

## The Role of Some Nutritional Elements in Treatment the Contracted Tendons and Crooked Limbs in Newborn Calves

Zahid I. Mohammed <sup>1</sup>, Ghassan H. Jameel <sup>3</sup>

<sup>1,3</sup> University of Diyala, College of Veterinary Medicine, Iraq

Miesaa G. Taher <sup>2</sup>

<sup>2</sup> University of Diyala, College of Medicine, Iraq

### Article Information

Received: Sep 22, 2023

Accepted: Oct 23, 2023

Published: Nov 24, 2023

**Keywords:** calves, calcium, phosphorus, vitamin D, abnormalities.

### ABSTRACT

*Contracted tendons and crooked limbs are the most common limb abnormality at birth. These abnormalities under challenging in determination of the causes if they are genetic, toxic or infectious, and with their respond to treatment. Twenty calves were conducted in this study to determine the cause of appearance of different types of limbs abnormalities in there. Calcium, phosphorus and vitamin D levels of their serum had been determined by using biological kits named (I Chroma) tests. Significant depression in the levels of calcium and vitamin D and sharp depression in the level of phosphorus has been elicited. In conclusions the administration of vit. D, calcium and phosphorus is enough to reduce these conditions in young calves.*

### INTRODUCTION

Occasionally a calf is born with contracted tendons (Fig-1) or some other abnormality that may need care. Straighten of the infected limbs occurred spontaneously with time and physiotherapy application, while others require medical intervention, and some defects are so severe the calf would be slaughtered (Allen and Dart, 2015).

Contracted tendons and crooked limbs are the most common limb abnormality at birth. These abnormalities under challenging in determination of the causes if they are genetic, toxic or infectious, and with their respond to treatment (Thomas, 2011).

Kahn (2005) and Allen and Dart (2015) were refer to relationship between the crooked limb syndrome (Fig 3 and 4) and feeding on certain toxic plants like lupine or hemlock. They are found the developing of skeletal structure of fetuses has been affected if the dam was consumed alkaloids of these plants during early pregnancy. The high doses of the alkaloids act as a sedative. Tendons become shortened if the fetus is not moved properly, and joints tend to become fixed. Twisting and fixing of the limbs had been occurred. Mostly the bones themselves developed in abnormal structure and rotational defects.

Phosphorus is a chemical element with atomic number 15 and the symbol **P**. Two major forms of elemental phosphorus exists, white and red phosphorus and because its highly reactive it is never

found as a free on earth. In general, phosphorus occurs as phosphate in minerals (Meija et al., 2016).

Medicinally, malnutrition, failure to absorb phosphate, and metabolic disturbances lead to phosphate deficiency syndrome due to draw the phosphate from the blood or pass in large amounts into the urine. Proteins do not contain phosphorus but the most food sources contain the both proteins and phosphorus. The main sources of phosphorus are milk, meat, and all grains (Washington, 1997).

Calcium ions (atomic number 20) play a vital role in the processes of organisms (biochemical and physiological) and cells when they are as electrolytes. These vital processes includes pathways of signal transduction where they act as a second messenger; and as neurotransmitter to signals released from neurons in all types of muscles interfere with the contraction as cofactors in fertilization and many enzymes. Maintaining of the potential differences across excitable cell membranes will need calcium ions presence outside cells also, they are important for protein synthesis, and bone building (Kriek et al., 2010 ; Balk et al.,2017).

**Vitamin D** is a fat-soluble vitamins. It has a vital role and main responsibility for improvement the intestinal absorption of magnesium, phosphate and calcium, in addition of many biological functions ( Holick ,2004). The major natural source of the vitamin D in the body that by synthesis of cholecalciferol in the lower layers of skin epidermis through a chemical reaction due to sun exposure ( McDonald, 2019). The milk of cows and plant-derived milk substitutes In the United States and other countries, are fortified with vitamin D ( Calvo et al.,2005).

Exposure to sufficient sunlight, most mammals can be synthesize vitamin D in adequate amounts without depending on a diet source. Norman (2008) considered vitamin D as a hormone after activation of the vitamin D pro-hormone resulting in calcitriol, the active form , which then produces effects through a receptors in the nucleus of the cells in multiple locations. Wolf, (2004) Used vitamin D supplements to treat or to prevent rickets and osteomalacia in young animals through it role in calcium homeostasis and metabolism.

