

## **PROMOTIVE EFFICIENCY TO TREAT ILLTHRIFTY FATTENING CALVES WITH SOLEVIT AS SEEN BY SOME BIOCHMICAL AND HEMATOLOGICAL STUDIES**

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### ***Abstract***

Blood and serum samples were collected from 50 adult calves (12- 24 month old) herd in Tanta, Mansoura, Domiat, Sharkia and Kafr El-Shikh Provinces suffering from loss of appetite and decrease body weight and 10 healthy adult calves as a control. Examination of ration samples revealed that both were balanced in their constituents including protein, fat, carbohydrate and free from rancidity, aflatoxin and ochratoxin, while, decrease in calcium, phosphorus, magnesium and copper but molybdenum increased comparing with normal animals.

Estimation of total RBCs, Hb, MCH and MCHC values showed significant decrease in illthriftly calves when compared with the corresponding values of healthy ones while, PCV and MCV revealed no significant variations. The analysis of data revealed significant leukopenia in illthriftly calves than healthy ones. There was highly significant decrease in serum copper, iron and zinc levels in illthriftly calves while, serum molybdenum concentration was significantly increased than healthy ones. Estimation of serum minerals revealed decrease in calcium, magnesium, sodium and potassium levels. Serum phosphorus level was in the normal physiological serum level. Serum triglycerides, glucose, cholesterol, total protein and albumin were highly significantly decreased in illthriftly animals while, serum globulin were not changed when compared with healthy one. Also, there was significant increase in the activities of AST, ALT, ALP, LDH and cortisol in illthriftly calves as compared with control calves. After parental treatment with solevit complex, it was observed that all parameters under investigation nearly returned to their normal values with improvement of the general healthy condition of illthriftly calves after one month of treatment.

From all investigated parameters, the decrease level of minerals in ration was suggested to be the cause of the illthriftly calves problem.

## INTRODUCTION

Cattle are important farm animals and they are considered as the main source of animal protein and milk production in Egypt. Ill-thriftiness is a major problem in fattening cattle, where, it appears as a failure of some animals to make satisfactory weight, in spite of the presence of ample feed and absence of signs of any primary disease, at the time all other cattle appear in satisfactory health and body condition (Abdel-All, 1990). The economic losses in fattening calves feed lot have been currently documented, however, the effects of environmental condition, age sex, seasons and diseased incidence as well as nutrition and management expertise were considered to be the major factors that influenced the achievement of optimum production (Blood and Radostits, 1989).

Nutritional surveys carried out in different areas of Egypt have revealed pathological symptoms existing in many livestock due to deficiency of minerals and trace elements in the soil and consequently in the fodder grazing on them, thus, deficiency symptoms due to subnormal intake of phosphorus copper, zinc, cobalt, selenium have been observed in certain areas in Kafr- El- Sheikh (Naser, 1995).

The present study was planned to secure the following information

- 1) Diagnostic procedures to determine the probable cause of ill-thriftiness in fattening cattle.
- 2) Detection of the mean levels of some biochemical constituents and hematological profile of the blood of unthrifty cattle and after response to treatment.
- 3) Detection of the mean levels of some minerals of unthrifty cattle and after response to treatment with solevit complex.

## MATERIALS AND METHODS

### A) Animals

A total of 50 adult calves (12- 24 months old) selected at random basis. herd in Tanta, Mansoura, Domiat, Sharkia and Kafr El Shikh Governorates was reported to loss of appetite and decreased body weight. Blood samples was takey at once and one month after treatment to assess hematology and serum biochemical constituents of the blood. Additional blood samples were also collected from 10 calves with no signs of appearance of illness as control.

**B) Sampling**

**1) Blood samples:** Two blood samples were obtained from each animal under investigation by Vein- Puncture through jugular vein before and after treatment. They were divided into two portions, the first was taken on heparin as anticoagulant (1- 2 IU/ ml) for hematological examination, and the other one was left to clot at room temperature for about 2 hours, stored overnight in a refrigerator at 4°C and centrifugated at 3000 rpm for 15 mint. Serum samples were drawn in dry clean capped tubes and kept in deep freeze at 20°C for biochemical analysis.

**2) Ration samples:** Ration constituents were analyzed for determination of Ca, Ph, Mg, Copper, Zinc, Fiber, Fat and Crude protein (A.O.A.C., 1990). Additional ration sample was examined for aflatoxins B<sub>1</sub>B<sub>2</sub>G<sub>2</sub> and G<sub>2</sub>, as well as ochratoxins were detected using thin layer chromatography as described by AOAC (1990).

