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Researching some mineral substance and vitamin levels in the cattle with indigestion

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ABSTRACT

Objective: This study; It was aimed to compare serum and rumen content, trace element and serum vitamin levels and rumen content in indigestion cattle with healthy animals.

Materials and Methods: The study was conducted on a total of 30 cattle, 10 healthy (control group) and 20 indigestion group. Indigestion diagnosis in animals was determined by anamnesis information, clinical and rumen content examination.

Results: Hematologically, there was no statistical difference between indigestion and control groups. Serum magnesium (Mg), calcium (Ca), zinc (Zn) levels of the measured trace elements decreased in the group with indigestion ($p<0.05$), while the levels of cobalt (Co) increased significantly ($p<0.01$). While there was a significant increase ($p<0.5$) in cattle with indigestion in rumen content Ca values compared to healthy cattle, serum levels were decreased ($p<0.05$). A positive correlation ($p<0.01$) was determined between rumen content levels of indigestion cattle and serum Mg levels of control group and rumen content of control group. In addition, a negative correlation was found between serum Ca and rumen content values of cattle with indigestion. In serum vitamin levels, Vitamin B_1 (Vit B_1) decreased statistically ($p<0.05$), while Vitamin B_{12} (Vit B_{12}) was found to increase non-statistically ($p>0.05$).

Conclusion: As a result, it was concluded that the decrease in serum Mg, Ca and Zn values in indigestion animals is important and these trace elements should be used in treatment.

Keywords: *Cattle, Indigestion, Rumen Content, Trace Elements*

INTRODUCTION

Indigestion, is a state of disruption of stomach movements and functions (İmren, 2003). Simple indigestion is a small-scale abnormality observed in forestomach motility or fermentative activity due to a sudden change in the quality and content of the diet used in feeding or other factors (Gül, 2016; Shah et al., 2017; Arora et al., 2018). Simple indigestion is of acute onset and does not lead to significant pathological consequences (Stefańska et al., 2017; Pechová and Nečasová, 2018).

The digestive system of ruminants is an ideal environment for fermentation. More than 60% of digestive activities occur in reticulo rumen. In ruminants, nutrients that monogastric animals can not digest, thanks to the microorganism population in the reticulo can be digested (Özel and Sarıçiçek, 2009). In this anaerobic conditions environment under microorganism bacteria, protozoa and fıngus are present symbiotically (Bilal, 2003; Altuğ, 2014).

Indigestion may be caused by all nutritional factors that cause changes in the intra-rumenal environment (Poock, 2011). Sudden ration changes, unbalanced ration, excessive feeding of grain feeds, increased energy amount in the ration, unidirectional feeding, poor quality feed materials

(frozen or moldy feeds, poor quality or soil contaminated silage), feding of your time irregularity, insufficient water supply, long-term use of antibiotics, sulfonamides or disinfectants, inactivity or reduced feed intake as a result of being closed, some diseases (such as forestomach or abomasum dysfunctions and other organ diseases) occur as a result of impaired adaptation of rumen microorganisms (Gül, 2016). Subacute rumen acidosis is also one of the suggested causes (Foster, 2003).

One of the most commonly used examinations in the diagnosis of forestomach diseases of cattle is the analysis of rumen fluid. Many physical and biochemical analyzes of rumen fluid samples are made (Dabak, 2009). In 1 ml of rumen content there are approximately $1x10^{10}$ bacteria, $1x10^{6}$ ciliate protozoa and $1x10^{6}$ fungus. This microbial population allows the diet to ferment essential fatty acids (acetic acid, propionic acid and butyric acid) microbial proteins and minerals (Dehorrity, 1998).

Trace elements have great importance in increasing the resistance against diseases in living things (Sarıbay and Özsoy, 2019). It is emphasized that insufficiency or excess causes serious clinical symptoms, causes significant losses in the livestock economy, and the resulting losses are as important as those caused by infectious and parasitic diseases. In animals, diseases caused by macro and micro elements are of great importance (Durmuş and Eryavuz, 2012). Incomplete or excessive intake of one or a few elements disrupts normal functions, as well as deterioration of the ratios between elements can cause physiological changes in the organism (Yeşil and Sarıözkan, 2017; Sarıbay and Özsoy, 2019; Hervig et al., 2019).

