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CLINICAL AND PATHOLOGICAL ASPECTS OF PERITONITIS ASSOCIATED WITH TRAUMATIC RETICULOPERITONITIS, RUMINITIS, AND RUMINAL TYMPANITES IN WATER BUFFALOES

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ABSTRACT

The Objective of the present study was to investigate the clinical and pathological aspects of peritonitis secondary to traumatic reticuloperitonitis, ruminitis, and ruminal tympanites in water buffaloes. Results of this study have showed that cases of acute peritonitis were more frequent than cases of chronic peritonitis. Body temperature, heart rate, and respiratory rate were higher significantly in cases of acute peritonitis than in cases of chronic peritonitis ($P<0.05$) and that these parameters were higher significantly in cases of peritonitis than in control animals. Ruminal motility was higher significantly in acute cases of peritonitis than in chronic peritonitis but it was lower significantly in cases of peritonitis than in control animals. Inappetance, grunting, and scant feces were more frequently seen in cases of acute peritonitis than in cases of chronic peritonitis. Arching of the back, rough coat, dripping urination, disinclination to move, and lying down with care were seen in cases of acute peritonitis only. Loss of body weight was seen in cases of chronic peritonitis only. Decreased milk production was more frequent in cases of chronic peritonitis than in cases of acute peritonitis. The packed cell volume values were higher significantly in cases of acute peritonitis than in control and chronic peritonitis. In contrast, the erythrocyte sedimentation rate was higher significantly in cases of chronic peritonitis, and in cases of peritonitis than in control animals. Plasma fibrinogen levels were higher significantly in cases of chronic peritonitis than in cases of acute peritonitis, and in cases of peritonitis than in control animals. The total lymphocytes count and neutrophils values were higher significantly in cases of acute peritonitis than in chronic peritonitis, and in peritonitis than in control animals. The lymphocytes value was significantly lower in cases of acute peritonitis than in chronic peritonitis and in control animals. Histologically, the lesions were in the form of congestion, extensive hemorrhages, and edema of the peritoneal tissue. Thrombosis of some blood vessels, areas of necrosis, and minimal mixed type inflammatory cells were also seen. Erythrocytes were the main consitituent of the exudate and deposits of hemosiderin were visualized in areas of hemorrhages.

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النواحي السريرية والمرضية لالتهاب الخلب المرتبط مع التهاب الخلب والشبكية الكلمي والتهاب الكرش وانتفاخ الكرش في الجاموس المائي

