

EFFECT OF FORESTOMACH FLORA AND MOTILITY INSUFFICIENCY ON PLASMA THIAMINE CONCENTRATION IN CALVES

Buzağlarda Ön Midelerde Mikroflora ve Motilite Yetersizliğinin Plazma Tiamin HCl Konsantrasyonu Üzerine Etkisi

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SUMMARY

In this study, the effect of forestomach flora and motility insufficiency on plasma thiamine HCl concentrations in calves were investigated. For this purpose, 12 different breed calves, ageing 45-60 days with forestomach flora and motility insufficiency (Experimental group) and six healthy calves (Control group) were used as a material.

Significant increments ($p<0.01$) in the counts of bacteria of ruminal fluids and significant decrements in the plasma thiamine HCl concentrations in the experimental group of calves were determined when these values were compared to the values of control group of calves.

While the number of motile protozoa of the ruminal fluid in a microscopic area were between 1-10, the mean counts of protozoa were 34.333/ml and methylene blue reduction time was of < 5 minutes in the control group of calves, the microscopic examination of ruminal fluid samples revealed no protozoa and methylene blue reduction time was of > 15 minutes in the experimental groups.

The result of the study showed that thiamine supplementation is to be considered as a part of treatment of forestomach flora and motility insufficiency.

Key Words: Calves, Plasma thiamine HCl, Forestomach flora and motility insufficiency.

ÖZET

Bu çalışmada, buzağlarda ön midelerde mikroflora ve motilite yetersizliğinin, plazma tiamin HC konsantrasyonuna etkisi araştırıldı. Bu amaç için değişik ırk ve cinsten, 45-60 günlük, ön midelerde mikroflora ve motilite yetersizliği olan 12 buzağı (Deney grubu) ve 6 benzer yaşlarda sağlıklı buzağı (Kontrol grubu) kullanıldı.

Kontrol grubuna göre, deney grubunda rumen sıvısı bakteri sayısı ($p<0.01$) ve rumen sıvısı pH'sı yüksek ($p<0.05$), plazma tiamin HCl konsantrasyonu ise düşük ($p<0.05$) bulundu.

Kontrol grubunda, rumen sıvısının mikroskopik muayenesinde her sahada 1-10 adet hareketli ortalama protozoa sayısı 34.333/ml ve metilen mavisi indirgenme test süresi < 5 dakika olarak tesbit edilirken, deney grubunda rumen sıvısında hiç protozoon yoktu ve metilen mavisi indirgenme test süresi 15 dakikadan daha uzundu.

Sonuç olarak, buzağlarda ön midelerde mikroflora ve motilite yetersizliğinin, plazma tiamin HCl konsantrasyonu üzerine olumsuz etkisi olduğu ve bu hastalığın tedavisinde tiamin takviyesinin göz önünde bulundurulması gerektiği görüldü.

Anahtar Sözcükler: Buzağı, Plazma tiamin HCl, Ön midelerde mikroflora ve motilite yetersizliği.

INTRODUCTION

It is generally accepted that the ruminant in which the rumen is fully developed is not in any way dependent on a dietary supply of thiamine. These animals usually consume feeds containing thiamine and this vitamin is also synthesised by symbiotic micro-organisms in the rumen. However, this situation does not apply to the young ruminant during the first few weeks of life. Such animals are entirely dependent on dietary supply of thiamine until the rumen is fully developed and has acquired the necessary growth of micro-organisms. Milk, and especially colostrum, are rich in thiamine, and will thus normally supply the requirements for this vi-

tamin at this time (1).

The primary function of the forestomach flora is cellulose digestion. To develop an active cellulolytic flora, the feed must contain adequate amounts of protein, starch or sugar and cellulose. These continued to stimulate growth of the microflora (2,3). If the ration does not contain enough readily digestible nutrients or animal prefers hay or straw, undigested roughage accumulates in the rumen-reticular chamber; the forestomachs and abdomen become increasingly dilated and so, insufficiency of forestomach flora and motility occur in these

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calves (2,4).

The purpose of this study was to determine alteration of plasma thiamine concentration in calves with forestomach flora and motility insufficiency.

MATERIALS and METHODS

In this study, twelve different breed calves, aging 45-60 days with forestomach flora and motility insufficiency (Experimental group) which were referred to the Clinic of Internal Medicine, Faculty of Veterinary Medicine, and clinically healthy six calves that are at the same age range (Control group) belonging to the Selçuk University, Veterinary Faculty farm of were used as a material. The diagnosis was made according to the anamnesis, clinical and laboratory findings.

Clinical Examinations: All animals were examined with regard to appetite, general appearance and behaviour, rectal temperature, rumination, eructation and reticulo-ruminal movements.

