

FIELD INVESTIGATIONS OF SOME BLOOD TRACE ELEMENTS IN BUFFALO-CALVES SUFFERING FROM LOSS OF HAIR AND SKIN LESIONS

(With 6 Fig. & 3 Tables)

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دراسة حقلية لبعض العناصر النادرة في دم العجول الجاموسى والتي تعاني من سقوط الشعر واصابات الجلد

على صديقي ، غزت رضوان
غرفات سيدي

شملت الدراسة عدد ٨٠ عجل جاموسى تتراوح أعمارها من ٢ - ٦ أشهر فى مزرعة الحواتكة للجاموس ، حيث كان من بينها عدد ٦٠ عجل جاموسى مريضه ، وعشرون عجل جاموسى سليمه أكلينيكياً أخذت للمقارنه ، تمثأت الأعراض الاكلينيكيه للحالات المريضة فى صورة تساقط كثيف للشعر فى مناطق مختلفه من الجسم مصحوبه بخشونة البشرة وضعف النمو . كما لوحظ وجود اصابات مختلفه فى المناطق العارويه من الجلد بدء من ظهور بقع حمراء مروراً بوجود البثرات والندب والقشور وانتهاء بتشقق الجلد وجفافه - وكان التشخيص المبدئى لهذه الحالات هو نقص بعض العناصر النادرة فى دماء هذه الحيوانات .

تم قياس مستويات كل من عنصر الزنك ، النحاس ، المنجنيز والحديد فى مصل دم العجول المريضة والسليمه ، وكذا قياس الحجم الكلى لكرات الدم الحمراء المصمته ، الهيموجلوبين مع العد الكلى والنوعى لكرات الدم البيضاء فى دم هذه الحيوانات .

أوضحت الدراسة الاحصائيه أن العجول الجاموسى بعد الفطام فى هذه المزرعه تعاني من نقص معنوى (٠.٠١ ر) فى عنصر الزنك وثقله فى النحاس وكان المنجنيز (٠.٥ ر) فى مصل دم العجول المريضة مما أدى الى نقص النمو وفقدان الوزن وظهور علامات مرضيه على الشعر والجلد - كما أفادت الدراسة أيضاً أن اضافة هذه العناصر (الزنك - النحاس - المنجنيز) بكميات مناسبة وكافيه الى مخلوط علائق العجول لمدة شهر قد أدى الى تحسن الحاله الصحيه لهذه الحيوانات .

SUMMARY

A total number of 80 buffalo-calves, 2-6 months of age in El-Hawatka buffaloe farm were involved in this study. Sixty buffalo-calves were clinically affected and 20 buffalo-calves were clinically healthy and served as control. The obvious signs were massive loss of hair at different regions of the body, rough coat and unthriftiness. Erythema, viscles papules, scales, fissure and parakeratosis were markedly observed in the nuded areas of skin. These signs were clinically suggestive for trace elements deficiency. Blood serum levels of zinc, copper, iron and manganese were estimated. Packed cell volume (PCV), haemoglobin (Hb) total and differential leucocytic cout were also investigated. The study revealed that post-weaning bufflo-calves in this farm suffered from deficiency of zinc ($P < 0.001$), copper ($P < 0.001$) and manganese ($P < 0.05$) in thier blood sera resulting in poor growth, unthriftiness, and coat and skin abnormalities. Addition of mineral mixture containing an adequate amounts of zinc, copper and manganese to the concentrate calf mixture for one month proved improvement of the condition.

Keywords: Field investigation, trace elements buffalo-calves, hair loss & skin lesions.

INTRODUCTION

There is no doubt that condition of the coat and skin in young calves is a reflection of its healthy status. Smooth, shinny and normally pigmented hair are signs of good housing and nutrition. Abnormal condition of the coat and skin are indicative of either primary or secondary skin diseases. Absence of the hair coat make the animal more exposed to sudden changes of climatic conditions, where signs of primary diseases and evidences of scratching or rubbing are noted (BLOOD and RADOSTITS, 1989).