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الخلاصة

إن هدف هذا البحث هو دراسة النواحي السريرية والمرضية لالتهاب الخلب الذي يحدث ثانوياً لالتهاب الخلب والشبكية الكلمي والتهاب الكرش والانتفاخ الكرشي في جاموس الماء. أشارت نتائج هذا البحث إلى أن حالات التهاب الخلب الحاد كانت اكثر ترداداً من حالات التهاب الخلب المزمن. وكانت قيم درجات الحرارة ومعدلات النبض ومعدلات التنفس أعلى بدرجة هامة ($P<0.05$) في حالات التهاب الخلب الحاد منها في حالات التهاب الخلب المزمن وان هذه القيم كانت أعلى بدرجة هامة في حالات التهاب الخلب منها في حيوانات السيطرة. وكانت حركة الكرش أعلى بدرجة هامة في حالات التهاب الخلب الحاد منها في حالات التهاب الخلب المزمن ولكنها كانت أوطأ بدرجة هامة في حالات التهاب الخلب منها في حيوانات السيطرة. ووجد بان أعراض فقدان الشهية والتأوه grunting وقلة الغائط كانت اكثر ترداداً في حالات التهاب الخلب الحاد منها في حالات التهاب الخلب المزمن. أما تقوس الظهر والغطاء الخشن والتبول على شكل النقط وعدم الرغبة في الحركة والاضطجاع بعناية فقد تمت مشاهدتها في حالات التهاب الخلب الحاد . وتمت مشاهدة فقدان الوزن في حالات التهاب الخلب المزمن فقط. ولوحظ نقص إنتاج الحليب بترداد أعلى في حالات التهاب الخلب المزمن منه في حالات التهاب الخلب الحاد. وكانت قيم حجم الخلية المرصوصة أعلى بدرجة هامة في حالات التهاب الخلب الحاد منها في حالات التهاب الخلب المزمن وحيوانات السيطرة. وعلى العكس من ذلك فأن معدل ترسيب الكريات الحمر كان أعلى بدرجة هامة في حالات التهاب الخلب المزمن، وفي حالات التهاب الخلب منه في حيوانات السيطرة. وكانت مستويات منشأ الليفين البلازمي أعلى بدرجة هامة في حالات التهاب الخلب المزمن منها في حالات التهاب الخلب الحاد، وفي حالات التهاب الخلب منها في حيوانات السيطرة. وكانت قيم العد الكلي للكريات البيض والعدلات أعلى بدرجة هامة في حالات التهاب الخلب الحاد منها في التهاب الخلب المزمن، وفي حالات التهاب الخلب الحاد منها في حيوانات السيطرة. وقيمة الخلايا اللمفية كانت أوطأ بدرجة هامة في حالات التهاب الخلب الحاد منها في حالات التهاب الخلب المزمن وفي حيوانات السيطرة. ونسجياً فقد كانت الآفات المرضية على شكل احتقان وأنزفة شديدة وخزب نسيج الخلب. كما لوحظ خثار بعض الأوعية الدموية ووجود باحات من النخر وخلايا التهابية مختلطة وبأعداد قليلة جدا. وشكلت الكريات الحمر العنصر المتغلب في النضحة الالتهابية مع وجود ترسبات لخضاب الهيموسيدرين في باحات الانزفة.

INTRODUCTION

Infectious peritonitis in cattle can occur in three forms, primary peritonitis (relatively rare), secondary peritonitis (most common), and tertiary peritonitis (1-3). Primary peritonitis refers to inflammation of the peritoneum without an evident intraabdominal source of infection (3). Examples of primary peritonitis include the fibrinous peritonitis seen in association with sporadic bovine encephalomyelitis (Chlamydia psittaci) and septicemia caused by Haemophilus spp. (1). Secondary

peritonitis includes cases of bacterial peritonitis that occur secondary to intra-abdominal lesions (1). Lesions that disrupt the normal barriers between a visceral lumen and the peritoneal cavity (foreign body perforations, ulcers, ischemia) and extension of preexisting infection through the peritoneal membrane (umbilical remnant infection, liver or renal abscesses, retroperitoneal infections, body wall infections) constitute the sources of bacterial peritonitis. Tertiary peritonitis is a recurrent peritoneal infection after an appropriately managed primary or secondary peritonitis (1). A number of factors have been identified in the peritoneal cavity that increase the survivability of invading pathogens and they include increased fluid levels, blood, hemoglobin, and foreign bodies (1-3). Additionally, factors such as inadequate hemostasis, incomplete removal of lavage fluid, inadequate debridement, traumatic surgical technique, and use of excessive or reactive suture material or surgical mesh by the surgeon, act as adjuvant in the peritoneal cavity and increase the risk of infection (1). Once the contaminants entered the peritoneal cavity, they can move through one of several stages (1,4). Stage 1 (golden period) represents a lapse of 4 to 6 hours between the introduction of bacteria into a tissue and establishment of infection. Stage 2 (acute generalized peritonitis) occurs between 3 to 4 hours and 4 to 5 days after contamination. Stage 3 (acute localizing peritonitis) occurs between 4 and 10 days after contamination. Stage 4 (Chronic abscessing peritonitis) begins anytime at or after the 8^{th} day following contamination (1).

Despite the high prevalence of peritonitis in all food animals (5-7) and its complex etiology, clinicians usually diagnose and treat conditions that cause peritonitis and seldom arrive to definitive diagnosis and specific treatment of peritonitis. Therefore, this study was undertaken to present clinical and pathological data extrapolated from cases of peritonitis in buffaloes. Such information might prove useful to clinicians in the diagnosis and treatment of peritonitis.

