# PREVENTION OF SECONDARY NUTRITIONAL HYPERPARATHYROIDISM IN HORSES USING ORGANIC MINERALS

**GOBESSO, A. A. O.**; WAJNSZTEJN, H.; GONZAGA, I. V. F.; TARAN, F. M. P.; MOREIRA, C. G.

Faculty of Veterinary Medicine and Animal Science, University of São Paulo – Av. Duque de Caxias Norte, 225 – Pirassunga, SP – Brazil – 13635-900
E-mail: cateto@usp.br

## OBJECTIVES

This study is aimed to evaluate the effect of the addition of oxalic acid in the diet, causing an imbalance between calcium (Ca) and phosphorus (P), and examine the possibility of preventing the nutritional secondary hyperparathyroidism (NSH) through supplementation with organic minerals.

## INTRODUCTION

Not uncommonly, the creation of horses in areas where the low phosphorus content, the unavailability of calcium and oxalate levels in plants can lead to imbalances resulting in NSH. Minerals exert their functions in the body almost entirely as chelated minerals, and not as inorganic ion, however, there is still much controversy in the literature regarding the use of organic minerals.

## METHODS

In the Laboratory for Research on Food and Equine Exercise Physiology (LABEQUI), belonging to the Faculty of Veterinary Medicine and Animal Science, University of São Paulo, was used 24 crossbred foals, aged between 18 and 24 months. Each treatment consisted of 6 foals (three males and three females), totaling four treatments in a completely randomized design with repeated measures on time, in a 2x2 factorial arrangement: supplementation with minerals organic or not (inorganic minerals), and presence or absence of oxalate in the diet.

Sampling was conducted over a period of 150 days. Every 30 days were taken blood samples for parathyroid hormone (PTH) and calcitonin analysis, and measured bone mineral density of the metaphysis of right third metacarpal. Every 75 days were collected samples for determination of Ca, P and magnesium (Mg) of the sacral region of iliac tuberosity by bone biopsy.

## RESULTS

The model of induced imbalance between calcium and phosphorus with addition of potassium oxalate is effective and produces the expected result. The mineral supplementation can increase bone mineral density in foals, regardless of source and sex. The results showed a difference on plasmatic PTH in T4 compared to other treatments (table 1). The creation of mineral imbalance by adding potassium oxalate decreases the concentration of calcium, phosphorus and magnesium in the bones of foals, regardless of source supplemented (tables 2 and 3). For the deposition of calcium in the bones, there was a linear reduction from the days of the experiment for all treatments (Graphic 1).

## CONCLUSIONS

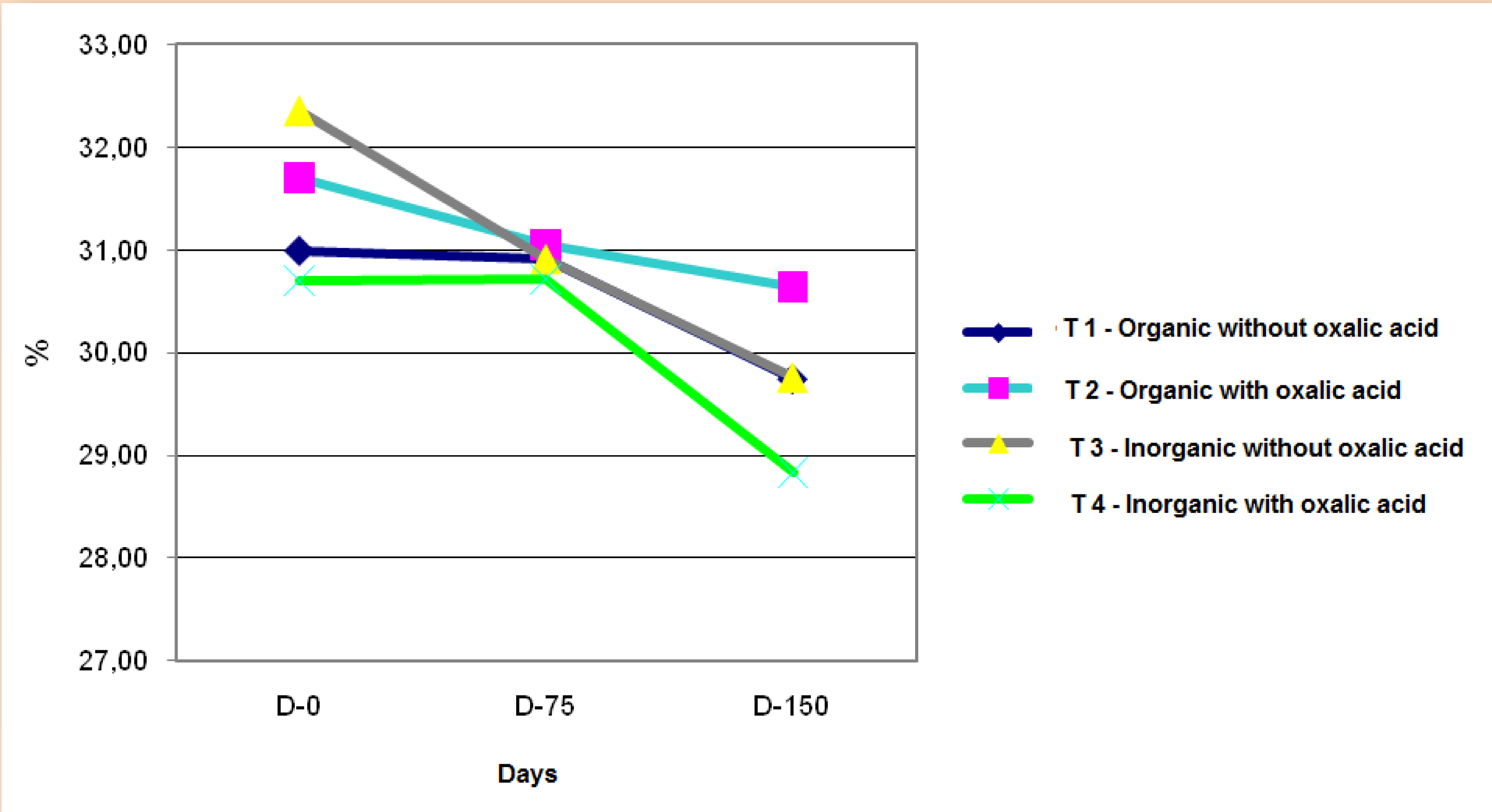
The creation of mineral imbalance by including oxalic acid decreases concentrations of Ca, Mg and P in bone, independent of additional sources. Foals supplemented with organic minerals, even when challenged with the addition of potassium oxalate in the diet, maintains levels of plasma I-PTH stable, showing more resistance to the imbalance between calcium and phosphorus and avoiding the development of fibrous osteodystrophy.

