

## BIOCHEMICAL INDICATORS IN SERUM INFLUENCED BY THE DOWNER SYNDROME IN DAIRY COWS

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### Abstract

Downer syndrome in dairy farm cows causes considerable direct and indirect economic damages and shows clinical, in particular prognostic, difficulties. The study aims at detecting biochemical indicators in the blood serum of cows with downer syndrome.

During the period January 2014 – March 2017 cases of downer cows' syndrome were studied in farms of Prizren area, in Kosovo. In 34 cows of different breeds and ages, diagnosed with downer syndrome blood samples were taken from jugular vein and serum was dissociated. Samples were analyzed using Biochemical analyzer EMP-168 Vet with respective kits, for following indicators: total proteins, albumins, overall calcium, inorganic phosphorus, magnesium, total bilirubin, creatinine, aspartate aminotransferases and alanine aminotransferases. The obtained data were statistically analyzed using ANOVA method (homogeneity of variances and normality) and compared with values of the reference according to averages of haemato-biochemical indicators of clinically healthy animals.

Obtained data showed that most influenced indicators were albumin ( $4.12 \pm 0.71$  from 2.1 - 3.6 g/L), overall calcium ( $1.69 \pm 0.59$  from 2.43 - 3.10 mmol/L), inorganic phosphorous ( $1.04 \pm 0.38$  from 1.08 - 2.76 mmol/L), magnesium ( $1.23 \pm 0.33$  from 0.74 - 1.10 mmol/L) and alanine aminotransferases ( $387.8 \pm 33.6$  from 35 - 350 IU/L). Changes in found biochemical indicators are statistically confirmed ( $p < 0.05$ ). Our data are close with reports of other researchers.

Based on the obtained results we think that changes in haemato-biochemical indicators can be used to check the clinical status and prognosis in cows affected by the downer syndrome.

**Key words:** Downer syndrome, Albumin, Calcium, Phosphorus, Magnesium, ALT.

### 1. Introduction

Cows that stay in recumbent position for more than 24 hours are treated as cattle with "downer" syndrome. Downer syndrome in cows is one of the most difficult clinical problems in dairy cow farms since majority of them fail to stand even after few days of medical care. This syndrome in cows is able to provoke considerable direct and indirect economic damages as it is often necessary to enforce forced slaughtering. Giving an accurate diagnosis for downer cow syndrome is complex and not always easy. Current studies are focused on finding connections between clinical diagnosis and changes in hematologic and hemato-biochemical indicators in blood.

The work dealing with the research and finding links between clinical diagnosis and hemato-biochemical changes aims in this direction. Hemato-biochemical and hematologic changes occurring in cows with downer syndrome can be used clinically to assess patient's clinical status and prognosis.

## 2. Materials and Methods

The study was carried in the period January 2014 - March 2017. Materials for this research were 34 cows of different ages and breeds, clinically diagnosed with the downer syndrome. Blood samples were taken from their jugular vein, and indicators of the: total proteins, albumins, overall calcium, inorganic phosphorus, magnesium, total bilirubin, creatinine, aspartate aminotransferases (AST) and alanine aminotransferases (ALT) were analysed. Samples were analysed using Biochemical analyser EMP-168 Vet. with respective kits. The obtained data were statistically analysed using method ANOVA (homogeneity of variances and normality) and compared with values of the reference according to Radostits *et al.*, [7], and with the average of hemato-biochemical indicators of clinically healthy cattle in our country. For the most visible affecting indicators by the downer syndrome (total of calcium and magnesium), biochemical checks in serum were performed on daily bases in 10 cattle heads and during the course of several days.

## 3. Results and Discussion

Hemato-biochemical indicators found in cattle diagnosed with downer syndrome, with their maximal, minimal and average values are shown in Table 1. In the Table are placed for comparison also data of normative indicators according to Radostits *et al.*, [7].

From the obtained data it seems that from indicators in the study some change (values with bold) and some

keep the normative values. Most affected indicators by the downer cow syndrome are the: amount of albumins, level of total calcium, of inorganic phosphorous, of magnesium and ALT. Total amount of proteins, level of total bilirubin, of creatinine and AST kept the normative values.