Copper is one of the most important trace elements necessary for the body and essentially it must be taken from outside. (Paksoy et al., 2010). The amount of Cu in the blood of cattle is between 32.8-35.2 µg / dl (Küçükaslan, 2011). It has been reported that symptoms such as growth pause, weight loss and cachexia occur in copper deficiency due to the contraction of oxidation in tissues (İmren and Şahal 1991).

Zinc essentially enters the structure of many enzymes in different ways, and protein, carbohydrate, nucleic acid and lipid metabolisms also play a role through these enzymes (Tanyüksel, 1995). Total blood Zn amount in cow are 319±34 µg/dl (Küçükaslan, 2011). Zn deficiency; It causes many symptoms such as diarrhea, anorexia, weakening, growth retardation, mouth inflammation, decreased milk yield, parakeratosis, and allopesia in animals (Başoğlu, 2004; Gül, 2012).

Chlorine is an extracellular ion with a high concentration (Turgut, 2000; Şentürk, 2013). Serum normal value of Cl in cattle; It is 95-110 mEq/l (Şentürk, 2013).

Extracellular Cl concentration is determined by measuring the plasma Cl level. Plasma Cl concentration varies according to absorption from the intestines. In cases of diarrhea or food-related indigestion that delay gastric emptying and in abomasal displacements, a Cl level below 75 mmol/l is accepted as a negative plasma value (Bilal, 2012).

Calcium is the most important mineral that forms bone tissue (Guyton and Hall, 1996). The blood Ca level of adult cattle is approximately 8.5-10 mg/dl. It is possible that blood Ca can maintain its normal normal level, Ca absorption from the rumen and intestines and Ca mobilization from bone tissue are possible (Guyton and Hall, 1996). Two types of hypocalcemia are mentioned in dairy cattle. The most common of these is parturient hypocalcemia, which is formed due to birth-related Ca loss, and less commonly, a decrease in non-parturient Ca levels due to Ca loss due to gastrointestinal diseases such as indigestions rather than Ca loss due to the onset of lactation and secondary disorders such as stress (Başoğlu and Sevinç, 2004).

Magnesium is an essential macro element essential for numerous functions in the body of all mammals, including fattening and diurnal cattle (Schaff, 2014). The digestibility of Mg in the diet is around 40% in ruminants and 60% in horses, cats and dogs. Mg is absorbed in the forestomach in ruminants, the last part of the small intestines and colon in monogastric animals. Increasing serum Mg level causes its absorption to decrease. While absorption occurs from the small and large intestine up to 1 month in calves, absorption occurs from here after the forestomach develops (Bilal, 2012).

Cobalt, which is one of the essential elements for ruminant animals, is necessary for rumen microorganisms to synthesize vitamin B_{12} (Vit B_{12}) (Okatan et al., 2008; Küçükaslan, 2011; Gül, 2012). Rumen bacteria are used in Vit B_{12} synthesis to meet both the animal's and their own Vit B_{12} needs (McDowell, 1992; Uyanık, 2000). Vit B_{12} deficiency due to Co causes loss of appetite and weakening in ruminants (Uyanık, 2000).

Deficiency of B vitamins in indigestion occurs due to the activity of rumen microflora (George, 2006).

Because they provide the nutrients (B complex vitamins and all essential amino acids) that ruminant animals need (Ensminger et al., 1990). Because they provide the nutrients (B complex vitamins and all essential amino acids) that ruminant animals need (Ensminger et al., 1990).

In studies conducted on the use of organic minerals in ruminant nutrition, it has been reported that these minerals can be used in ruminant rations, increase yield performance, prevent low yield due to mastitis, have an effect on milk production and quality, using organic minerals reduces the number of somatic cells and has a positive effect on immunity (Boland, 2003).

In this study; It was aimed to compare serum and rumen content, trace element and serum vitamin levels, rumen content examination and hematological parameters in cattle with indigestion with healthy animals.

