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Study of Some Biochemical Changes Associated with Downer Cow Syndrome in Local Cattle

Buthainah M.K. Alzaidi[1], Omar- Althani S. Saed[2*], Khalid A.H. Hameed[2]**
[1] Directorate of Agriculture, Salah al-Din Governorate, Iraq
[2, 3] Department of Pathological Diagnostics, Veterinary College, University of Tikrit, Iraq
*Omar_med@tu.edu.iq , **dr.physiologist@tu.edu.iq

ABSTRACT

This study was prepared to find out the effect of downer cow syndrome in local cows on some biochemical parameters, 50 blood samples were collected from separate areas of the city of Kirkuk (40 blood samples from animals infected with resting cows and 10 blood samples from healthy animals) at the age of 3-8 years. Each of the parameters (Ca, Mg, P, Total protein, Albumin, Globulin, Glucose, ALT, AST, ALP, CPK) were studied. It was noted that there was a significant decrease ($p<0.05$) in the values of (Ca, Mg, P, Total portion, Albumin, Globulin, Glucose) in the infected cows compared with the healthy cows, while there was a significant increase ($p<0.05$) in the values of (ALT, AST, ALP, CPK) in cows infected with downer cow syndrome compared to healthy cows. We conclude from this study that downer cow syndrome has an adverse effect on some biochemical parameters, and these parameters in turn give an indication of infection and ways to control it through good management and treatment programs.

Keywords : downer cow syndrome, domestic cows, total protein, glucose

Introduction

The term “downer cow” syndrome is applied to any cow that is in a lying position for more than 24 hours without a clear reason. The disease affects cows with high production as a result of malnutrition and weak immune system in addition to the stress and fatigue that affects the animal after birth [1]. The disease is clinically characterized by the cow lying on the ground and lack of her ability to get up and stand up on her own during the two or three days following birth due to birth defect [2]. The animal still in a state of long lying down without responding to treatment more than once time with calcium and phosphorous compounds, but it moves and creeps actively from one side to the other 3]. This phenomenon is accompanied by metabolic and functional disorders affecting the circulatory, digestive, muscular and nervous systems, a condition that is difficult to differentiate from many cases. This makes it a complex pathological disorder and a challenge to any practicing field doctor, in addition to the financial losses it causes in saving time, medical treatment and transportation costs [4].

Several primary causes overlap with this disease, and it is difficult to distinguish them because of the similarities between them, which makes it a complex pathological problem that leads to secondary complications that cause prolonged lying, and the most important of these causes is complications of milk fever, which results in muscle and nervous injury [5], when cows remain in a lying position for 3-4 hours, the passage of blood in the hind legs decreases, which leads to inflammation and death of the surrounding muscles and tissues, and this condition is difficult to improve and return from, as the cow may break one of its limbs while trying to get up, which leads to the death of the animal or its slaughter [2]. There are many reasons for this disorder

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include the deficiency of some elements such as "magnesium, phosphorous and potassium, or a traumatic injury to the nerves feeding the posterior legs, especially the sciatic nerve and the cataract nerve due to fatal pressure during dystocia" [6], and other possible causes of severe toxicities such as mastitis, rupture of the uterus and vagina or prolapse and uterus inflammation [7]. The current study was conducted to find out:

1. Studying the level of some minerals such as calcium, magnesium, phosphorous, potassium, total protein, albumin, globulin and glucose in cows affected by downer cow syndrome.
2. Measuring the level of some serum enzymes (alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, creatine phosphokinase) in cows suffering from downer cow syndrome.

Materials and Methods

Blood sample collection

Blood samples were obtained from 50 cows from some areas of Kirkuk governorate; they were distributed into two groups: The first one included (40) cows suffering from downer cow syndrome, while the second group included (10) healthy cows, which were considered as a control group. Blood was drawn from the jugular vein. Using single-use plastic syringes, measuring 18, with a capacity of 10 ml, after sterilizing the area well with ethyl alcohol at a concentration of 70%, the blood sample was divided to tow parts Approximately 2.5 ml was placed put in the test tubes containing EDTA anticoagulant material to obtain fresh blood for for hematological examinations. As for the other part, about 7.5 ml was placed in plan test tubes, left at room temperature 25 ° C for half an hour, and then placed in a centrifuge and the speed of the device was set at 3000 rpm for 15 minutes to obtain the serum for biochemical tests and was kept in Abendorf tubes. Refrigerate at -20°C until necessary checks are carried out.

The duration of the study took place from 1/10/2020 until 1/6/2021, and all biochemical tests were conducted in the Al-Kindi laboratory. The concentration of elements (calcium, magnesium, glucose, total protein, albumin) was analysed by a spectrophotometer at wavelength 570, 520, 500, 540, respectively according to the method by [8]. As for phosphorous, potassium was analysed by atomic absorption spectrometry at wavelength 340,587. As like the method of [9].

Globulin was estimated by subtracting albumin from total protein. The activity of AST, ALT, ALP, and CPK was estimated by spectrophotometer and at wavelength 546,510,540 using the method [10].

Statistical analysis

The results were statistically analyzed using the ready-made program (SPSS) for the values that represent the mean and standard error, and the data were analyzed using the analysis of variance one way (ANOVA), and the differences between the groups were determined using the Duncan multiple range test. For all tests, it was at a probability level of ($P \geq 0.05$).