MATERIALS AND METHODS

Animals: Thirty eight clinical cases of 5-10 years old water buffaloes of a local breed that were brought to private veterinary clinics constituted the animals of this study. The animals were suffering from traumatic reticulo-peritonitis (TRP) (18 cases), ruminitis due to acute carbohydrate engorgement (12 cases), and severe tympany that needed trocarization (8 cases). Additionally, 10 apparently healthy buffaloes belonging to a private herd were used as control.

Clinical Examination: Clinical signs and symptoms exhibited by the animals were recorded. Metallic foreign objects were detected using metal detector in all of the cases of TRP (18 cases). These animals were treated surgically through rumenatomy using the Weingarth's apparatus. Rumenatomy was also done in buffaloes suffering from rumenitis due to acute carbohydrate overload (12 cases). Severe tympany was diagnosed in 8 cases and these were treated through trocarization. Blood sample was collected from each of the 38 cases before surgery (as well as from each of the 10 control buffaloes) and forwarded for hemogram and DLC determination. Estimation of the level of fibrinogen was also done using a commercial kit. During surgery, a small piece of the visceral peritoneum was collected from the site of operation, preserved in 10 % phosphate buffered formalin, and forwarded to the histopathology laboratory for histopathological examination.

Histopathological Examination: The tissue samples were fixed in 10 % phosphate buffered formalin for 48 hours. They were processed routinely, embedded in paraffin wax, sectioned at 5-6 μm thickness, stained with hematoxylin and eosin stain, and examined under a light microscope (8).

Statistical Analysis: Data were analyzed by using the one way analysis of variance and the Duncans test to a certain the statistical differences at $P<0.05$ level (9).

RESULTS

Results of clinical examination of the 48 buffaloes are presented in Table (1). The body temperature, heart rate, and respiratory rate were higher significantly in cases of acute peritonitis than in cases of chronic peritonitis ($P>0.05$). These parameters were higher significantly in cases of acute peritonitis than in control animals. Ruminal motility was higher significantly in acute cases of peritonitis than in chronic peritonitis but it was lower significantly in cases of peritonitis than in control animals. Table (2) shows the signs and symptoms exhibited by cases of acute and chronic peritonitis. Inappetance, grunting, and scanty feces were more frequently seen in cases of acute peritonitis than in cases of chronic peritonitis. Arching of the back, rough coat, dripping urination, disinclination to move, and lying down with care were seen in cases of acute peritonitis only. Loss of body weight was seen in cases of chronic peritonitis only. Furthermore, decreased milk production was more frequent in cases of chronic peritonitis than in cases of acute peritonitis.

Table (3) presents results of the hemogram, differential leucocytic count, and fibrinogen determination. Significant differences were encountered only in the values of PCV, ESR, fibrinogen, TLC, lymphocytes, and neutrophils. Thus the PCV value was higher significantly in cases of acute peritonitis than in control and chronic peritonitis. In contrast, the ESR value was higher significantly in cases of chronic peritonitis. This value was higher significantly in cases of peritonitis than in control animals. Similarly, the fibrinogen value was higher significantly in cases of chronic peritonitis than in cases of acute peritonitis and higher significantly in cases of peritonitis than in control animals. The TLC and N values were higher significantly in cases of acute peritonitis than in chronic peritonitis and higher significantly in peritonitis than in control animals. The L value was significantly lower in cases of acute peritonitis than in chronic peritonitis and in control animals.

The histopathological lesions were in the form of congestion, extensive hemorrhages, and edema of the peritoneal tissue in the majority of the cases. Thrombosis of some of the blood vessels, areas of coagulative necrosis, and minimal mixed type inflammatory polymorphonuclear cells were also seen. Erythrocytes were the main constituent of the exudates and deposits of hemosiderin were visualized in areas of hemorrhages.

Table (1): Signs and symptoms encountered in buffaloes with acute peritonitis (n=26) and chronic peritonitis (n=12) as compared to control (n=10).