MATERIALS and METHODS

This study was approved by Yuzuncu Yil University Animal Experiments Local Ethics Committee (YUHADYEK) with the decision dated 25.06.2015 and numbered 08.

Animal selection criteria

Animal material included in the study was carried out on a total of 30 cattle with an average age of 3 (three) registered with the Ministry of Agriculture and Forestry in Van and surrounding districts. Twenty of these animals were indigestion and 10 of them constituted the control group. Routine clinical examination of all cattle was made (heart and respiratory frequency, body temperature, dehydration status, examination of mucous membranes) and the data obtained were recorded.

Among the cattle with suspicion of 20 indigestion with anorexia, decrease in milk yield and rumen movements according to anamnesis information; With the help of the content probe, the rumen content was taken into containers that were duly heated up to 36-38°C at room temperature. This content, which was brought to the laboratory, was first examined macroscopically and the pH value was measured. At the same time, the preparation was prepared and examined under a microscope in terms of infusoria. Samples detected as positive for indigestion were stored at -20°C until the number was completed. It was determined that the presence and mobility of protozoans in the indigestion group decreased compared to normal. Ten cattle without any symptoms in their anamnesis and showing compliance with physiological conditions as a result of rumen content controls constituted the control group.

In addition, blood samples were taken from the animals in both biochemistry and hematology tubes from the vena jugularis. The rumen contents and the serums separated by centrifuge were stored in a deep freezer (-20ºC) in the laboratory of the Van Yuzuncu Yil University, Faculty of Veterinary Medicine, Department of Internal Diseases.

Method

Hematological examinations

The blood collected was brought to Van Yüzüncü Yıl University Faculty of Veterinary Medicine, Department of Internal Diseases, and hematological parameters (Red blood cell (RBC), Haemoglobin (Hg) Haematocrit (HTC), MCV, White blood cell (WBC), Lymphocyte (LY), Monocyte (MO) Neutrophil (NE), Eozonophil (EO), Basophil (BA), Platelet (PLT), veterinary blood count device (Abacus - Junior Vet5).

Biochemical Examinations

Serum samples were seperated off by centrifugation for 3000/10 cycle /minute and stored in a deep freezer (-20°C) until biochemical analysis was performed.

Physical examinations of rumen contents

In the diagnosis of indigestion animals, pH, smell, color, consistency, number of protozoa and their movements (Başoğlu, 1998; Bilal, 2012; Şentürk, 2013; Altuğ, 2014) were evaluated.

Trace element measurements of rumen content

For the determination of trace elements and minerals in rumen content; The content samples were centrifuged before analysis (3000/5 rpm) and the supernatant part was removed. Diluted with 2 ml rumen contents and 2 ml 1/5 nitrochloric acid and centrifuged (3000/5 rpm) then filtered and clear filtrate. 3 ml was taken and placed in tubes. From trace elements and minerals from the supernatant taken; Zn, Cu, Ca, Mg, Co and Cl levels were measured by Atomic Absorption Spectrophotometer device.

Serum Vit B_1 liquid chromatography device (HPLC Agilend 1100), Vit B_{12} levels (Abbot C16200®) device and Zn, Cu, Ca, Mg, Co and Cl levels of trace elements were measured with Atomic Absorption Spectrophotometer device.

Statistical analysis

Descriptive statistics for control group and indigestion group; Average was expressed as Standard Deviation values. Independent-samples T test was performed to compare the control group and the indication group.

In addition, Spearman correlation analysis was performed to determine the relationships between blood serum and rumen content parameters.

In calculations, the statistical significance level was taken as 5% and the SPSS statistical package program was used for calculations (Suvak et al., 2014; Başbuğan et al., 2015).

RESULTS

Clinical findings

Anamnesis information was obtained in cattle with indigestion, no eating and drinking between 3-10 days, animals did not rumble, decreased milk yield was observed, fatigue and staggering, tympani in some animals and no defecation was obtained.