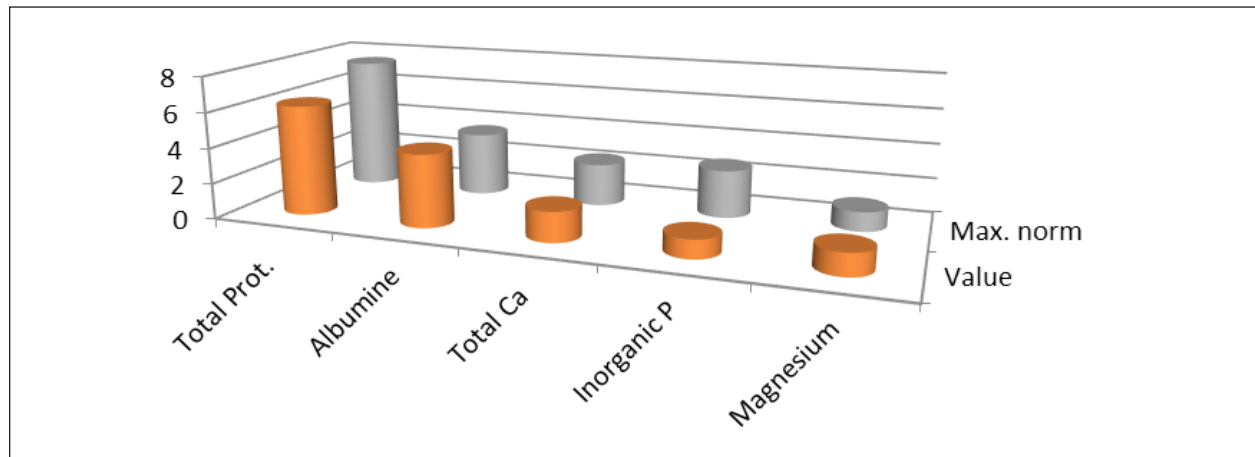
The average level of albumins increases respectively  $4.12 \pm 0.71$  g/dL from 2.1 - 3.6 g/dL which is reference normative value. The indicator of the total calcium shows a significant decrease, respectively  $1.69 \pm 0.59$  mmol/L from 2.43 - 3.10 mmol/L, which are maximal and minimal values of reference norm. Average values of inorganic phosphorous also shows a decrease, respectively  $1.04 \pm 0.38$  mmol/L, towards 1.08 - 2.76 mmol/L that are normative values. With significant increase appear average values of magnesium and ALT. average level of magnesium increases on average  $1.23 \pm 0.33$  mmol/L, compared with 0.74 - 1.10 mmol/L, which are maximal and minimal values of normative reference. ALT increases up to  $387.8 \pm 33.6$  IU/L from 35 - 350 IU/L that are values of reference norm. Hemato-biochemical indicators studied with their average values are given in Figure 1 compared with maximal normative levels.

Hemato-biochemical changes found for the indicator of albumin amount, total of calcium, inorganic phosphorous and magnesium are statistically verified ( $p < 0.05$ ). Data for change in the values of ALT are not statistically confirmed. Changes in ALT values were non-uniform, with wide variations and can be random in different individuals.

**Table 1. Maximal, minimal and average values of hemato-biochemical parameters in cows, compared with normative values**

Indicators	Reference values (Radostits [7])	Indicators by diagnosis	
		max. and min. values	aver. values ( $M \pm m$ )
Total Proteins g/dL	<b>6.7 - 7.5</b>	8.2 - 4.8	$6.27 \pm 1.37$
Albumin g/dL	<b>2.1 - 3.6</b>	*5.0 - 3.3	<b><math>4.12 \pm 0.71</math></b>
Total of calcium. (mmol/L)	<b>2.43 - 3.10</b>	*3.13 - 0.96	<b><math>1.69 \pm 0.59</math></b>
Inorganic phosphorous (mmol/L)	<b>1.08 - 2.76</b>	*2.0 - 0.61	<b><math>1.04 \pm 0.38</math></b>
Magnesium (mmol/L)	<b>0.74 - 1.10</b>	*1.59 - 0.51	<b><math>1.23 \pm 0.33</math></b>
Total of bilirubin ( $\mu$ mol/L)	<b>0.17 - 8.03</b>	65.7 - 2.17	$4.52 \pm 2.22$
Creatinine ( $\mu$ mol/L)	<b>0.35 - 2.80</b>	1.62 - 0.4	$1.04 \pm 0.54$
AST IU/L	<b>60 - 150</b>	403.0 - 13.2	$82.2 \pm 27.3$
ALT IU/L	<b>35 - 350</b>	2040.0 - 58.2	<b><math>387.8 \pm 33.6</math></b>

\*Significant changes towards the reference group ( $p < 0.05$ ).



**Figure 1. Average values of few hemato-biochemical indicators in downer cow syndrome, compared with maximal normative values**

Above claims about changes of values of few hemato-biochemical indicators under the influence of the downer cow syndrome are shown also in Figure 1. Total proteins are lower than maximal normative level, whilst the amount of albumins is increased. In the Figure 1 we can see reduced values of calcium and phosphorous, as it is recorded the increased level of magnesium.