Parameter	Control	Acute	Chronic
Temperature (C̊)	38.9 ± 1.29 a	40.1 ± 1.66 b	39.1 ± 2.16 a
Heart rate/min.	77.9 ± 3.87 a	98.25 ± 5.22 b	75.66 ± 4.72 a
Resp. rate/min.	22.11 ± 2.99 a	40.26 ± 4.22 b	25.9 ± 5.64 a
Rum. motility/5min.	3.27 ± 0.71 a	1.98 ± 0.57 b	1.66 ± 0.98 b

* Different letters (horizontally) mean significant difference.

Table (2): Signs and symptoms of acute (n=26) and chronic peritonitis (n=12) in buffaloes.

Signs and symptoms	Acute peritonitis		Chronic peritonitis	
	No.	Percent	No.	Percent
Inappetance (anorexia)	17	65.3	6	50
Grunting	15	57.6	1	8.3
Loss of body weight	---	---	10	83.3
Scant feces	10	38.4	3	25
Arching of the back	8	30	---	---
Rough coat	10	38.4	---	---
Decreased milk production	17	65.3	8	66.6
Dripping urination	9	34.6	---	---
Disinclination to move	8	30	---	---
Lying down with care	10	38.4	---	---

Table (3); Hemogram and differential leucocytic count of control buffaloes (n=10), buffaloes with acute peritonitis (n=26), and buffaloes with chronic peritonitis (n=12).

Parameter	Control	Acute peritonitis	Chronic Peritonitis
RBC × 10^6	7.23 ± 1.33 a	7.42 ± 1.67 a	7.13 ± 2.11 a
Hb g/100 ml	10.9 ± 1.29 a	11.0 ± 2.39 a	11.3 ± 2.61 a
PCV %	33.12 ± 2.9 a	39.6 ± 2.21 b	35.63 ± 4.54 a
ESR/24 H	3.8 ± 1.67 a	16.73 ± 3.15 b	17.69 ± 5.25 b
Fibrinogen* mg/100ml	405.29±22.24 a	680.35±50.22 b	692.26±62.73 b
TLC × 10^3	9.23±1.39 a	13.22±2.61 b	10.11±4.65 a
L %	47.23±1.05 a	37.21±3.11 b	45.77±4.29 a
N %	45.61± 1.66 a	55.3±1.66 b	47.62±3.39 a
M %	3.12±1.21 a	3.66±1.03 a	4.02±2.33 a
E %	2.02±0.11 a	2.19±0.3 a	2.21±1.2 a
B %	1.02± 0.02 a	1.11±0.12 a	1.21±1.02 a

* Estimated spectrophotometrically using kits from Sigma-Aldrich Chemie GmbH. Germany.