**3) Hematological examination:** The hemoglobin content, packed cell volume (PCV), total erythrocytic, leucocytic count and differential leucocytic count after Coles (1986).

**4) Biochemical blood analysis**

- Determination of serum copper, zinc, iron, Molybdenum and cobalt as described by Allain and Maurous (1979). These elements were estimated in serum by atomic absorption spectrophotometry according to manufactureres manual (Unicam Model Spgo, Unicam Instr. Ltd., Cambridge). In other hand biochemical procedures used for serum samples are demonstrated in Table 1.

**C) Statistical analysis:** samples were simultaneously analyzed using T- student test according Petrie and Watson (1999).

Table 1. Procedures adopted for serum biochemical analysis.

Parameter	Author
Alanine aminotransferase (ALT)	Reitman and Frankel (1957)
Aspartate aminotransferase (AST)	Reitman and Frankel (1957)
Alkaline phosphatase (AP)	Kilchling and Freiburg (1951)
Lactate dehydrogenase (LDH)	Cabaud and Worblewski (1958)
Glucose	Siest <i>et al.</i> (1981)
Cholesterol	Richmound (1973)
Triglycerides: T.G.	Young and Pestoner (1975)
Cortisol	Calstorn <i>et al.</i> (1988)
Calcium	Glinder and King (1972)
Phosphorus	Kilichling and Freiburg (1951)
Magnesium	Niel and Neely (1956)
Sodium	Burriel and Ramirez (1957)
Potassium	Burriel and Ramirez (1957)
Total protein	Weichselbaum (1946)
Albumin	Drupt (1974)

#### D) Treatment trials

The diseased calves were treated with Solevit complex (injectable solution containing 2 mg copper, 0.25 mg selenium, 75 mg vitamin E and 1 mg phosphoric acid per/ ml), Syva laboratories, France. The calves were injected I/M three times daily for 5 days. Dose of injection was 4 ml/50 Kg body weight.

## RESULTS

Clinical findings: A total of 50 adult calves 12- 24 month old under investigation were greatly affected. General condition was moderate to severe debility. Inappetence, decreased feed intake, poor growth and ill-thriftiness were described by attendant and also clinically noticed in about 95% of affected calves. Internal body temperature, arterial pulse rate, lung auscultation and respiratory rate were almost within normal range, conjunctiva, oral, nasal and vaginal mucous membranes were slightly pale in colour with no lesions.

Gradual improvement of the general health condition of the affected calves started after administration of copper (Solevit complex) supplement. This improved appetite and increased feed intake.

**Ration analysis:** The analysis of 10 samples of both ration samples of affected calves and apparently healthy ones revealed that both were balanced in their constituents including protein, fat, carbohydrate and free from rancidity and aflatoxins B<sub>1</sub>, B<sub>2</sub>, G<sub>1</sub>, G<sub>2</sub> and ochratoxin. Decrease in ration calcium, phosphorus, magnesium and copper were observed, but molybdenum was increased than normal ( Table 2).

### **Hematological analysis**

The results of hematological picture of apparently healthy, ill thrifty calves and after response of treatment are described in Table 3. The mean values of total red blood corpuscles, hemoglobin, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration showed significant decrease in ill-thrifty calves when compared with the corresponding values of healthy ones. Packed cell volume and mean corpuscular volume revealed no significant variation. All hematological parameters approached the control values after one month of treatment (Table 3). The mean values of total white blood cells and differential leucocytic count in apparently healthy, ill thrifty and after treatment are shown in Table 3. The analysis of data revealed significant leucopenia in diseased calves than healthy ones.

### **Biochemical Examination**

The mean values of serum enzymes activities of Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), alkaline phosphatase (A/P) and Lactate dehydrogenase (LDH) in apparently healthy, ill-thrifty calves and post-treatment are shown in Table 4. There were significant increases in serum AST, ALT, A/P of ill-thrifty calves when compared with healthy ones. Also, serum LDH was significantly higher in some calves than healthy ones Table 4.

The mean values of blood serum glucose, cholesterol, triglycerides and cortisol in healthy and ill-thrifty calves before and after treatment are illustrated in Table 5.

There were significant decrease in serum glucose, cholesterol and triglyceride levels (Table 5), whereas, serum cortisol, concentration showed significant increase in ill- thrifty calves when compared with healthy ones. All parameter returned towards normal levels post-treatment (Table 5).