A rumen examination was performed along with the general examination of the animals whose anamnesis information was obtained. Hypomotility was detected. Rumenoreticular contractions were found to be lower than normal. It was also observed that the sounds heard from the rumen were weakened. In 10 of the animals, foreign bodies were found to be positive after ferroscopic examination. It was found that the indigestion was formed due to the foreign body.

Rumen content examination

In healthy animals (control group) included in the study, the pH of the rumen content was 6-7, the smell was normal, aromatic, its color changed from bright green to gray, its consistency was viscous and infsoria was dense and mobile, in the indigestion group the pH was 6-8, the odor was sour and moldy, dingy color changed from gray to dark green even black, its consistency was watery and foamy, the amount of infsoria was small and the presence of only small sized ones were found to be less mobile.

Table 1. Trace element levels with indigestion and control animals.

Parameters		Control (n=10)	Indigestion (n=20)	Reference value
Mg	Serum (mg/dl)	2.089±1.27	1.540±0.89*	1.8-2.3[1]
	Rumen content (mg/L)	27.21±0.18	27.00±0.75	
Zn	Serum (µg/dl)	1.17±0.04	0.96±0.05*	0.95-1.03[2]
	Rumen content (mg/L)	3.36±0.72	4.05±064	
Cu	Serum (mg/L)	0.6±0.04	0.48±0.04	0.5-2.2[3]
	Rumen content (mg/L)	0.45±0.13	0.24±0.03	
Ca	Serum (mg/dl)	13.87±3.84[a]	8.94±2.18*[b]	9.7-10.4[4]
	Rumen content (mg/L)	312.46±59.77[a]	374.07±81.63*[b]	
Cl	Serum (mEq/L)	98.05±6.04	91.62±4.30	97-111[4.5]
	Rumen content (mg/L)	22.36±0.8	26.04±1.03	
Co	Serum (µg/dl)	0.16±0.01	0.29±0.02**	0.26[2]
	Rumen content (mg/L)	0.49±0.02	0.56±0.09	

* Indicates the statistical significance on the same line. [a,b] Indicates the statistical significance in the different row. [1](Şentürk 2013), [2](Okatan ve ark., 2008), [3](Blood ve ark.,1987),[4](Bilal 2012), [5](Turgut, 2000)

Laboratory findings

Trace element levels obtained from indigestion and control group animals in the study are given in Table 1, and Vit B_1 and B_{12} levels are given in Table 2. Among the statistical correlation analyzes, no statistically significant correlation was found in the serum and rumen content values of Cu, Zn and Co, and the statistical correlation tables of the Mg and Ca parameters are presented in Table 3,4.

Biochemical findings

In the indigestion group, it was determined that Mg, Ca and Zn levels were statistically decreased compared to the control group. (P<0.05).

Table 2. Vitamin B_1 and B_{12} levels with indigestion and control animals.

Parameter	Control	Indigestion	Reference
Vit B_1 (µg/dl)	8.30±0.44	4.40±0.30**	7±1.1 [1]
Vit B_{12}(pg/ml)	193.00±7.69	186.62±15.84	155.13±19.74 [2]

*p<0.01

[1](Mert, 1996), [2](İssi ve ark., 2010)

It was observed that there was a statistically significant increase in serum Co levels in the indigestion group compared to the control group. (p<0.01).

It was determined that Ca level in rumen content in the indigestion group increased statistically compared to the control group (p<0.05)

It was determined that serum vit B_1 levels in the indigestion group were statistically significantly decreased compared to the control group (p<0.01). In the indigestion group compared to the control group, there was no statistical significance for the results obtained at vit B_{12} levels (p>0.05).

Table 3. Magnesium serum and rumen content levels with indigestion and control animals.

Parameter		Serum Mg		Rumen content Mg	
		Control (n=10)	Indigestion (n=20)	Control (n=10)	Indigestion (n=20)
Serum Mg (mg/dl)	Control	1			
	Indigestion	-0.217	1		
Rumen content Mg (mg/dl)	Control	0.870**	0.139	1	
	Indigestion	-0.212	0.283	-0.199	1

**: p<0.01

Table 4. Calcium serum and rumen content levels with indigestion and control animals.