** Different letters (horizontally) mean significant difference.

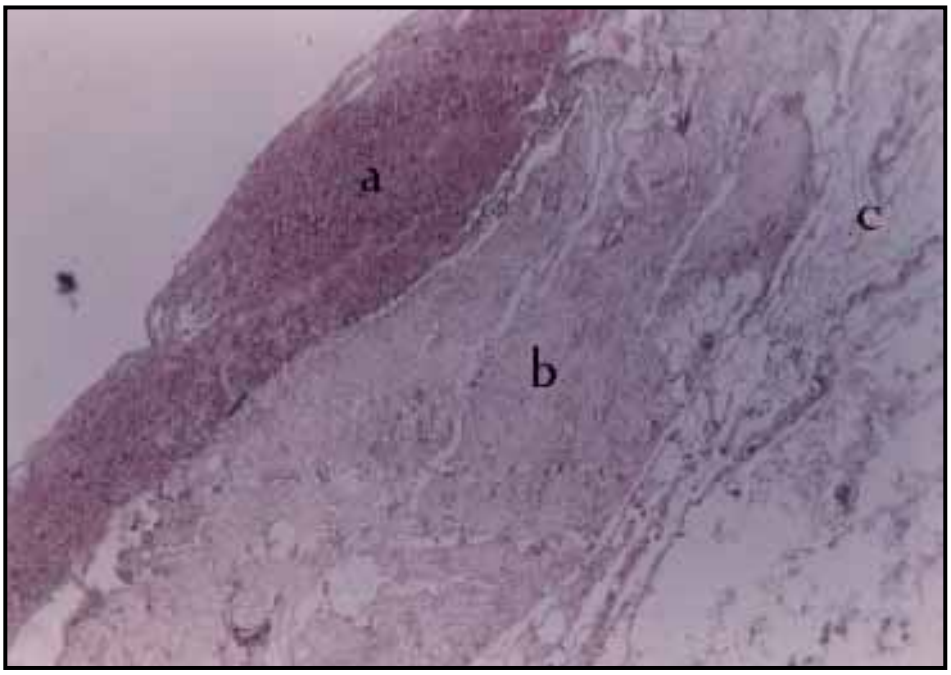

Figure 1- Photomicrograph of cross section of the peritoneum from a buffalo affected with acute peritonitis. Note the presence of a mass of large numbers of erythrocytes and fibrin on the surface of the peritoneum (a), and necrosis (b) and edema (c) of the peritoneum H & E. 100X.

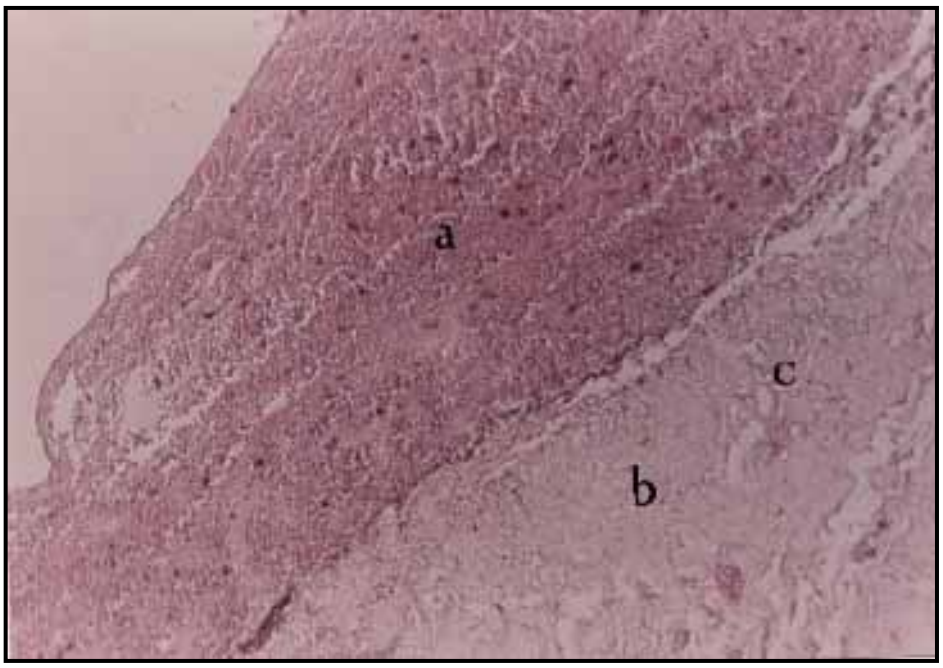

Figure 2- A higher power magnification of the previous photomicrograph. Accumulation of masses of erythrocytes and fibrin on the surface of the peritoneum (a), necrosis (b), and edema (c) of the peritoneum are discernible. H & E. 100X.