The mean values of total serum protein albumin and globulin (Alpha, Beta, Gamma) in healthy and ill- thrifty calves before and after treatment are tabulated in Table 6. There was a significant decrease in serum total protein and albumin of diseased calves than healthy ones, while serum globulin level showed non significant value in the same animal than healthy calves ( Table 6).

The mean values of blood serum copper, zinc, iron, molybdenum, calcium phosphorus, magnesium, sodium and potassium in apparently healthy and ill- thrifty calves, as well as, post-treatment are shown in Table 7. A highly significant decrease was noticed in serum copper, zinc, iron, cobalt concentrations in ill-thrifty calves than healthy ones, while, serum molybdenum concentration level showed significant increase in same ill-thrifty calves. Otherwise, Ca, Ph, Magnesium Sodium and potassium concentrations were significantly decreased in ill-thrifty animals than normal ones, (Table 7). All parameter values returned towards control levels after treatment (Table 7).

Table 2. Mean values for analysis of ration offered to diseased animals compared with fresh one (control).

Parameter	Tested (n = 10)	Control (n =10)
Crude protein %	14.7	16.1
Total Fat %	3.1	3.1
Total Ca %	0.64	0.84
Total Ph %	0.55	0.71
Total Mg %	0.27	0.35
Total Cu %	0.35	0.42
Total Zn %	0.20	0.23
Total Fe %	5.2	4.1
Total Molybdenum %	0.9	0.49
Acid No.	3.1	5.2
Aflatoxin G <sub>1</sub>	- ve	- ve
G <sub>2</sub>	- ve	- ve
B <sub>1</sub>	- ve	- ve
B <sub>2</sub>	- ve	- ve
Ochratoxin	- ve	- ve

Table 3. Haemogram and leukogram profile in both apparently healthy and unthrifty calves as well as post-treatment.

Parameter		Healthy animal (n =10)	Unthrifty calves (n =50)	Post treatment (n =50)
RBCs X 10 <sup>6</sup> cum		6.3 ± 2.3	4.1 ± 1.2**	5.9 ± 1.03
Hb g/dl		8.4 ± 0.13	7.9 ± 0.55*	8.3 ± 1.31
PCV%		31.6 ± 0.72	30.17 ± 1.5	31 ± 0.6
MCV Cu		52.5 ± 0.41	53.5 ± 0.9	52 ± 0.4
MCH ug		14 ± 0.17	11.58 ± 0.31*	13.9 ± 0.51
MCHC g/ dl		26.3 ± 0.8	22 ± 0.6*	25.1 ± 0.4
WBCs X 10 <sup>3</sup> cum		7.360 ± 0.49	5.78 ± 0.4**	6.8 ± 0.1
Differential leucocytic count	Neutrophils %	31 ± 1.0	34 ± 1.8	34 ± 1
	Eosinophils %	5.13 ± 0.4	5 ± 0.2	5.2 ± 0.22
	Basophils %	0	0	0
	Lymphocytes %	57.87 ± 3.4	52.6 ± 7.0	55.14 ± 1.8
	Monocytes %	6.0 ± 0.2	8.4 ± 0.3	5.66 ± 1.05

\* Significant comparing with control at P< 0.01 using student test

\*\* Significant comparing with control at P< 0.001 using student test

Table 4. Mean serum values ± SE of studied macro- and micro elements in both apparently healthy and unthrifty calves as well as post-treatment.

Parameter	Healthy calves (n = 10)	Unthrifty calves (n = 50)	Post treatment (n = 50)
Copper µg/ dl	60.3 ± 2.66	50.7 ± 3.15**	58.9 ± 4.2
Zinc µg/ dl	80.08 ± 6.1	59.4 ± 4.05**	81.1 ± 7.1
Iron µg/ dl	87.3 ± 4.1	63 ± 3.75*	84 ± 3.9
Molybdenum m µg/ dl	56.8 ± 3.4	90.6 ± 4.8**	60.2 ± 4.1
Calcium mg/dl	10.28 ± 0.34	8.4 ± 1.33*	10.3 ± 0.4
Inorganic Phosphorus mg/ dl	5.4 ± 0.9	5 ± 0.98	5.42 ± 0.8
Magnesium mg/ dl	2.84 ± 0.2	2.1 ± 0.31*	2.75 ± 0.4
Sodium mEq/ l	143.5 ± 6.4	135.3 ± 5.7*	141 ± 5.4
Potassium mEq/ l	5.0 ± 0.19	4.2 ± 0.26*	5.02 ± 0.3

\* Significant comparing with control at P< 0.01 using student test

\*\* Significant comparing with control at P< 0.001 using student test

Table 5. Mean serum of some biochemical tests in both healthy and unthrifty calves as well as post-treatment (mean  $\pm$  SE).