## **MATERIALS AND METHODS**

### **1. Groups of Animals**

Twenty newborn calves at age from 1-7 days were conducted in this study, ten were infected with skeletal abnormalities and, ten were in normal state as a control group.

### **2. Test Procedure**

By a transfer pipette (150 ul ,75 ul and 150ul) was transferred from each calf serum to tube containing the detection buffer of the elements (Calcium, Phosphorus) and, Vitamin D levels respectively . Closure of the lid of the detection buffer tube was done, then shaking the sample about 10 times to good mixing. Pipette out 75ul of sample mixture and load it into the sample well on the cartridge and left the sample in loaded cartridge at room temperature for 15 minutes. When the incubation time is over , scanning of the sample immediately to obtain exact result, then the sample was inserted into the cartridge holder of the instrument for I Chroma tests (I Chroma - Boditech Med Inc.). Press select button on the instrument for I Chroma tests to start the scanning process. Reading of the result on the display screen of instruments for (I Chroma) tests must performed.



I chroma - Boditech Med Inc.

### 3. Statistical analysis

The Statistical computations were done using the SPSS program to explore the influence of treatment. as well as t test was used to significant compare between means in this study (Steel and Tarries,1980). The significant difference statements were based on the possibility ( $P \leq 0.05$ )

### RESULTS

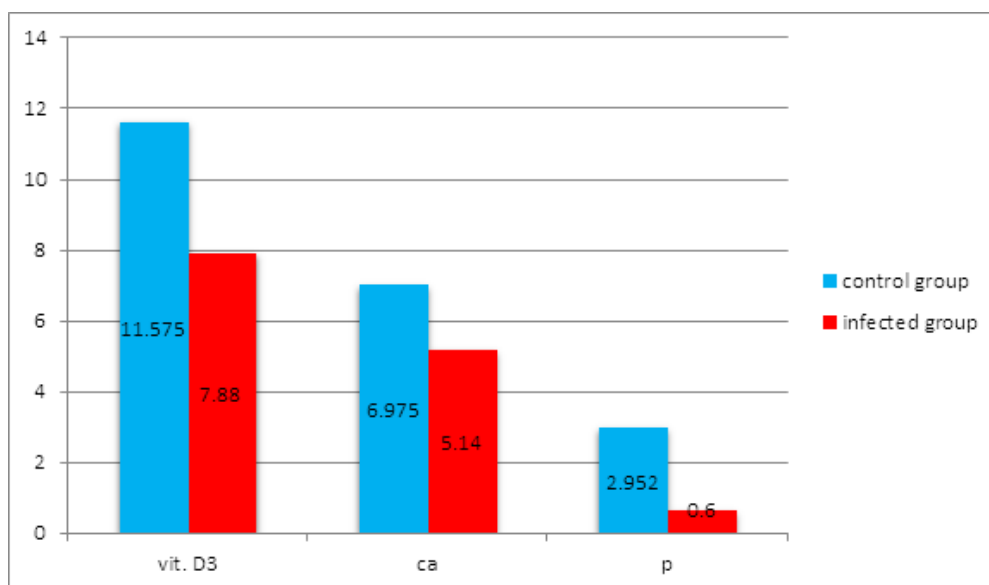
Table (1) was revealed the levels of vitamin D3, calcium and phosphorus and standard error in the serum of intended calves in this study (control and infected group).

On another hand The concentrations of vitamin D3, calcium and phosphorus decreased significantly in the infected group ( $7.88 \pm 0.59$  ng/ml,  $5.14 \pm 0.44$  mg/dl and  $0.6 \pm 0.19$  mg/dl) as compared with control groups whereas ( $11.575 \pm 0.10$  ng/ml,  $6.975 \pm 0.67$  mg/dl and  $2.950 \pm 0.21$  mg/dl) respectively.