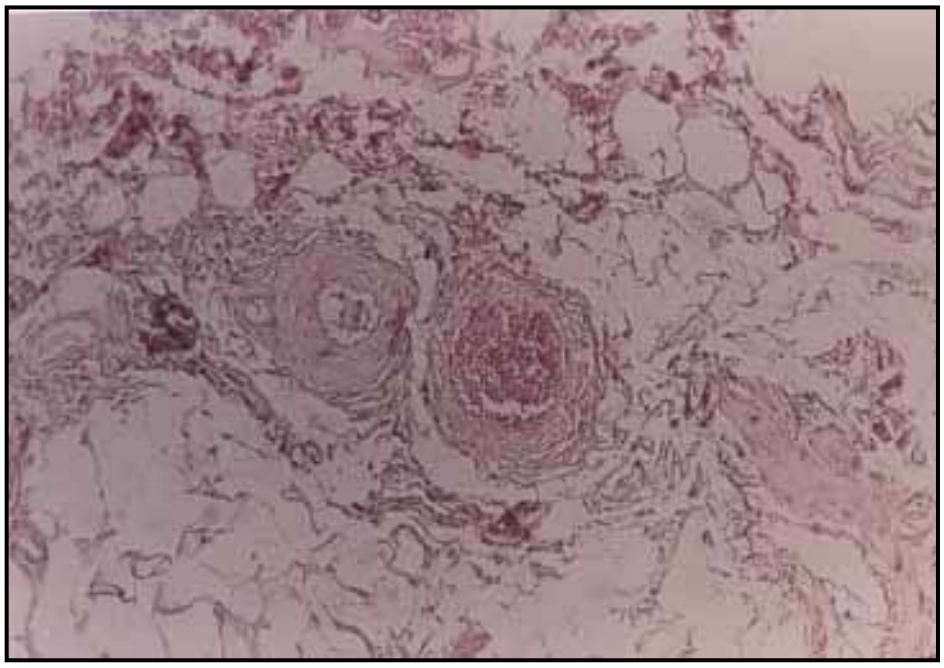

Figure 3- Cross section of the peritoneum from a buffalo affected with acute peritonitis. Note necrosis and edema of the peritoneum and congestion and thrombosis of blood vessels in the peritoneal tissue. H & E. 400X.

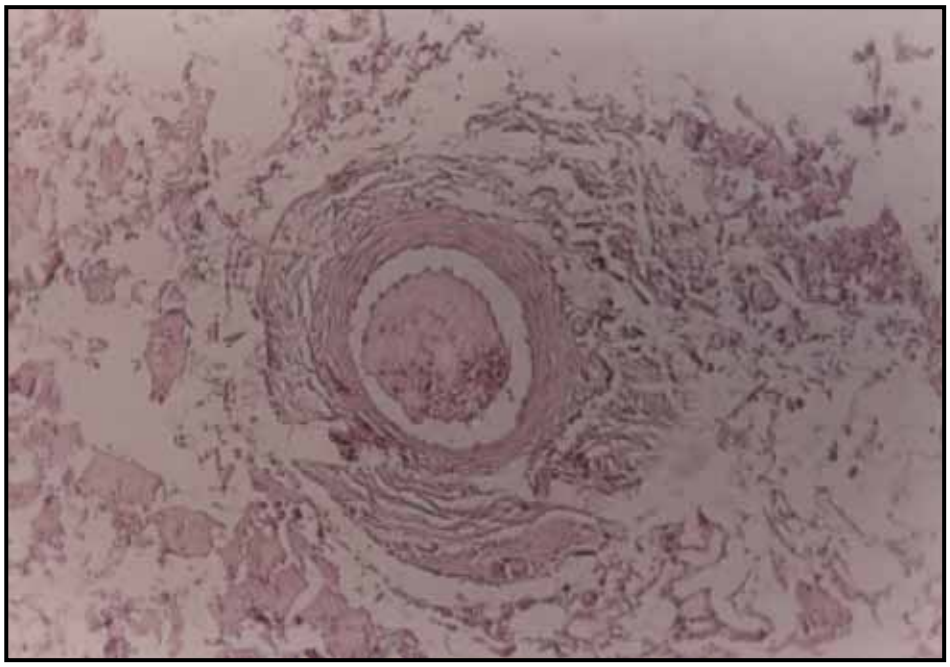

Figure 4- Cross section of the peritoneum from a buffalo affected with acute peritonitis. Thrombosis of a blood vessel, necrosis, and edema of the peritoneum could be seen. H & E. 400X.