Parameter	Healthy calves (n = 10)	Unthrifty calves (n = 50)	Post treatment (n = 50)
AST IU/ml	35.1 $\pm$ 0.82	46 $\pm$ 1.12**	40 $\pm$ 1.2
ALT IU/ml	15.2 $\pm$ 2.1	30.1 $\pm$ 2.6**	22 $\pm$ 3.1
A/P IU/L	87.2 $\pm$ 0.6	115 $\pm$ 1.33**	95 $\pm$ 2.1
LDH IU/L	450 $\pm$ 9.2	670 $\pm$ 7.6**	470 $\pm$ 11.1
Cortisol mg/dl	5.7 $\pm$ 0.14	8.7 $\pm$ 1.1**	5.8 $\pm$ 0.22
Total protein g/dl	7.6 $\pm$ 0.27	6.4 $\pm$ 0.27*	7.5 $\pm$ 0.3
Albumin g/dl	3.8 $\pm$ 0.17	2.71 $\pm$ 0.13*	3.7 $\pm$ 0.4
Globulin g/dl	3.78 $\pm$ 0.18	3.86 $\pm$ 0.2	3.8 $\pm$ 0.11
Glucose mg/ dl	69.7 $\pm$ 1.2	45.4 $\pm$ 1.04*	70.2 $\pm$ 1.33
Cholesterol mg/ dl	124.3 $\pm$ 1.02	90.4 $\pm$ 2.1*	125 $\pm$ 3.1
Triglycerides mg/ dl	94.1 $\pm$ 0.9	84 $\pm$ 0.44*	92 $\pm$ 1.2

\* Significant comparing with control at  $P < 0.01$  using student test

\*\* Significant comparing with control at  $P < 0.001$  using student test

## DISCUSSION

The main clinical features of the affected animals were inappetence, decreased feed intake, poor growth and ill-thriftiness.

In our results, depression was observed with total RBCs counts Hb values, MCH and MCHC than those in healthy ones. No significant differences were detected with other selected hemogramic parameters (Table 3). Those results, revealed generally a coexistence of clinical marginal anaemia with clinical laboratory copper deficiency.

However, leukogram in ill-thrifty fattening calves was found to be significantly depressed for total WBCs than the corresponding values in healthy ones.



The decrease of total leucocytic count in copper deficient fattening calves may be attributed to the stress of malnutrition. This suggestion was supported and discussed by the opinion of Mgongo *et al.* (1985). Regarding the results, biochemical profile of some trace elements of apparently healthy and ill-thrifty fattening calves (Table 4), these obtained values were highly significantly decreased in serum copper. The decrement in serum copper levels in diseased fattening calves was attributed to increase molybdenum concentration in the ration, which, reduces the availability of dietary copper due to formation of insoluble cupric- thiomolybdate complex in the rumen of animals (McDonald *et al.*, 1979). This antagonistic relationship between copper and molybdenum was previously recorded by Suttle (1994) who reported that forage molybdenum concentration greater than the copper concentration often leads to secondary copper deficiency, even when forage copper is adequate.

In our investigation, there was significant decrease in serum zinc level in fattening calves suffering from ill-thrifty when compared with their healthy ones. This decrease may be attributed to disturbance in absorption of zinc from gastrointestinal tract or may be due to loss of appetite.

In the present study, the serum iron of fattening calves suffering from copper deficiency, showed significant decrease if compared with healthy ones.

In our results, serum calcium, phosphorus magnesium, sodium and potassium showed significant decrease in diseased animals although ration analysis revealed lowered value of these minerals that caused significant decrease in serum calcium and magnesium, which is sufficient to cover all animal needs and at the same time present occurrence of the hypomagnesaemic tetany and emaciation. This finding rendered the exact cause of the condition enigmatic and aroused controversial confusion as reported by Duncan *et al.* (1994).

From table 5, it appears that there is a significant decrease in serum total protein, and serum albumin in calves suffering from copper deficiency when compared with healthy ones. The obtained result was in agreement with Coles, (1986).

Decrease in serum protein and serum albumin levels in copper deficiency calves may be attributed to stress factors for which the animal is exposed to general ill thriftiness which may affect worsely the hepatic parenchyma resulting in

the failure of protein synthesis. Moreover, this decrease may again be attributed to increased levels of cortisol in diseased animal which causes catabolism of protein leading to negative nitrogen balance and increased urinary elimination of nitrogen .

