Immunobiochemical profile in cattle infected with lumpy skin disease.

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Abstract

Lumpy skin disease virus (LSDV) was isolated, from naturally infected cattle that have a history of previous vaccination with live attenuated sheep pox virus (SPV) vaccine. Lumpy skin disease (LSD) is a skin disease of cattle caused by a strain of genus Capripox virus which causes an acute, subacute or inapparent infection in all ages and breeds of cattle. The disease causes considerable economic losses due to emaciation, damage of hides, infertility in males and females, mastitis, loss of milk production with morbidity up to 100% in natural outbreaks and mortality rate rarely exceeds 5%. This study aimed to demonstrate the alteration caused by (LSDV) infection on some immunobiochemical parameters as, total protein, Albumin immunoglobulins, ca^{++}, ph^{++}, sodium, potassium, in addition to liver and kidney functions. This study was carried out on sixty Egyptian cows in a private farm (El Menoufia Governorate- El Sadat city). About 35 animals are monitored and inspected (apparently healthy) and considered as control group. The other 25 animals were infected with apparent clinical signs and considered as infected group. Blood samples were taken from both groups and serum was separated for measuring the total protein, albumin, globulin, ca^{++} ph^{++}, mg^{++}, liver function (ALT, AST, and alkaline phosphatase), kidney function (serum ceatinine and urea). Our findings revealed that there were significant decreases in tota protein, albumin, globulin, ca^{++}, ph^{++}, sodium and potassium ions. ALT, AST Alkaline phosphatase, urea, Ig G and ceatinine were significant increases. sc we can concluded that the LSVD causes severe alteration in differen biochemical parameters specially total protein, albumin and globulin and sc reduce the immune response in infected cattle to be considered in the treatment.

Key words: LSVD; Cattle; Total proteins; Immune response; Liver; Kidney.

Introduction

Lumpy skin disease virus (LSDV), a member of the capripoxvirus genus of the Poxviridae, is the etiologic agent of an important disease of cattle in Africa Capripoxviruses (CaPVs) represent one of eight genera within the chordopoxvirus (ChPV) subfamily of the Poxviridae. The Capripoxvirus genus is currently comprised of LSDV, sheep pox virus (ShPV), and goat pox virus (GPV). These viruses are responsible for some of the most economically significant diseases of domestic ruminants in Africa and Asia (Fenner, 1996) CaPV infections are generally host specific and have specific geographic distributions (Davies, 1991; Carn, 1993; Coetzer et al., 1994). CaPVs are however, serologically indistinguishable from each other. The disease is listed in the office international des Epizooties List "A" which identifies diseases with the

potential rapid spread and severe economic losses (Irons et al., 2005). F observations and supporting evidence indicate that the disease is transmitte biting flies. There are also indications of transmission in the absence of in vectors, whereas contact-transmission among animals is extremely ineffic (Carn and Kitching, 1995).

Lumpy skin disease is primarily spread among animals by biting insects (vec such as mosquitoes and biting flies. Less commonly, the virus may be sprea direct contact to the skin lesions, saliva, nasal discharge, milk, or seme infected animals. Lumpy skin disease characterized by rapid eruption of mul circumscribed skin nodules, and generalized lymphadenitis and fever and result in mastitis and orchitis (Coetzer, 2005). Other lesions are visible at p mortem examination include necrotic plaques in the membranes, mainly in upper respiratory tract, the oral cavity and rumen.

Historically, the stable fly Stomoxys calcitrans Linnaeus was the arthro thought most likely to have a role in the epidemiology of LSD. This was ba on virus isolation from flies that had fed on infected cattle (Weiss, 1968). literature search, one report claims that the female mosquito, Aedes aeg (Diptera: Culicidae) is capable of the mechanical transmission of LSDV f infected to susceptible cattle, but the clinical disease recorded in the anir experimentally exposed to infected mosquitoes, was mild in nature only (Chil et al., 2001). In addition, an attempt at mechanical transmission of LSDV biting insects failed (Chihota et al., 2003). The aim of this study wa demonstrate the alteration caused by (LSDV) infection on s immunobiochemical parameters as total protein, immunoglobulins, ca++, pl sodium, potassium, in addition to hepatic and renal functions in affected cow

Materials and methods

This study was carried out on sixty Egyptian cows in a private farm (Menc Governorate, El-Sadat city). About 35 animals are monitored and inspe (apparently healthy) and considered as control group. The other 25 anir were infected with Lumpy skin disease virus (LSDV) and showed appa clinical signs and considered as infected group. The blood samples were dir taken from jugular vein (without anticoagulant) from both control and infe groups, the samples were left at room temperature for 15 min then centrifu for serum separation. After separation serum samples were kept at -20°C performing immunobiochemical analysis.

Biochemical assay:

Total protein concentration was determined by Lowry method (Lowery et 1951). Serum samples were solubilized in sample buffer containing 50 mM /HCl, pH 7.5, 9% SDS, 15 % glycerol, 6% β-mercaptoethanol. Protein sam (20/ l per lane) were subjected to SDS-polyacryalmide gel electrophoresis (gel). The gel was stained with Commasae brilliant blue. Intensities of ba were analyzed densitometrically using densitometer and the resultant va were referred to total protein concentration.