Wasting diseases, alopecia, depigmented hair, skin disorders, non infectious abortion, diarrhoea, anaemia, loss of appetite, bone abnormalities, tetanv, low fertility and pica were clinical signs often suggestive of mineral deficiencies through the world (McDOWELL and CONRAD, 1977; underwood, 1977 and ANDDREWS et al., 1992).

Mineral requirements for animals is affected by many aspects, such as nature and level of production, age, level and chemical form of elements, interrelationship with other nutrients, mineral intake, breed and animal adaptation (McDOWELL and CONRAD, 1977 and UNDERWOOD, 1977). The role of minerals in animal nutrition is complex because excess of some of them may cause toxicity. In addition of a rather complex interaction between different essential elements. In tropical environments, minerals deficiencies may be enhanced by losing considerable quantities of the elements during sweating or by excessive salivation (WILLIAMSON and PAVNE, 1982).

Deficiency of single trace element rarely occur in domestic animals in the field, however combination of mineral deficiencies are more common (HIDIROGLOU, 1979). Ruminants are frequently subjected to severe dietary deficiencies of trace elements such as copper, cobalt, selenium, iodine, manganese and zinc (UNDERWOOD, 1977 and EL-AZAB et al., 1993).

This investigation aimed to: 1- Description of the clinical picture and the probable cause of the massive loss of hair, skin lesions and unthriftiness among buffalo-calves in El-Hawatka Governmental buffalo farm, 2- Estimation of blood serum level of zinc, copper, manganese and iron, 3- Determination of PCV, Hb, total and differential leucocytic count and 4- Parasitological examination of faeces and skin scrapping.

MATERIAL AND METHODS

A- Animals:

A total number of 80 buffalo-calves of both sex, 2-6 months of age in El-Hawatka Governmental buffalo farm were clinically examined. Buffalo-calves were raised in three separate free stall barns which were partly covered with aspestose sheds. Sixty calves (75%) were suffering from variable signs of alopecia, poor growth, rough coat, reddness of skin and skin lesions on different parts of the body. Twenty buffalo-calves 2-6 months of age were selected as control, these were growing good, with no signs of apparent illness, no alopecia or skin lesion. They were subjected for clinical and laboratory examination and proved to be healthy.

All Buffalo-calves were locally born in the same farm and housed in separate barns after weaning. They were raised for both fattening (males) and herd replacement (females). They were fed whole mother milk until weaning. From 3-5 months of age, the station feeding system was to fed each calf about 11-74 kg barseem, 0.75 kg straw in winter and 5.25 kg green

fodder plus 1.25 kg calf mixture and 0.75 kg straw in summer. In absence of green fodder it was replaced by 2 kg calf mixture*.

B- Samples and adopted methods:

The following samples were collected from the diseased buffalo-calves as well as control ones.

- 1- Whole blood without anticoagulant for determination of blood serum levels of zinc, copper and manganese ($\mu\text{mol/l}$) by means of Atomic Absorption Spectrophotometer (Perkin Elmer Model 2380 USA). Blood serum iron ($\mu\text{mol/l}$) was determined colorimetrically by means of a test kits supplied by Sclavo company** after the method modified by GARCIC (1979). Whole blood with anticoagulant (disodium salt of EDTA) for estimation of PCV (%), Hb concentration (g/l), total and differential leucocytic count. The adopted methods were after COLES (1980).
- 3- Skin scrapping: Examined for dermatophytes and metazoan parasite according to the method described in COLES (1980).
- 4- Faecal samples: Examined for gastrointestinal parasites according to the method described by COLES (1980).

The obtained data were statistically analysed by means of a Microsoft computer program (microstat).

C- Therapeutic trials:

Mineral mixture containing adequate amounts of zinc sulphate (200 mg per kg feed daily) and 0.75 gm copper sulphate daily were offered for calves for 4 weeks. Clinical observation of these calves were carried out during and after treatment.