**Table (1) was revealed the concentrations of vitamin D3, calcium and phosphorus**

Parameters groups	Vit. D3 (mean $\pm$ SD) ng/ml	Ca (mean $\pm$ SD) mg/dl	P (mean $\pm$ SD) mg/dl
control group	$11.575 \pm 0.10$	$6.975 \pm 0.67$	$2.950 \pm 0.21$
Infected group	$7.88 \pm 0.59$	$5.14 \pm 0.44$	$0.6 \pm 0.19$
P value	0.011**	0.001 **	0.023 **

\*\* Significant differences vertically at ( $P \leq 0.05$ ). Data presented as mean  $\pm$ SD.



**Figure (1) was revealed the concentrations of vitamin D3, calcium and phosphorus**

The figures (2 and 3) were revealed the infected and healthy calf whom suffered from contracted tendon before and after treatment.

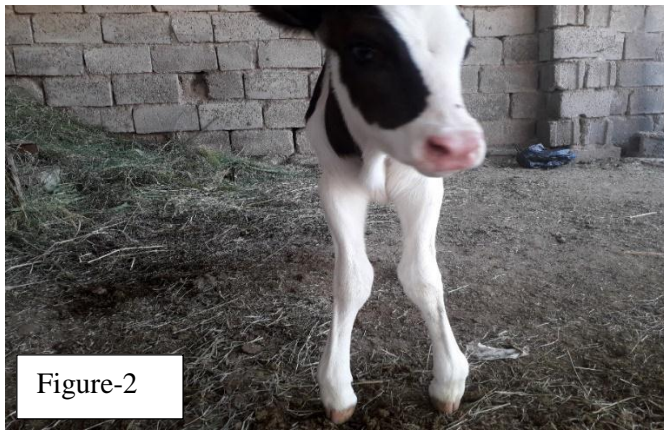


Figure-2: Revealed newborn calf with contracted tendon



Figure-3: revealed the cured calf with contracted



Figure-4: Crooked limb of newborn calf.



Figure-5: Crooked limb of newborn calf.

## DISSCUSION

The results in table (1) were revealed high significant depression in the level of phosphorus at ( $P \leq 0.05$ ) whereas ( $0.6 \pm 0.19 \text{ mg/dl}$ ) as compared with the control (normal) group which be ( $2.950 \pm 0.21 \text{ mg/dl}$ ). Also the levels of the calcium and Vitamin D were revealed significant depression were ( $5.14 \pm 0.44 \text{ mg/dl}$ ) and ( $7.88 \pm 0.59 \text{ ng/ml}$ ) respectively in treatment group as compared with control group ( $6.97 \pm 0.67 \text{ mg/dl}$ ) and ( $11.57 \pm 0.1 \text{ ng/ml}$ ) respectively.

The depression in all levels of intended minerals and vitamin D in all infected calves result in appearance of different types of abnormalities in the limbs figures (2, 4 and 5).

Our study was came in agree with study was performed by Hanusa, (2020) who mentioned that the imbalanced feeding to the pregnant cows result in poor growth of their calves accompanied with some abnormalities specially the phosphorus and calcium. Also was came in agree with Radostits et al., ( 2006) who mentioned that calcium, phosphorus and vitamin D absolute deficiencies or imbalance in calcium-phosphorus rations in diets cause rickets in young animals. Khan and Line (2005) were refer to nutritional deficiencies could be lead to contracted tendons.

Our study was in agree with Balk et al.,(2017) who were refer to the role of calcium to build healthy skeleton in addition to other blood components. All the calves characterized by hypophosphatemia means decrease in soluble phosphate levels in blood serum and inside the cells may suffer from neurological dysfunction , muscle disruption and blood cells due to lack of ATP ( Anderson, 1996 ; Mehanna et al.,2008). We says that neurological dysfunction can affect the messages toward movement of the muscles and safe formation of the joints result in temporal affect.

Significant depression of Vitamin D level at ( $P < 0.011$ ) lead to different shapes of abnormalities were mentioned above and certificated when Wolf, (2004) was refer to the role of Vitamin D in calcium homeostasis and metabolism in balanced level.

The administration of analgesic drugs (to relief pain) and mixture of minerals and vitamins orally and intramuscularly for 5-7 days would prove good results in cure all the infected cases figures (3, 6 and 7).