Immunological parameters:

Immunoglobulins (α, β, and γ globulins) concentrations were determined u commercial radio immune diffusion plates (Hassan et al., 1995).

Albumin concentration was performed according to the method described by (Doumas, 1975) where Calcium, Phosphours, Sodium and Potassium concentrations were determined in serum using spectrophotometer according to methods previously described by (Gindler and King, 1972; Drekh and Jung, 1970; Trinder, 1951; Terri and Sesin; 1958), respectively .

Hepatic and renal function tests:

Liver enzymes as ALT and AST were measured according the method of (Reitman and Frankel, 1957) and alkaline phosphatase according the method of (John, 1982). On the other hand, creatinine and urea concentrations were measured according to the method of (Young et al., 1975; and Putton and Crouch, 1977), respectively.

Statistical analysis:

Data were expressed as means ± S.E. and the results were considered statistically significant at ($P \leq 0.01$). All data were subjected to analysis of variance (ANOVA) test according to Snedecor **and Cochran (1980).**

Results

The present results revealed that total proteins and albumin were significantly ($P<0.01$) decreased in infected group compared to the control group (table 1). However, total immunoglobulin especially γ globulins are significantly ($P<0.01$) increased in infected group compared to the control group (table 1). Result of immunoglobulins especially IgG were significantly ($P<0.01$) increased in infected group compared to the control group (1.77 ± 0.13 in control; 3.1 ± 0.14 in infected group) (table 2). Regarding to the level of estimated minerals in the serum of both groups were significant ($P<0.01$) decreases in calcium, phosphorus, sodium and potassium concentrations in infected compared to control groups (table 3). Concerning the biochemical studies of hepatic and renal functions, there were highly significant ($P<0.01$) increases in the activity of AST, ALT and alkaline phosphatase, urea and creatinine in infected group compared to control group (table 4).

Discussion

The current study showed that there were many factors affecting the outbreak of the Lumpy skin disease virus (LSDV) in Egypt (2005-2007). It is assumed that many arthropods like stable flies may take part in the outbreak of the disease. Exposure of animals to adverse stressful conditions during seasonal climatic changes, stressful management conditions and importation of animals from other areas, might predispose for the infection. However, inferior immune statuses as well as presence of arthropod vectors were the major factors that predispose to infection with LSD (Coetzer et al., 1994).

Concerning the electrophortic pattern, there were significant decreases in both total protein and albumin in infected group however; there was a significant increase in the level of total immunoglobulin specially gamma globulin fraction. These results might be attributed to decreased synthesis and higher catabolic rate as well as damaged liver parenchyma. While, increased gamma globulins, especially Ig G immunoglobulin values were mainly an immune response following infection. These results come in accordance with that obtained by

(Estes et al., 1990; Agag et al., 1989). In general the obtained data indic ability of the body defense against these viral infections.

Concerning the biochemical studies of hepatic and renal functions, the highly significant increases in the activity of both AST, ALT and phosphatase of infected cows compared to apparently healthy cows. Th of LSDV infection on hepatic enzyme activities was so clear. Renal func also altered due to viral exposure as the data revealed that both u creatinine level were significantly increased. These results were in ag with that recorded by (Abdalla and Gawad, 1992; Aly et al., 2006) attributed the marked increase of ALT activity to the hepatocellular caused by various agents. The highly significant increase in AST acti rather inclusive with respect to the status of the liver, heart muscle general tissue breakdown caused by the virus or secondary invaders (al., 1989). The high level of serum urea and creatinine values might be from degenerative changes in kidney and liver.

In the current study, LSDV infection adversely affected the concentra serum calcium, phosphorus, sodium and potassium (table 3). On going the literatures, it seems to be scanty and not sufficient data could be t the available data about such topics. However, infected animals are g suffering from malnutrition and low energy status following loss of appe fever with subsequent disturbance of all the metabolic processes (Rost 1991; Ahmed, 2007). Generally, the significant decrease in concentrations could be attributed to two main factors; decreased synth higher catabolic rate as well as damaged liver parenchma. Changes i trace elements, especially sodium and potassium might be related to c food consumption or hinder absorption of these elements. Moreover, was considered as a sort of stress on animals and is associated with ir level of disturbed oxidant/antioxidant status in the body (Ahmed, 2007).

In conclusion, as LSDV affects all immunobiochemical parameters in th body especially protein level. Moreover, animals suffering from LSDV high temperature with inferior appetite and consequently decreased prc and cessation of milking. Animals showed severe symptoms of the dise even mortalities, so this disease consequently leads to severe economic Proper hygienic measures including combating of arthropods and the sheep pox vaccine due to cross reactivity between LSD virus and sh virus must be intensified for controlling of LSD. In addition, this study that the electrophoresis of total protein is a useful method for an diagnosis of LSD infection in vitro

Table (1): Electrophoretic pattern of serum protein (g/dl) in Egyptian cow lumpy skin infection. (Means ± SE).