Results and discussion:

The results of the study showed, a significant decrease ($p<0.05$) in the level of calcium, magnesium, phosphorous, potassium in cows infected with downer cow syndrome compared with healthy cows. The results of the current study agreed with study [11] as it showed that low calcium in the blood occurs in the perinatal period, whether during or after birth, in order to meet the requirements of the fetus and prepare the udder with milk and colostrum. As mentioned [12]

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and [13] in their study that the reason for the low level of calcium in the blood may be attributed to an imbalance between calcium taken and excreted from urine or dung, and the failure of the PTH hormone to regulate the level of calcium by absorbing it from the intestines with the help of vitamin D3. As for phosphorous deficiency, an imbalance occurs between calcium and phosphorous when grazing cows in alfalfa farms, which contains high amounts of calcium and its lack of phosphorus without Compensating the animal with dry diets containing phosphorous or to increase its excretion from urine and the lack of saliva secretion as a result of a decrease in rumen movement [2].

Table 1. the effect of downer cow syndrome on the level of (Ca, Mg, P, K) compared to control group

The parameters/ groups	Infected group mean± SD	Control group mean ±SD
Calcium (mg/Dl)	8.26±1.7 b	11.95±1.5 a
Magnesium (mg/dL)	1.83±0.8 b	2.23±0.9 a
phosphorous (mg/dL)	5.42±0.3 b	6.3±0.8 a
Potassium (mmol/L)	3.7±0.3 b	4.44±0.84 a

The different lowercase letters within the same row indicate a significant difference at the level ($P \leq 0.05$).

The results of the study agreed with the study of [14] about magnesium deficiency in laying cows, which may be attributed to digestive disorders, malnutrition and increased excretion in milk, especially in dairy cows. Magnesium deficiency causes muscle cramps, nervous excitability, and convulsive seizures, leading to the cow's sluggishness and then lying down. The results of our study agreed with study [15], which indicated that potassium deficiency may occur from muscle damage resulting from prolonged lying down, which leads to increased exudation of the muscle cell membranes of potassium and its leakage outside the cells, causing muscle spasm and the inability of the cow to rise.

Table 2. the effect of downer cow syndrome on the level of (total protein, albumin, globulin, glucose) compared to control group.

The parameters/ groups	Infected group mean± SD	Control group mean ±SD
total protein (g/Dl)	7.1±0.3 b	0.1±8.7 a
albumin (g/dL)	3.3±30.3 b	0.04±4.1 a
globulin (g/dL)	3.8±10.0 b	4.06±0.02 a
glucose (mg/L)	65.13±3.48 B	77.55± 4.3 a

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The different lowercase letters within the same row indicate a significant difference at the level (P ≤ 0.05).

The results of the study showed a significant decrease (P≤0.05) in the level of total protein, albumin, globulin and glucose in the affected cows compared with the healthy cows. The results of the study agreed with study [16] and study [17] in which they showed that a decrease in the value of protein, albumin and globulin may be affected by the physiological state of the animal and the cow's need to produce colostrum and the formation of immune bodies in milk. As for glucose deficiency, the results of the study were in agreement with the study [18], in which he mentioned that the deficiency of glucose usually decreases in conjunction with the hormonal changes that occur during that period, in addition to the lack of dry matter consumption, which can cause a defect in liver functions, and this is reflected in the negative energy balance required for milk production.

Table 3. the effect of downer cow syndrome on the level of (AST ،ALT ،ALP ،CPK) compared to control group.

The parameters/ groups	Infected group mean± SD	Control group mean ±SD
AST (IU/L)	54.87±2.7 a	19.48±1.51 b
ALT (IU/L)	88.42±5.2 a	55.46±1.38 b
ALP (IU/L)	50.67±3.2 a	41.24±2.7 b
CPK (IU/L)	140.32±6.22 a	94.43±7.3 b

The different lowercase letters within the same row indicate a significant difference at the level (P ≤ 0.05).

It was observed that there was a significant increase (P ≤0.05) in the level of AST, ALT, ALP, and CPK in cows infected with downer cow syndrome compared with healthy group, and the results were in agreement with a study [19] In which shown that the level of CPK enzyme rises after 12-24 hours from the beginning of lying down, and this may be attributed to the presence of injury and damage to the muscles due to the presence of the enzyme in a high percentage in the muscles.

As for changes in the levels of AST, ALT, and ALP enzymes, the results of the study agreed with a study [20], in which they stated that an increase in these enzymes may occur as a result of damage the liver cells and due to changes in the ability of antioxidants in the liver or a change in the structure of phospholipids in the cell membrane; Which leads to the rupture of the liver cell and releasing the enzymes in the blood stream and became in high concentration in the blood.

The results of the study were also in agreement with the researchers' study [21], in which they showed that cow lying may have a negative effect on hepatocytes or the occurrence of fatty liver changes, and thus an increase in the level of serum enzymes AST, ALT. In addition, the increase in the concentration of ALP enzyme may be caused by high biliary pressure and acute cell necrosis, which leads to the release of ALP enzyme from the hepatic membranes and then into the blood.

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