RESULTS

1- Clinical Findings:

Sixty out of eighty buffalo-calves were variably affected (Table 1). Calves with 5-6 months age were largely affected. Wide spread loss of hair in the ventral aspects of neck, breast, lower abdomen, flank region, inside and lateral aspects of the thigh, around eyes, around muzzle, perinum and tail head of the animals were observed (Fig. 1,2 and 3). Mating of the hair coat at the shoulder, chest, for limb and base of the ears

*: Calf mixture contain 40% cotton seed cake, 25% rice polish, 20% wheat bran, 12% crushed barley, 2% lime stone, 1% common salt (as stated by the manufacturer).

** : Sclavo S.P.A. Div. Diagnostici e Strumenti, Via Fiorentina, 1. 53100 Siena, Italy.

were noticed. The underlying skin in the nuded areas was markedly hyperaemic (erythematous). Vesicles, blisters, papules and pustules of variable sizes (1-3 cm in diameter, 1-2 mm elevation) were observed in about 90% of affected calves (Fig. 2). Thickening and dryness of skin in the neck and dewlap regions were noticed in most cases. However some calves showed only alopecia with redness in the underlying skin (Fig. 3 and 4). Scratches of skin and areas of bleedings were noticed (Fig. 2). Parakeratosis in the form of wide grey circular areas with cracks, fissures, wrinkling and corrugation of the skin was also noticed (Fig. 1, 2 and 5).

Inappetence, decreased feed intake, poor growth and ill thrift were described by the attendant and also clinically noticed. Watery diarrhoea was observed only in three cases (Fig. 6), however, soft faeces was noticed in most of them.

Internal body temperature, arterial pulse rate, respiratory rate and lung auscultation were almostly within their normal ranges. Conjunctival, oral, nasal and vaginal mucous membranes were slightly pale in color with no lesions. Some calves showed stiffness of gait, others reluctant to move and swollen joints specially knee and pastern joints were also observed.

Gradual improvement of the general health condition of calves was started after addition of the required trace elements. Rathor complete healing was noticed after the elapse of one month. It was in the form of improved appetite, increased feed intake, disappearance of the signs of diarrhoea and skin lesions began to subside gradually.

II- Laboratory Findings:

The results of blood serum levels of zinc, copper, manganese and iron are tabulated in table 2, however, the results of PCV, Hb, Total and differential leucocytic count are illustrated in table 3.

Parasitological examination of faecal samples revealed mild infestation with *Ascaris vitillorum* on two cases.

Skin scrappings revealed no parasitic or mycotic skin infection of the affected cases.

DISCUSSION

Nutritional diseases are considered one of the important causes of economic losses of calves. Suboptimal performance due to inadequate nutrition of calves from birth to six months old is common (*RADOSTITIS and BLOOD, 1985*).

Trace elements deficiency in the developing countries is confounded by the common deficiency of energy, protein,

phosphorus and water which affect postnatal growth and reproductive performance. Undernutrition is commonly accepted as the most important limitation to livestock production in tropic countries (BLOOD and RADOSTITS, 1989).

In this study, the observed signs of alopecia, skin lesions and poor growth in buffalo-calves are typically suggestive of nutritional deficiency especially of trace elements. The laboratory investigation of blood samples for trace elements confirmed this expectation where marked decrease in the blood serum levels of zinc ($P < 0.001$), copper ($P < 0.001$) and manganese ($P < 0.05$) were established, however blood serum levels of iron was not significantly altered (table 2).