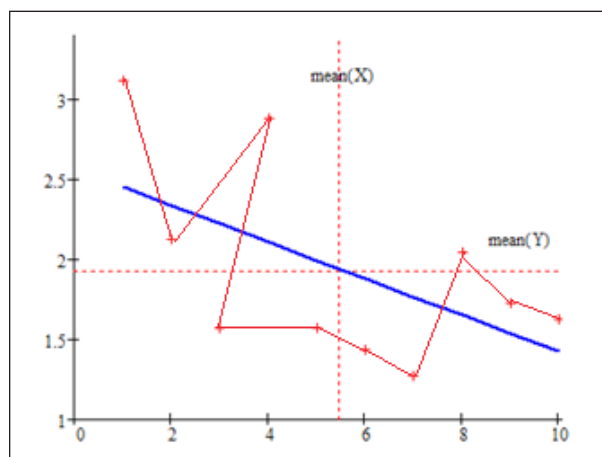
Hemato-biochemical changes of indicators in the blood serum of cows with pathology associated by downer syndrome are reported by other authors in their studies [1, 2].

From indicators in the study the total level of calcium and magnesium showed identified changes and with progressive tendencies by subsequent days of the recumbent condition. For these two indicators, in particular, samples and checks were carried on daily bases in 10 cattle heads. Obtained data are shown in Figures 2 and 3 that show the tendency of change.

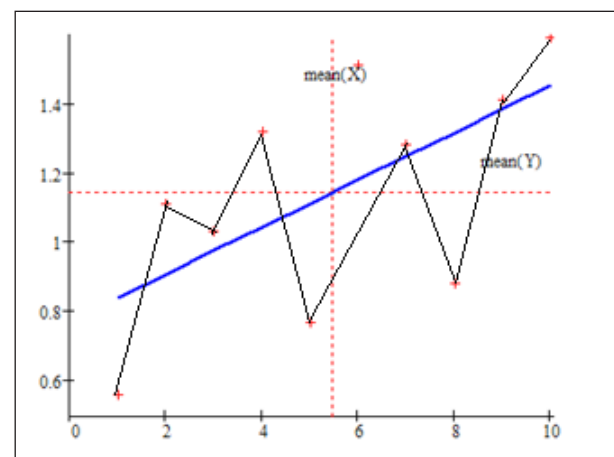
In Figures 2 and 3 are represented decreasing and increasing tendencies of the average levels of total calcium and magnesium by the days of recumbent position. Tendency for decrease or increase of the hemato-biochemical indicators recorded as occurrence in this study corresponds with the reported finds from other authors, Peinado *et al.*, [6].

We suppose that statistically confirmed changes in the average values of hemato-biochemical indicators is the body's respond towards the susceptible cause of the clinical pathology manifested in the recumbent position, Ceroni V. *et al.*, [2], Doornenbal *et al.*, [3], Peinado *et al.*, [6], Radostits *et al.*, [7].

The study results suggest that cows suffering from the downer syndrome, changes occurring in the hematologic and hemato-biochemical indicators can be used and be valuable in determining the prognosis for dairy



**Figure 2. Average level of total calcium based on the subsequent days in the cows with downer syndrome. (Red curve shows changes in daily average values, whilst blue curve shows the tendency of progressive decrease of the level of magnesium depending on the days of recumbent position)**



**Figure 3. Average level of magnesium based on the subsequent days in cows with downer syndrome. (Black curve shows daily variations, whilst blue curve shows the tendency of progressive increase of the level of magnesium depending on the day of the recumbent position).**

cows. Other researchers as well reached such conclusions, Lumsden *et al.*, [5], Doornenbal *et al.*, [3], and Duraj and Ceroni [4].

#### 4. Conclusions

- In cows suffering from downer syndrome present are statistically confirmed changes in values of few hemato-biochemical parameters.
- Indicators that are affected mostly by the downer cow syndrome are the level of albumins, level of total calcium, inorganic phosphorous, of magnesium and ALT.
- The amount of albumins, level of magnesium and ALT faces significant increase.
- Level of total calcium and inorganic phosphorous are indicators facing significant decrease from the normative levels.
- Average level of total calcium and magnesium have opposite tendencies of changes. Changes in these indicators in cows are apparent and tend to aggravate, depending on the days of recumbent position.
- Hemato-biochemical indicators in cows changed by the presence of the downer syndrome can be used to specify the diagnosis and assessing their prognosis.

#### 5. References

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