general, the susceptibility to brucellosis depends on various factors such as immune status, routes of infection, size of the inoculums and the species of brucella (8). Also there is a positive association among population density, grazing, strategy and disease prevalence (10). In addition, the seroprevalence of brucellosis is characterized by considerable geographical variability, these factors may reflex the variations in the prevalence between animals and also in humans between our results and results recorded by (11) 7.9% and (12) 23.3% in Baghdad province, also (13) who referred that the infection in rams was higher than ewes 12.1%, 11.7% respectively, while (14) mentioned that morbidity rate in rams was 65.6%. On the other hand, (15) recorded 1, 4% morbidity rate in rams and 1.68% in ewes. Our results in sheep disagreed with (16) who recorded morbidity rate by RBPT 10.31%. This may be due to breeding age (17) or increasing animal exposure to the bacteria (10) Also, sexually mature animals are more prone to infection than sexually immature animals of both sexes due to sex hormones and erythritol present in males and in females allontic fluids stimulate the growth and multiplication of brucella organism and tend to increase concentration with age and sexual maturity (15). Due to the factors mentioned above our results disagree with (18) who found the seroprevalence rates in cattle, sheep and goats was 0.58%, 6.26% and 7.24% respectively and (15) who found morbidity rate 2.5% by RBPT in sheep and (19) who found that prevalence rate by RBPT in cattle, sheep and goats 1.8%, 3.5% and 2.4% respectively and (20) found brucella prevalence in cattle, sheep and goats were 5.3%, 7.6% and 15% respectively. Our results disagree with (21) in Iraq who found high morbidity rates in cattle by RBPT and TAT which was 54% and 32% respectively, Also disagreed with (16) who found that the infection rate in sheep by TAT was 49, 35% which was higher than our results and also disagreed with his findings about the antibodies titer, which was in his study between 1/40 to 1/160. The differences between results of both tests in this study may be due to that animals were in incubation period of disease or after incubation or during the chronic stage of the disease which the serum agglutinating tend to wane, Also IgG1 produced in some sera has the ability to block agglutination by other immunoglobulin, Particularly IgM, therefore IgG1 fail to agglutinate while IgM is far most efficient (22). The appearance of low antibodies titers may be due to decline antibodies level after recovery from the disease and the agglutination occurred due to residual immunoglobulin's especially IgG which persist for several months or for one year (23). Our results in humans agreed with (24) who found the prevalence of brucellosis in human in Iran was 19.1% and disagreed with (25) that indicated a 4,8% prevalence of brucellosis in Ethiopia, it also disagreed with (5) who found the prevalence of brucellosis in human in Turkey was 13.2%. The detection of a higher rate of sero-positive serum from farmers comparing with other studies indicates that exposure to brucellosis is more common and people involved in this study consume dairy products such as butter, white cheese and cream made of raw or insufficiently heated milk or through direct contact with infected animals and their aborted fetus and discharges. It's concluded that brucellosis is prevalent in human and farm animals in Baghdad city due to the lack of control and vaccination programs for animals and the consuming of contaminated animal products for humans, so preventive

and control programs should be implemented to protect animals and humans from brucellosis.

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