TABLE 2 - Means and standard errors of the mean amount of calcium (Ca) and phosphorus (P) in the bone by treatment (%)

| Periods | T1 | | T2 | | T3 | | T4 | |
|---|---|---|---|---|---|---|---|---|
| | Ca | P | Ca | P | Ca | P | Ca | P |
| D0 | 30,99 | 16,12 | 31,70 | 16,11 | 32,35 | 15,75 | 30,70 | 16,13 |
| D75 | 30,91 | 15,84 | 31,05 | 14,94 | 30,91 | 15,45 | 30,71 | 14,71 |
| D150 | 29,74 | 14,56 | 30,63 | 15,34 | 29,75 | 14,73 | 28,84 | 14,40 |
| SEM | 0,70 | 0,83 | 0,54 | 0,59 | 1,30 | 0,52 | 1,08 | 0,92 |

TABLE 3 - Means and standard errors of the average amount of magnesium in the bones per treatment (ppm)

| Periods | T1 | | T2 | | T3 | | T4 | |
|---|---|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female | Male | Female |
| D0 | 0,75 | 0,72 | 0,74 | 0,63 | 0,71 | 0,79 | 0,78 | 0,78 |
| D75 | 0,68 | 0,92 | 0,65 | 0,59 | 0,57 | 0,70 | 0,66 | 0,71 |
| D150 | 0,47 | 0,64 | 0,58 | 0,49 | 0,75 | 0,53 | 0,81 | 0,58 |
| SEM | 0,14 | 0,14 | 0,08 | 0,07 | 0,10 | 0,13 | 0,08 | 0,10 |




GRAPHIC 1 - Concentrations of calcium (%) in bone, for treatment during the experimental period

TABLE 1 - Mean and standard deviation of the PTH (pg/mL) in the different treatments (T1=organic minerals without oxalate, T2=organic minerals + oxalate, T3=inorganic minerals without oxalate, T4=inorganic minerals + oxalate)

| Treatments | Periods | | | | |
|---|---|---|---|---|---|
| | D30 | D60 | D90 | D120 | D150 |
| T1 | $58,2^{bA}\pm50,0$ | $77,33^{aA}\pm80,9$ | $36,33^{bA}\pm38,7$ | $17,33^{aA}\pm21,8$ | $72,00^{aA}\pm88,9$ |
| T2 | $81,50^{bAB}\pm29,8$ | $49,33^{aAB}\pm41,37$ | $26,67^{bB}\pm37,5$ | $49,50^{aAB}\pm84,8$ | $75,00^{aA}\pm97,1$ |
| T3 | $191,67^{abA}\pm196,6$ | $79,00^{aA}\pm82,5$ | $60,00^{bA}\pm48,3$ | $85,00^{aA}\pm153,5$ | $47,33^{aA}\pm45,6$ |
| T4 | $981,17^{aA}\pm891,9$ | $60,00^{aC}\pm47,5$ | $490,33^{aAB}\pm551,9$ | $113,00^{aC}\pm161,6$ | $217,83^{aBC}\pm223,3$ |

Means of treatments followed by different letters (uppercase in columns and lowercase in lines) differ by Tukey test at a significance level of 5%.