Parameter		Serum Ca		Rumen content Ca	
		Control (n=10)	Indigestion (n=20)	Control (n=10)	Indigestion (n=20)
Serum Ca (mg/dl)	Control	1			
	Indigestion	-0.636	1		
Rumen content Ca (mg/dl)	Control	-0.040	-0.341	1	
	Indigestion	0.654	-0.897**	0.057	1

**: p<0.01

After Spearman correlation analysis performed to determine the relationships between properties in serum and index group, a 87.0% correlation was found between serum Mg value of control group and Mg value of rumen content of control group. Accordingly, while the serum Mg value in the control group increases, the rumen content of the control group also increases by 87.0%. In other words, while the Mg value of the rumen content of the control group increases, the serum Mg value of the control group also increases by 87.0%.

There was no statistically significant correlation among other features. After Spearman correlation analysis performed to determine the relationships between properties in serum and indigestion groups, a negative correlation of 89.7% was found between the serum Ca value of the indexed group and the rumen content Ca value of the indigested group. Accordingly, while serum Ca value in the indigestion group decreased, the rumen content Ca value in the control group increased by 89.7%. There was no statistically significant correlation between other features.

DISCUSSION

Forestomach diseases have an important place in the digestive system diseases of cattle (Dabak, 2009; Suvak et al., 2014). The yield level obtained from

ruminants is in parallel with the healthy work of the forestomach and abomasum (Başoğlu, 1998). One of the most common examinations used in the diagnosis of forestomach diseases of cattle is the examination of rumen fluid. Many physical and biochemical analyzes of rumen fluid samples (Dabak, 2009; Suvak et al., 2014). For this purpose, the analysis of rumen content, color, odor, pH, consistency and existing infsoria is an important criterion (Bilal, 2012; Şentürk, 2013).

According to researches, the color of the rumen content changes depending on the quality of the feed given to the animal. The color varying between gray and brown in those fed in pasture and in green barns. When healthy animals are fed with a diet rich in carbohydrates, rumen content is sour and an odor similar to ammonia is perceived when they are fed protein-rich diet. In cases of rumen acidosis, it turns into a sour dough odor. pH examination of rumen content is between 6.2-7.2 in healthy animals. In rumen acidosis, while the colour of rumen content turns from sesema paste-tahini- to brown, it smells like sourdough and the pH drops below 5. While the rumen content in rumen alkalosis has a sharp ammonia odor, the pH is between 7.5-8.0. In rumen smelling, while the color takes on a greenish color close to black, an odor resembling the smell of rotten and sour food is perceived (Başoğlu, 1998; Bilal, 2012; Şentürk, 2013).

In this study, it was observed that the rumen content of the indigestion group changed from dark green to gray brown, their pH was between 7-8 and had a musty and sour odor. In the control group, it was observed that the rumen content was green and brown in color, its odor was not aromatic and not alarming, but its pH was between 6-7. This situation is in line with what the researchers (Başoğlu, 1998; Batmaz, 2010; Clanie and Tesfaye, 2012; Şentürk, 2013) stated.

In the examination of infsoria, which has an important place in the examination of rumen content, it is stated that the density of animals fed with insufficient and poor quality ration decreases, when the pH is below 5, the infsoria completely disappear, and when the pH is 7 and above, their movements are reduced although they are dense and lively (İmren, 2003; Bilal, 2012; Şentürk, 2013).

It was observed that the infsoria in the stomach contents of the control group animals included in this study were dense, mobile, and equal numbers of large, small and medium sizes. In the indigestion group, the presence of fewer and less mobile infsorias was detected. It was understood that these findings were similar to what the researchers (Şentürk, 2013; Bilal, 2012) said about indigestion animals.

In this study, no statistical difference was found between hematological parameters examined in control and indigestion groups. Due to this situation, it was not included in the discussion. Although serum trace element and mineral levels have been determined in many studies, no study has been found on the mineral and trace element levels of rumen fluid. The aim of this study was to evaluate serum and rumen content, mineral and trace element levels together to aid in diagnosis and to be used as a reference value in animals with indigestion.