DISCUSSION

In this study, acute hemorrhagic peritonitis was more common (26 cases) than chronic peritonitis (12 cases). This finding is expectable since peritonitis is a dynamic process that starts as acute reaction and some of the cases can evolve into a more chronic peritonitis (10-12). The body temperature, heart rate, and respiratory rate were higher significantly in buffaloes affected with acute peritonitis than in buffaloes affected with chronic peritonitis ($P<0.05$). A high fever (up to 41.5 ºC) has been reported to indicate acute diffuse peritonitis (5). It is due to toxemia and its severity varies depending on the area of peritoneum involved, the identity of the pathogen, and the amount of tissue injury (5). Fever is also seen in chronic peritonitis and this is due to persistence of endotoxemia (5). Tachycardia is a common finding in peritonitis and it is due to endotoxemia (5). The increased respiratory rate is contributed to the relative fixation of the abdominal wall because of pain (5). In the present study, ruminal motility was higher significantly in acute cases of peritonitis than in chronic peritonitis but it was lower significantly in cases of peritonitis than in control animals. These findings could be explained on the bases that in the acute stage, abdominal pain and the release of catecholamine often lead to a complete gastrointestinal stasis and illus. The rumen is then completely atonic (3). In chronic cases, this situation is exaggerated by the development and advance of adhesions wich interfere with normal alimentary tract movements (5).

In the present study, inappetance, grunting, and scant feces were the signs and symptoms more frequently seen in acute peritonitis in comparison with chronic peritonitis. These signs and symptoms are commonly reported in cases of acute peritonitis and they become less common as the condition become chronic (3,5). Arching of the back, rough coat, drippling urination, disinclination to move, and lying down with care were seen in cases of acute peritonitis only. These are the signs and symptoms of acute peritonitis, and in chronic peritonitis which takes a course of several weeks, a chronic syndrome of indigestion and toxemia is seen (1,3,5).

In the present study loss of body weight was seen in cases of chronic peritonitis only. This could be explained on the bases of the inappetance, alimentary tract stasis, and abdominal pain seen in peritonitis as well as the long course of chronic peritonitis which lasts for several weeks. In this study, decreased milk production was more frequent in cases of chronic peritonitis than in cases of acute peritonitis. This could be due to inappetance, ruminal atony, and abdominal pain which last for several weeks in cases of chronic peritonitis (5).

The total and differential leucocytic count has been considered a useful aid in the diagnosis of peritonitis and in assessing its severity (5). In acute diffuse peritonitis with toxemia there is usually a leukopenia, neutropenia, and a marked increase in immature neutrophils (a degenerative left shift), (5). In mild forms of acute peritonitis of a few days duration there may be leukocytosis due to a neutrophilia with the appearance of immature neutrophils (5). In acute local peritonitis as occur in traumatic reticuloperitonitis, there is usually a normal total leukocyte count, or a slight increase, with regenerative left shift (5). In chronic peritonitis, the total and differential leukocyte count may be normal, or there may be a leukocytosis with a marked neutrophilia and occasionally an increase in the total numbers of lymphocytes and monocytes (5). In the present study, the TLC and N values were higher significantly in cases of acute peritonitis than in chronic

peritonitis and higher significantly in peritonitis than in control animals. The L Values were significantly lower in cases of acute peritonitis and in control animals. The fibrinogen values were higher significantly in cases of chronic peritonitis than in cases of acute peritonitis and higher significantly in cases of peritonitis than in control animals. This finding is in accordance with that of others who stated that the plasma fibrinogen levels in cattle, in general, tend to increase as the severity of acute peritonitis increase (5). Furthermore, hyperfibrinogenemia has been considered the most consistent hematological finding in peritonitis (1). The PCV values were higher significantly in cases of acute peritonitis than in chronic peritonitis and control animals. The ESR values were higher significantly in cases of chronic peritonitis than in cases of acute peritonitis and in cases of peritonitis than in control animals. These findings were hard to evaluate because of lack of similar studies. Results of the present study have indicated clearly that the plasma fibrinogen levels as well as the total and differential leukocyte count are useful aid in the diagnosis of peritonitis, and in assessing its severity.

Histopathological lesions that are reported in the present study were similar to those reported in the literature(13,14). A well documented finding is that peritonitis may be serofibrinous, fibrinopurulent, purulent, or hemorrhagic, and may be localized or generalized. This variation in the type of exudate and distribution is understandable in view of the complex etiology and pathophysiology of peritonitis in domestic animals (15-18).

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