Deficiency of trace elements in calves in the post weaning period are not uncommon and may be attributed not only to inadequate diet (poor quality roughage and inadequate concentration of minerals) but also to the fact that calves do not adjust themselves to dry feed effectively for up to several weeks post weaning (UNDERWOOD, 1977 and RADOSTITS and BLOOD, 1985). Similar signs of zinc deficiency in ruminants were reported. These signs were in the form of loss of hair, dermatitis, scaling, cracking and fissuring of the skin. The legs were tender, injured and often raw and bleeding (BLACKMON *et al.*, 1967 and UNDERWOOD and SOMERS, 1969). Skin lesions and tail tip necrosis in young and adult buffaloes suffering from zinc deficiency in the same farm were described (SADIEK, 1994). Zinc deficiency was reported to cause anorexia, alteration in food utilization, growth retardation, depression of immune response, haematological abnormalities, decreased wound healing and keratinization defects in the epidermis, hair, wool and horny appendages in all domestic species (JUBB *et al.*, 1985).

In similar reports of zinc deficiency in buffalo-calves (EL-SHEIKH, 1990) and in housed calves 6-10 weeks old (ANDREWS *et al.*, 1992), where stunted growth, poor appetite, loss of hair, skin lesions and parakeratosis frequently in limbs, muzzle, vulva, anus and tail head were observed.

The observed signs in buffalo-calves are partially related to copper deficiency and the obtained blood serum copper level represent its marginal deficiency. Unthriftiness, stiff gait, grayness of hair, rough starring coat and diarrhoea are reported in copper deficiency (UNDERWOOD, 1977 and BLOOD and RADOSTITS, 1989). Copper have many functions as it chair in the process of osteogenesis, in the body's protective function, in pigmentation and keratinization of hair and in the formation of the copper containing - protein with enzymatic function (BREAZIL, 1971).

Growth retardation caused by zinc is probably arise from:

- a- Decreased activity of thymidine kinase and hence impaired DNA synthesis and cell division.
- b- Decreased appetite and impaired feed utilization. However, manganese deficiency inhibit growth through reduction in feed consumption and impaired efficiency of feed utilization (UNDERWOOD, 1977). On the other hand copper deficiency impair tissue oxidation resulting in interference with intermediate metabolism and loss of condition and failure to grow (BLOOD and RADOSTITS, 1989).

The decreased Hb concentration in diseased buffalo-calves (table 3) are reasonable finding in copper, iron and zinc deficiency. Copper is necessary for the reutilization of iron liberated from normal breakdown of Hb (UNDERWOOD, 1977 and BLOOD and RADOSTITS, 1989). The significant increase ($P < 0.05$) in total leucocytic count with neutrophilia ($P < 0.05$) in diseased buffalo-calves could be attributed to zinc deficiency and its subsequent skin lesions (UNDERWOOD, 1977). Increase PCV ($P < 0.05$) in diseased buffalo-calves may be attributed to the loss of body fluids in calves with diarrhoea and soft faeces. It could be concluded that growing buffalo-calves may be exposed to certain nutritional disorders including trace elements deficiency resulting in its poor growth, coat and skin abnormalities and unthriftiness. Mineral mixture containing adequate amounts of zinc, copper and manganese to the calf concentrate mixture for one month proved improvement of health condition of buffalo-calves. Improved appetite, increased feed intake, absence of diarrhoea and gradual disappearance of skin lesions were a significant reflection to the efficiency of treatment.

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DISCRIPTION OF PICTURES

- Fig. 1: Wide spread areas of alopecia in the ventrolateral aspects of the neck and shoulder with multiple small circumscribed grey lesions.
- Fig. 2: Loss of hair, abrasions, scratches and haemorrhagic skin lesion in the ventral aspect of the neck.

- Fig. 3: Loss of hair in th breast, neck, around eyes with erythematous skin.
- Fig. 4: Massive loss of hair in th ventral aspect of the chest, abdomen, fore limbs with dry wrinkled skin.
- Fig. 5: Wrinkling and corrugation of skin with alopecia and parakeratosis in breast regions with matted hair.
- Fig. 6: Watery diarrhoea in buffalo-calve.

