# MINERALS IMBALANCE AS A FIELD PROBLEM IN CALVES

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## *ABSTRACT*

*Serum samples were collected from 14 calves of different ages suffering from anorexia, loss of body weight, depression, recumbency alopacia and diarrhea. Estimation of serum minerals revealed increase in calcium, phosphorus and zinc concentration, as well as decreased levels of magnesium, sodium and potassium in serum while those of copper and iron were in the normal physiological value. Examination of ration samples revealed decrease in protein content and increase in calcium, phosphorus, and iron levels. While, magnesium, copper and zinc levels were adequate to cover requirement of calves. Also, acid number was high indicated oxidative rancidity of the ration.*

*The mineral imbalance state of ration in addition to rancidity were suggested to be the real cause of the problem as the symptoms were subsided when the ration was replaced by a new one.*

## *INTRODUCTION*

Calf is considered to be the primary producing unit in the beef industry. Feeding of calves is of special interest because of the high economic losses from early diseases problem and death. Feeding of calves encounters many problems in Egypt and many countries of similar condition, these problems mainly associated with mineral imbalanced ration. As the mineral are required to metabolize the energy and protein portion of ration. Although the cattle's body contains a large number of minerals, only 15 can be considered essential sodium, chloride, iodine, manganese, iron, copper, cobalt, zinc, calcium, phosphorus, potassium, magnesium, sulfur molybdenum and selenium **(Pope, 1972)**.

Livestock obtain minerals primarily from two sources those contained in feed ingredients and from mineral supplements. Water may or may not provide a source while, air rarely contributes any significant amount **(Reith, 1985)**. The misuse of mineral supplements by producers, manufacturers and the user of livestock ration may lead to many feed problems due to imbalanced mineral ration. The mineral content of the feed is only a guideline to the mineral status of the animal. In certain instances, this information can be quite helpful but it needs to be combined

with clinical and pathological examinations of the animals. Likewise, deficiency symptoms also can be served as guidelines since many symptoms are not characteristic of a single mineral inadequacy. So, it would seem that one of the most valuable aids in detection of mineral deficiencies or excess is blood analysis.

On the other hand, storage of feed stuffs for a long period of time especially under local bad environmental conditions of high temperature and humidity exposes these feeds to deterioration s and losses of their nutritive values. The most common problem met with during storage is autoxidation. Autoxidation is the chemical manifestation of rancidity which has been incriminated in the impairment of many biochemical and physiological function in animals resulting in reduced feed intake, poor performance, depressed growth, diarrhea and altered protein utilization **(Carpenter et al., 1963)**. No available literature regarding the effect of mineral imbalance and rancid ration on performance of calves, for this reason, this investigation was carried out to elucidate the role of rancidity and dietary minerals as probable factors affecting performance of calves.

## *MATERIALS AND METHODS*

**Animals and Ration : -**

Fourteen Friesian calves of different ages in a herd in private farm in Ismaelia Governrate were reported to have loss of appetite, decrease in body weight and diarrhea. Calves were allowed to diet composed of concentrated ration, to which was added forage and hay ration, chemical analysis revealed that it contained 12.51% protein, 2.81% fat, 0.7% calcium, 0.53% phosphors, 0.29% magnesium, 0.45% copper, 7.4% iron and 0.14% zinc while the acid number was 179.

Close clinical examination revealed weakness, anorexia deprived appetite, loss of body weight, alopecia, diarrhea and recumbency. Temperature, respiration and plus were not altered. Clinical examination revealed no parasitic infection. There was no response to antibiotic therapy.

**Samples : -**

Serum samples were obtained for determination of mineral profile in calves. Concentration of magnesium, iron, copper and zinc were determined by atomic absorption spectrophotometer according to methods described by manufacturer **(Perkin Elmer, 1973)**. Calcium concentration measured according to **Gingler and King (1973)** while inorganic phosphorus was measured as described by **Kilchling and Freiburg (1951)**. Sodium and potassium were determined according to **Burriel and Ramirez (1957)**.

Ration samples were analyzed for determination of crude protein **(Oser, 1979)**, acid number for hydrolytic and oxidative rancidity **(Koch and Hank, 1953)**. Also, ration samples were analyzed for determination of calcium, inorganic phosphorus, magnesium, copper, iron and zinc concentration.

Control for both serum samples (14 apparently healthy animals) and ration sample (one fresh sample) were simultaneously analyzed and statistically operated with the test samples according to **Petrie and Watson (1999)**.

## *RESULTS AND DISCUSSION*

The main clinical features of the affected animals were authenticated by laboratory analysis of both serum and ration. Table (1) which revealed significant increase in concentration of calcium, phosphorus and zinc while there was significant decrease in concentration of magnesium, sodium and potassium. On the other hand, there was no physiological change in concentration of both copper and iron of the diseased animal when compared with control one.