The Mg level in healthy cattle is reported as 1.8-2.3 mg/dl (Şentürk, 2013). In this study, serum Mg level was measured as 2.089±1.27 mg/dl in the control group and this was found to be parallel with the specified value. Serum Mg value was measured as 1.540±0.89 mg/dl'in the indigestion group. This value is lower than the control group and is statistically significant ($p<0.05$). While the Mg level of rumen content was 27.21±0.18 mg/L in the control group, it was 27.00±0.75 mg/L in the group with indigestion. It was observed that there was no difference compared to the control. Magnesium is an essential macro element essential for numerous functions in the body of all mammals (Schauff, 2014). Mg is absorbed in the forestomach of cattle. Increa

Serum Zn levels are reported to be 0,98±0,01(0,95-1,03) μg/dl in healthy cattle (Okatan et al., 2008). Serum Mg level causes decrease in absorption (Bilal, 2012). In this study, serum Zn level was measured as 1.17±0.04 μg/dl in the control group and 0.96±0.05 μg/dl in the indigestion group. As can be seen in Table 1, it was observed that this value decreased compared to the control group and was statistically significant ($p<0.05$). This level was measured as 4.05 ± 064 mg/L in animals with 3.36 ± 0.72 mg/L indigestion in the Zn control group with rumen content.

Blood et al. (1987) found serum Cu level 0.5-2.2 mg/L in healthy cattle. In our study given in Table 1, serum Cu level in the control group was 60±0.4 μg/dl, while it was found as 48±4 μg/dl in indigestion animals. This situation was not found statistically significant when compared with the indigestion group of the control group, which was parallel to the statements in Blood et al. In this

study, the rumen content was measured as 0.45±0.13 mg/L in the control group and 0.24±0.03 mg/L in the indigestion group, and these values are the first data feature detected in cattle.

Serum Ca level in healthy cattle 9.7-10.4 mg/dl in the control group (Bilal, 2012). In this study, serum Ca level was measured as 13.87±3.84 mg/dl in the control group. It was seen that this value was between the levels that the researchers gave for serum Ca levels of healthy cattle. Serum Ca level was measured as 8.94 ± 2.18 mg/dl in indigestion animals given in Table 1, and this level was found to be statistically significantly decreased ($p<0.05$) compared to the control group. Ca level of rumen content was found to be 312.46±59.77 mg / L in the control group and 374.07±81.63 in the group with indigestion.

Although it was determined that the rumen Ca level decreased in indigestion animals compared to the control group, this situation was not statistically significant ($p>0.05$). It is thought that there is a decrease due to indigestion in the group with Ca indigestion. The Cl level in healthy cattle is between 97-111 mEq/L (Turgut, 2000; Bilal, 2012).

In our study, the Cl level, which was parallel to the statements of the researchers (Turgut, 2000; Bilal, 2012), was found to be 98.05±6.04 mEq/L in the control group, while it was 91.62±4.30 mEq/L in the group with indigestion. It was concluded that the value, which was found to be lower than the control group, was statistically insignificant ($p>0.05$).

Rumen content Cl values are a frequently used marker in the differentiation of anter Rumen Cl level in healthy cattle has been reported as <25 mEq/L. prior and posterior functional stenosis. Posterior stenosis occurs in which serum levels below <85 and rumen content will be above >25 mEq/L (Turgut, 2000). The rumen content of the control group, which is similar to the statement of the investigators given in Table 1, was 22.36±0.8 mEq L, while it was found to be 26.04±1.03 mEq/L in the group with indigestion. In this context, it is an indication that there is no posterior functional stenosis in animals. Although in indigestion animals the rumen Cl control unit increased compared to the display, this is similarly insignificant ($p>0.005$).