Protein fraction (gm/dl)	Control group (Total no 35)	Infected (Total no
Total protein	6.8 ± 0.1[a]	5.48 ± 0.0
Albumin	3.9 ± 0.14[a]	2.10 ± 0.2
α globulins	1.60 ± 0.03[a]	1.433 ± 0.
β globulins	1.98 ± 0.04[a]	2.01 ± 0.0
γ globulins	0.62 ± 0.066[a]	1.79 ± 0.

Values with different letters in same raw means were significant (P < 0.01) and with the same letters means non significant.

Table (2): Immunoglobulin (Means ± SE) values (mg/ml) in serum of control and infected groups

Type of Igs	Control group (Total no 35)	Infected group (Total no 25)
Ig G	1.77 ± 0.13^{a}	3.1 ± 0.14^{b}
Ig A	0.29 ± 0.01^{a}	0.31 ± 0.03^{b}
Ig M	0.41 ± 0.010^{a}	0.44 ± 0.04^{b}

Values with different letters in same raw means were significant (P < 0.01) and with the same letters means non significant.

Table (3): Serum level of some minerals in both infected and control groups

Type of mineral	Control group (Total no 35)	Infected group (Total no 25)
Calcium (mg/dl)	9.50 ± 0.22a	8.10 ± 0.2b
Phosphorus (mg/dl)	5.60 ± 0.36a	4.90 ± 0.03b
Sodium mEq/L	137.21 ± 0.14a	115.20 ± 0.15b
Potassium mEq/L	4.8.32 ± 0.09a	4.00 ± 0.02b

Values with different letters in same raw means were significant (P < 0.01) and with the same letters means non significant.

Table (4): Effect of lumpy skin infection on both kidney and liver functions

Criteria	Control group (Total no 35)	Infected group (Total no 25)
ALT (IU)	18.3 ± 0.2a	39.01 ± 0.24b
AST (IU)	55.6 ± 0.5a	71.03 ± 0.021b
Alkaline phosphatase (IU/L)	65.22 ± 0.02a	79.02 ± 0.54b
Urea (mg/dl)	21.54 ± 0.55a	36.6 ± 0.06b
Creatinine (mg/dl)	1.4 ± 0.041a	1.9 ± 0.01b

Values with different letters in same raw means were significant (P < 0.01) and with the same letters means non significant.

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ن العربى

ة المناعية فى الماشية المصابة بفيروس الجلد العقدى

يوسف حسن: قسم الإمراض الباطنة .كلية الطب البيطرى بالسادات-جامعة المنوفية
فرج الكرداسى: قسم الكيمياء الحيوية وكيمياء التغذية . كلية الطب البيطرى بالسادات-جامعة المنوفية
لى: معهد بحوث صحة الحيوان (شبين الكوم)

مرض الجلد العقدى من الامراض التى تسبب خسارة اقتصادية كبيرة فى الماشية مثل ب العام والتأثير البالغ على جودة الجلود والعقم فى الذكور والتهاب الضرع فى الاناث ن فى كمية الحليب المنتجة يوميا. والسبب فى مرض الجلد العقدى يرجع الى الاصابة ل الجلد العقدى. التى تصل نسبة الاصابة به وسط قطعان الماشيه الى١٠٠% ونسبة ى الى ٥%.

ريت هذه الدراسه على عدد ٦٠ حيوان من الماشية بمزرعة خاصة بمدينة السادات ة المنوفية-مصر. قسمت هذه الحيوانات الى مجموعتين اساسيتين .المجموعة الاولى ى على ٣٥ حيوان بالفحص الظاهرى لايعانون من اى اصابة وقد اعتبرت هذه هى عة الضابطة(control)والمجموعة الثانية اشتملت على ٢٥ حيوان مصاب ص(وضوح اعراض الاصابة) واعتبرت هذه المجموعه هى المجموعه المصابة بالمرض.

تهدفت هذه الدراسة الى توضيح التأثير الناتج عن الاصابه بهذا الفيروس على مستوى كل روتين الكلى والالبيومين والاميونوجلوبين وكذلك تأثيرة على مستوى بعد المعادن مثل وم والفسفور والبوتاسيوم والصوديوم.كما تمت دراسة تأثير الاصابة على نشاط الانزيما ة بوظائف الكبد .(ALT, AST &Alk. Phosphatase) فى أمصال ات.وكذلك تمت دراسة تأثير الاصابة بالمرض على مستوى اليوريا والكرياتنين.

هرت النتائج وجود نقص معنوى فى مستوى البروتين الكلى والالبيومين والجلوبيلولين نقص معنوى فى مستوى الكالسيوم الفسفوروالصوديوم والبوتاسيوم.

بد زيادة معنوية فى نشاط انزيمات. (ALT ,AST &Alk. Phosphatase) . كما ايضا وجود زيادة معنوية فى مستوى (IGg) و اليوريا والكرياتنين.

نتائج السابقة نستخلص ان الاصابة بمرض الجلد العقدى تؤدى الى تغيرات بيوكيميائية فى امصال الحيوانات المصابة خصوصا على مستوى البروتين الكلى والالبيومين يبولين الذى يؤدى الى نقص الاستجابة المناعية للحيوانات المصابة.