Ration analysis was tabulated in table 2, it revealed decreased level of crude protein, and increased value of acid number as an indication of oxidative rancidity. The concentration of calcium, phosphorus and iron were higher than normal value in control sample (fresh sample). A decrease in the levels of magnesium, copper and zinc concentration was also detected .

Minerals are of major economic importance in calves and cattle and are intimately concerned with optimal health and performance **(Radostits et al., 1995)**. The deficiency symptoms of minerals was not characteristic of a single mineral inadequency as the main mineral deficiency symptoms were anorexia, loss of body weight, weakness, recombancy and might be diarrhea. The same clinical features were reported in our investigation.

Serum calcium level showed significant increase as a result of feeding animals on excess calcium and unbalanced ca/p ratio. The obtained results were in accordance with those reported by **Doxey (1971)**. Serum phosphorus level showed significant increase as ration contain excess phosphorus, **De-Boer et al., (1981)** reported that excessive phosphorus intake elevated plasma phosphorus and may cause bone resorption and urinary troubles.

Results revealed serum hypo magnesia although ration analysis revealed adequate level of magnesium that was sufficient to cover all animals needs and at the same time present occurrence of hypomagnesaemic tetany. This finding rendered the exact cause of the condition enigmatic and aroused controversial confusion as reported by **Kaneko (1989); Meyer et al.,( 1992)** and **Duncan et al., (1994)**.

Serum zinc concentration slightly increased although zinc level in ration was within normal value. **DeBoer et al., (1981)** reported that level of zinc in ration has direct effect on serum zinc level.

Concentration of both iron and copper in serum was in the normal physiological level while in ration were adequate to cover animal maintenance.

Both sodium and potassium concentration were decreased which might be due to diarrhea and electrolyte loss. **(Ramadan et al., 1985)**.

**Kelly (1984)** recorded that animals received rancid fat in ration showed affects which might be include appetite and growth depression, diarrhea alopecia, general morbidity same. So, the effect of rancidity and ration mineral imbalance may combine to form the clinical symptoms recorded in this investigation.

From the above results, it is obvious that there is a great relationship between mineral content of the feed and the mineral status of the animal. Also, there is a direct effect of mineral imbalance in ration and rancidity of fat.

**Table 1 :** Serum analysis of diseased and control animals.

| Parameter / Animal | Ca Mg % | P Mg % | Mg Mg % | Z n Mg % | Fe (mg/dl) | Cu (mg/dl) | N a Mg % | K Mg % |
|---|---|---|---|---|---|---|---|---|
| Diseased | 12.3±0.89 | 6.8±1.05 | 1.71±0.20 | 0.11±0.04 | 89.3±1.20 | 73.0±5.30 | 261.1±6.81 | 61.2±0.81 |
| Control | 9.7±0.26 | 3.6±0.79 | 2.65±0.11 | 0.07±0.01 | 83.0±3.23 | 64.2±3.79 | 311.0 ±8.58 | 34.3±3.43 |

LSD at $P < 0.05$.

**Table 2 :** Analysis of ration offered to diseased animals compared with fresh one (control).

| Parameter / Ration | Protein % | Fat % | Acid No. | Ca % | P h % | Mg % | Cu % | Z n mg | Fe % |
|---|---|---|---|---|---|---|---|---|---|
| Diseased | 12.51 | 2.81 | 1.79 | 0.97 | 0.73 | 0.29 | 0.45 | 0.14 | 7.4 |
| Control | 17.21 | 2.56 | 10.0 | 0.89 | 0.61 | 0.39 | 0.50 | 0.20 | 4.00 |

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*الملخص العربى*

# عدم توازن الأملاح المعدنية كمشكلة حقلية فى العجول

نهاد عاطف بدراوى و إيمـــان لاظ

معهد بحوث صحة الحيوان بالدقى

ظهرت أعراض فقدان فى الشهية ونقص الأوزان وخمول ورقود وسقوط الشعر من بعض الحيوانات وإسهال فى إحدى المزارع ولهذا تم تجميع عينات دم من ١٤ عجل من أعمار مختلفة وبقياس نسبة الأملاح فى الدم أظهرت النتائج زيادة فى نسبة الكالسيوم والفوسفور والزنك. كان هناك نقص فى تركيز الماغنسيوم والصوديوم والبوتاسيوم بينما لم تتأثر تركيز الحديد والنحاس. أظهر تحليل العليقة نقص فى نسبة البروتين وزيادة فى نسبة الكالسيوم والفوسفور والحديد بينما تركيز الماغنسيوم والنحاس والزنك كان ملائماً لتلبية إحتياجات الحيوانات. الرقم الحمضى كان عالياً دلالة على الزناخة التأكسدية للعلف، ولهذا كان اختلال مستوى المعادن بالإضافة إلى الزناخة التأكسدية هى الأسباب الرئيسية للمشكلة.