One of the essential elements for ruminant animals, Co is necessary for rumen microorganisms to synthesize vitamin B_{12} (Okatan et al., 2008; Küçükaslan, 2011). The need for Co of ruminants results from the Co requirement of the bacteria in the rumen (Uyanık, 2000; Gül, 2012). Rumen bacteria are used in vit B_{12} synthesis to meet both the animal's and their own vit B_{12} needs (Uyanık, 2000). Serum Co levels in healthy cattle are reported to be between 0.26±0.15 μg/dl (Okatan et al., 2008).

In this study, the serum Co level was 0.16±0.01 μg/dl in the control group and it is parallel with the value in healthy cattle expressed by the researcher. Serum Co level was measured as 0.29±0.02 μg/dl in the indigestion group. It was determined that the increase in serum Co levels in animals with indigestion was statistically significant ($p<0.01$).

This situation is thought to be increased due to the fact that the rumen micro flora cannot be used in vit B_{12} synthesis, as stated by the researchers (Okatan et al., 2008; Küçükaslan, 2011; Gül, 2012). While the Co level of rumen content was measured as 0.49±0.02 mg/L in the control group, this value was measured as 0.56±0.09 mg/L in the indigestion group. Although the rumen Co level increased in the indigestion group compared to the control group, this increase was found to be statistically insignificant ($p>0.05$).

Vitamin B_1 is synthesized with the help of rumen microorganisms. (Evan, 1993; Karapınar et al., 2010). Therefore, this situation should be taken into consideration when adding thiamine to rations (Evan, 1993; Karapınar et al., 2010). Serum Vit B_1 level in healthy cattle is stated to be 7±1.1 μg/dl (Mert, 1996). In this study, vit B_1 level was measured as 0.83± 0.44 (μg/ml) in the control group and as 0.440±0.30 (μg/ml) in the indigestion group. Cyanocobalamin is synthesized in the digestive tract of ruminants (İmren, 1991). As there is sufficient cobalt and protein in the feed, ruminant animals do not need to take Vit B_{12} from outside (İmren and Şahal, 1991). It is synthesized in the digestive tract of ruminants.

As long as there is sufficient amount of cobalt and protein in feed, ruminant animals do not need to take Vit B_{12} from outside (Şahal and İmren, 1991). Serum Vit B12 level of healthy cattle is reported to be 155.13±19.74 pg/mL (İssi et al., 2010). In this study, vit B_{12} level in the control group was 193.00±7.69. 209.94 ± 27.65 in pg mL indigestion group. It is measured in pg/mL. Although it was observed that the Vit B_{12} level increased compared to the control group (Table 2), this increase was statistically insignificant ($p>0.05$).

In this study; There was no statistical difference in hematological findings between healthy animals and indigestive animals. Serum magnesium (Mg),

calcium (Ca), zinc (Zn) levels of trace elements decreased in the group with indigestion ($p<0.05$), while a significant increase in cobalt (Co) levels ($p<0.01$) was detected. Although there was a significant increase ($p<0.5$) in the group with rumen content Ca values indigestion compared to the healthy group, a decrease in serum levels ($p<0.05$) was detected. There was a positive correlation ($p<0.01$) between rumen content of indigestion cattle and blood serum values between control group serum Mg and control group rumen content. In addition, a negative correlation was found between the indigestion group serum Ca and the indigestion group rumen content Ca. Serum vitamin levels decreased in Vit B_1 statistically ($p<0.05$), while a non-statistical increase was determined in Vit B12 ($p>0.05$).

CONCLUSION

As a result, although serum trace element and mineral levels were determined in many studies, no study was found on the mineral and trace element levels in rumen fluid. With this study, it is thought that the values measured together with serum and rumen content, mineral and trace element levels will be helpful in diagnosis and can be used as a reference value in animals with indigestion. In addition, in this study, it was observed that the decreases in serum Vitamin B_1 as well as in Mg, Ca and Zn values were significant in animals with indigestion, and these decreases were due to indigestion. Thus, it was concluded that these vitamins and trace elements should be taken into consideration in the treatment.

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Author's Contributions: NY and FE designed the study. FE collected the materials, NY and FE performed the analysis. FE evaluated statistically. NY and FE wrote the study. (FE: Fatma Ertaş; NY: Nazmi Yüksek)

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