Table 1 : Summary of the observed clinical signs in buffalo-calves in El-Hawatka buffaloe farm.

| Observations | Number | % |
|------------------------------|--------|---------------------|
| Examined animals : | | |
| - Diseased | 80 | 100.00 |
| - Healthy | 60 | 75.00 |
| | 20 | 25.00 |
| <u>Clinical signs</u> . | | |
| Loss of hair only | 6 | 10.00 ^a |
| Loss of hair & skin lesions. | 54 | 75.00 ^a |
| Unthriftiness | 60 | 100.00 ^a |
| Skin scratches and bleeding. | 5 | 8.30 ^a |
| Stiff gait and swollen joint | 10 | 16.00 ^a |
| Soft faeces | 40 | 66.00 ^a |
| Watery diarrhoea | 3 | 5.00 ^a |

^a: The ratio is related to the number of the diseased calves .

BLOOD TRACE ELEMENTS, BUFFALO-CALVES & SKIN LESIONS

Table 2: Blood serum levels of zinc, copper, manganese and iron ($\mu\text{mol/l}$) in diseased and clinically healthy buffaloes calves.

| Parameter | | Zinc $\mu\text{mol/l}$ | Copper $\mu\text{mol/l}$ | Mang $\mu\text{mol/l}$ | Iron $\mu\text{mol/l}$ |
|---|-----------|---------------------------|-----------------------------|---------------------------|---------------------------|
| Diseased buffaloe calves (n = 60) | \bar{x} | 15.50*** | 10.386*** | 8.58* | 22.90 ^{n.s} |
| | sd. | 2.40 | 2.737 | 2.22 | 4.08 |
| | min. | 12.00 | 6.000 | 4.00 | 17.00 |
| | max. | 21.00 | 15.000 | 13.00 | 31.00 |
| Clinically healthy buffaloe calves (n = 20) | \bar{x} | 25.05 | 22.25 | 10.80 | 25.20 |
| | sd | 4.23 | 4.21 | 1.80 | 4.87 |
| | min. | 19.00 | 16.00 | 9.00 | 14.00 |
| | max. | 38.00 | 30.00 | 14.00 | 31.00 |

Table 3 : PCV, Hb, total and differential leucocytic count in diseased and clinically healthy buffaloes calves.

| Parameter | | PCV % | Hb g/l | TWBC G/l | Im.n % | M.N % | Lymph % | Mono. % | Eos. % |
|---|-----------|----------|-----------|-------------|-----------|----------|------------|------------|-----------|
| Diseased buffaloe calves (n = 60) | \bar{x} | 38.06* | 114.03* | 12.54* | 3.48 | 39.48** | 51.00 | 3.18 | 2.81 |
| | sd. | 6.53 | 10.84 | 3.00 | 2.56 | 8.55 | 9.90 | 3.73 | 2.19 |
| | min. | 28.00 | 95.00 | 6.40 | .00 | 29.00 | 33.00 | .00 | 0.00 |
| | max. | 55.00 | 160.00 | 18.00 | 8.00 | 62.00 | 70.00 | 14.00 | 7.00 |
| Clinically healthy buffaloe calves (n = 20) | \bar{x} | 31.60 | 127.00 | 9.04 | 3.05 | 30.75 | 60.85 | 3.45 | 1.90 |
| | sd | 4.16 | 17.19 | 1.16 | 1.63 | 5.17 | 5.18 | 1.87 | 1.58 |
| | min. | 26.00 | 100.00 | 7.40 | .00 | 23.00 | 50.00 | 1.00 | .00 |
| | max. | 40.00 | 151.00 | 12.00 | 5.00 | 41.00 | 71.00 | 6.00 | 5.00 |

G/l = Giga /liter ($10^9/l$) \bar{x} = Mean n.s = non significant
 sd. = Standard Deviation. min. = Minimum max. = Maximum
 * = (P < 0.05) ** = (P < 0.01) *** = (P < 0.001)
 Im.n = Immature Neutrophil M.N. = Mature Neutrophils