Our data in the present study showed that the AST, ALT, ALP and LDH activating in the ill thrifty fattening calves were significantly increased when compared with control ones (Table 5). The obtained data were similar to those previously reported by Fell (1981) who observed elevation of liver enzymes in the blood of sheep fed copper deficient diet, indicating hepatic dysfunction. It is evident from Table 5 that the serum ALP and LDH showed significant increase in copper deficiency calves.

Increase serum alkaline phosphatase activity in the copper deficient calves may be attributed to higher cortisol level estimated for increase the alkaline phosphatase production from biliary epithelium. In our results, it was found that the serum glucose level in diseased animals was significantly decreased as compared with healthy control groups. The decrease in serum glucose level in the diseased animal (Table 5) may be due to copper deficiency.

Our investigation showed that the total serum cholesterol and triglyceride levels in ill-thrifty fattening calves were significantly decreased when compared with control ones (Table 5). The obtained results were similar to those previously reported by Hamam *et al.* (1980) who found reduction in serum cholesterol level in copper deficient animals. These reduction of cholesterol and triglycerides may reflect either reduced food intake or early hepatic damage .

Our data obtained in the results showed a highly significant increase in the serum cortisol concentration of copper deficient calves when compared with healthy ones (Table 5). The high values of serum cortisol may be attributed to hypocuprosis via influencing the adrenal cortex ascorbic acid.

After treatment with solevit complex I/M for three times for 5 days it was observed that all parameters under investigation returned to their normal values with improvement of general healthy condition of diseased calves after one month of treatment.

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## التأثير العلاجي لحالات الضعف العام فى عجول التسمين بمستحضر سوليفيت ونتيجة الدراسات البيوكيميائية والهيماطولوجية

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تم إجراء هذه الدراسة على ٥٠ رأساً من عجول الأبقار التى تتراوح أعمارها من (١٢- ٢٤ شهراً) فى محافظات طنطا ، المنصورة ، دمياط ، الشرقية وكفر الشيخ التى ظهرت عليها سوء التغذية وانخفاض فى الوزن بالإضافة إلى عدد ١٠ أبقار سليمة تتغذى على علائق متكاملة كمجموعة ضابطة.

وقد تم دراسة الأعراض الإكلينيكية وأخذ عينات من دم ومصل عجول الأبقار قبل وبعد العلاج بعقار السوليفيت وقد أسفرت النتائج على ما يلى:

١- بالنسبة لصوره السدم: لوحظ انخفاض معنوى لمستوى العد الكلى لكرات الدم الحمراء وكمية الهيموجلوبين وحجم الخلايا المضغوطة فى الحيوانات المريضة مما تبين أن الحيوانات تعانى من أنيميا. كما لوحظ انخفاض ملحوظ فى العد الكلى لخلايا الدم البيضاء ونسبة الخلايا القاعدية عند مقارنتها بالمجموعة الضابطة.

٢- بالنسبة للتحليل البيوكيميائى لمصل الدم وجد الآتى:

أ- انخفاض معنوى فى مستوى النحاس والحديد والزنك مع ارتفاع معنوى فى مستوى الموليبيدوم فى الأبقار المريضة عند مقارنتها بالمجموعة الضابطة.

ب- انخفاض معنوى فى مستويات الكالسيوم والماغنسيوم والصوديوم والبوتاسيوم.

ج- انخفاض ملحوظ فى مستوى البروتين الكلى والالبومين والجلوكوز والكوليستيرول والدهون الثلاثية.

د - ارتفاع ملحوظ فى انزيمات الاسبارتيت أمينوترانسفيريز والفوسفاتيز القلوى واللاكتك اسيد ديهيدروجينيز والكورتيزون مقارنة بالمجموعة الضابطة.

هذا وقد رجعت كل هذه القياسات الى قرب مستوياتها الطبيعى بعد شهر من العلاج.

ومن الدراسة يتضح أن العلائق المقدمة لعجول التسمين يوجد بها نقص فى الأملاح الأساسية والنادرة أو توجد بنسبة لا تكفى لاحتياجتها مما يجعل ظهور هذه الحالات من مرض نقص النحاس فى الدم الأمر الذى يعترى إلى ضرورة التنبيه لتلك الظاهرة واتخاذ الإحتياطات اللازمة لمقاومة ومنع هذه الأعراض من خلال إعطاء مثل هذه الحيوانات مركبات فيتامينات وأملاح لتعويض هذا النقص حتى نتلافى الخسائر الإقتصادية الناجمة عن ذلك.