Laboratory Examinations: The ruminal fluid samples for the determination of color, consistency, odor, ruminal fluid pH, microscopic examination of protozoa, methylene blue reduction time, and protozoa and bacteria continuing and venous blood samples (heparinised) for the determination of plasma thiamine HCL concentrations were collected from each animal after clinical examinations. Ruminal fluid samples were taken by passing a stomach tube and analysis were performed immediately after collection.

Ruminal fluid pH determination was measured by means of electronic pH meter (ACT pH meter, Piccola Model Singapore). Microscopic examination of protozoa and methylene blue reduction time was determined as the methods described by Turgut K (5).

The count of the protozoa and bacteria of ruminal fluid samples were determined as the method described by Eksen et al (6).

The plasma samples were stored at -25 °C deepfreeze until tested and plasma thiamine HCL concentrations were measured by HPLC method described by Olkowsky et al (7).

Statistical Analysis: Statistical significance were tested using Mann-Whitney test between experimental and control group for ruminal fluid pH, the counts of bacteria of ruminal fluid and plasma thiamine HCL concentrations (8).

RESULTS

All routine clinical examination findings and the laboratory results were normal and between normal range in the control group of calves. The number of motile protozoa of the ruminal fluid in a microscopic area were between 1-10, the mean counts of protozoa of ruminal fluid were 34.333/ml and the methylene blue reduction time was of <5 minutes in the control group of calves.

Experimental group calves showed anorexia, depression, no rumination and eructation and decreased reticulo-ruminal movements, rough hair coat, poor growing, chronic tympany. They had typical hay belly appearance. Rectal temperature, respiratory and heart rates were between normal range in the experimental group of calves. The ruminal fluid samples of experimental group of calves had usually dark yellow color, mostly putrid odor, very viscous and watery consistency and undigested plant fibers. The microscopic examination of ruminal fluid samples revealed no protozoa, methylene blue reduction time was of >15 minutes.

The median ruminal fluid pH values, the counts of bacteria of ruminal fluid samples and plasma thiamine HCL concentrations in experimental and control group of calves and their statistical significance are given in table I.

Significant increments ($p < 0.01$) in the counts of bacteria of ruminal fluids and significant decrements in the plasma thiamine HCL concentrations in the experimental group of calves were determined when these values were compared to the values of control group of calves.

Tablo 1. Grupların ortalama plazma tiamin HCl konsantrasyonu, rumen sıvı örneklerinin bakteri sayısı ve rumen sıvısının pH'sı ve bu parametrelerin istatistiksel önemlilikleri.

Table 1. The median plasma thiamine HCl concentrations, the counts of bacteria of ruminal fluid samples and the ruminal fluid pH values in the both groups and their statistical significance.

Parameters	GROUPS	
	Control Group n:6	Experimental Group n:12
Plasma thiamine HCL (µg/ml)	0.739	0.475*
Bacterial counts of ruminal fluid (x10 ⁹ /ml)	2.85	6.40**
PH of ruminal fluid	6.5	7.2*

*: p<0.05 **: p<0.01

DISCUSSION

In this study, significant decrement (p<0.05) in the plasma thiamine HCl concentration were observed in the experimental group. The mean plasma HCl concentrations in healthy calves (control groups) were 0.739 µg/ml. However, the count of bacteria of ruminal fluid samples was found to be significantly higher (p<0.01) in experimental group of calves (Table 1).

"Hay belly" in calves is from of ruminal microbial inactivity caused by chronic consumption of poor quality roughage with poorly digestible fiber and low nutrient value. When the ration is deficient in specific minerals or active cellulolytic flora not developed, the breakdown of feed stuffs prolongs and undigested roughage accumulates in the rumen and reticulum. Meanwhile, the animal continues to hunger and so consumes more of the poor-quality feed. The forestomach and abdomen become increasingly dilated (9). In this study, all calves of experimental group had typical "Hay belly" appearance, anorexia, depression, no rumination and eructation, decreased reticulo-ruminal movements, rough hair coat and poor growing. This could be explained by inadequate feeding and not developed of active cellulolytic flora.

It is commonly accepted that the rumen bacteria play a great role in thiamine synthesis (6,10,11). Some research workers have stated that the protozoa in the rumen also took part into this synthesis (12,13). However, in this study significant increment in the count of bacteria of ruminal fluid in the experimental group

of calves was determined when the count of bacteria of ruminal fluid in control group of calves was compared. This could be the result of change of bacterial flora in the experimental group of calves. This result can be supported by the higher ruminal fluid pH, increased methylene blue reduction time and fetid odor in most ruminal fluid samples.

The result of the present study showed that thiamine supplementation is to be considered as a part of treatment of forestomach flora and motility insufficiency and supplementation of this vitamin will help prevent the subsequent deficiencies.

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