Figure -6: Recovered calf after treatment.



Figure-7: Recovered calf after treatment.

## CONCLUSIONS

Balanced feeding of pregnant cows during all stages of pregnancy will prevent or reduce the rate of this abnormalities in newborn calves. Also the administration of vit. D, calcium and phosphorus downsample these cases in newborn calves.

## ACKNOWLEDGEMENT

The authors thankful all members of animal nutrition laboratory/ Department of public health college of veterinary medicine for supporting with essential requirements for present research.

## Conflict of Interest

Authors declare that they have no conflict of interest.

## Authors Contribution

All authors contributed equally to the manuscript.

## REFERENCES

1. Allen DG and Dart A (2015). Overview of Congenital and Inherited Anomalies. The Merck Veterinary Manual. 9<sup>th</sup> Edition, Wiley.ISBN-13: 978-0911910506.
2. Balk EM, Adam GP, Langberg VN, Earley A, Clark P, Ebeling PR, Mithal A, Rizzoli R, Zerbin CA, Pierroz DD, Dawson-Hughes B (2017). "Global dietary calcium intake among adults: a systematic review" . Osteoporosis International. 28 (12): 3315– 3324.
3. Calvo MS, Whiting JJ and Barton CN (2005). "Vitamin D intake : a global perspective of current status". The Journal of Nutrition. 135(2): 310-316.
4. Hanusa TP (2020). "Phosphorus". Chemical Element. Department of Chemistry, Vanderbilt University, Nashville, Tennessee. Encyclopedia Britannica.
5. Holick MF (2004). "Sunlight and Vitamin D for Bone Health and Prevention of Autoimmune Diseases and cardiovascular Disease" . The American Journal of Clinical Nutrition. 80 (6): 1676S-1688S.
6. Kahn CM (2005). "Contracted Tendons" .The Merck Veterinary Manual. (9<sup>th</sup>) Edition.Wiley.ISBN-13: 978-0911910506.
7. Kriek S, Görls H and Westerhausen M (2010). "Mechanistic Elucidation of the Formation of the Inverse Ca(I) Sandwich Complex [(thf)<sub>3</sub>Ca(μ-C<sub>6</sub>H<sub>3</sub>-1,3,5- Ph<sub>3</sub>)Ca(thf)<sub>3</sub>] and Stability of Aryl-Substituted Phenylcalcium Complexes". Journal of the American Chemical Society. 132 (35): 12492–12501.

8. McDonald J (2019). "How Does the Body Make Vitamin D from Sunlight". JSTOR Daily.
9. Mehanna HM, Moledina J and Travis J (2008). " Refeeding Syndrome: what it is ,and how to prevent and treat it". *BMJ*.336, (7659): 1495-8.
10. Meija J, Coplen TB, Bergland M, Brand WA, De Bievre P and Groning M (2016). Atomic Weights of the Elements 2013( IUPAC Technical Report). *Pure and Applied Chemistry*; 88(3), 293-306.
11. Norman AW (2008). " From Vitamin D to Hormone D Endocrine System Essential For Good Health". *The American Journal of Clinical Nutrition*. 88(2): 491S-499S.
12. Radostits OM, Gay CC, Hinchliff KW and Constable PD (2006). *Diseases of Musculoskeletal Systems. Veterinary Medicine : A textbook of the diseases of cattle, sheep, goats, pigs and horses. (10<sup>th</sup>) Edition. PP: 637-8.Saunders Elsevier, Philadelphia, PA.*
13. Steel RG, Tarries JH (1980). *Principle and procedure of statistical 2th ed., Mc grow Hill book. Co. In. New York.*
14. Thomas HS (2011). *Limb Problem in Newborn Calves. The Beef Magazine Canadian Cattlemen.WWW.beefmagazine.com.*
15. Washington DC (1997). "Phosphorus". *Dietary Reference Intakes for Calcium ,Phosphorus, Magnesium, Vitamin D and Fluoride. Institute of Medicine. The National Academies Press,PP.146-189.*
16. Wolf G (2004). "The discovery of Vitamin D: the contribution of Adolf Windaus". *The Journal of Nutrition*. 134(6): 1299-302.