Some Studies on Deviated Appetite (Pica) in Cattle

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Abstract

This study was carried out on Thirty two non-pregnant lactating cows aged (5±0.5) year, these cattle were examined separately as individual cases in Behera governorate, Egypt. All cattle were admitted to clinical and laboratory examination. Accordingly, the chosen cattle were divided into two groups. Group (I) consisted of 22 cow showed signs of pica. Group (II) consisted of 10 healthy cows used as a control. The most visual signs are ingestion of abnormal materials that are generally uneatable for cows like wood, paper, plastic and so on, in addition to continuous hair, floor and manager licking with decrease in the body weight and loss of its conditions. The biochemical findings reveals mild significant decrease \((p < 0.05)\) in serum glucose and total antioxidant capacity (TAC) concentration, with moderate significant decrease \((p < 0.01)\) in serum Zinc, Copper, Iron, Cobalt, Magnesium and Selenium concentrations and sever significant decrease \((p < 0.001)\) in Phosphorus concentrations in group (I). There is mild significant increase \((p < 0.05)\) in BUN and malondialdehyde (MDA) concentration, with moderate significant increase \((p < 0.01)\) in Creatinine, AST and Bilirubin concentrations and sever significant increase \((p < 0.001)\) in ALT concentration in diseased group. On the other hand there is no significant difference in serum calcium and total protein concentration between two group.

1. INTRODUCTION:

Pica is a depraved or abnormal appetite, it is usually associated with animals that chew or eat wood, fences, trees, buildings, dirt, bones, or other inanimate objects not usually considered feedstuffs. The mechanism of pica are not yet understood, it has been associated with parasitism and deficiencies of phosphorus, salt, protein (smith, 2015). Mostly, Allotriophagia (pica) associated with dietary deficiency or imbalances, either of bulk fiber or of animal nutrients, mainly salt, phosphorus and cobalt. Serious complications of pica include cannibalism, foreign bodies penetrating alimentary tract as traumatic reticuloperitonitis, poisonings particularly by lead, botulism, or accumulations of wool, fiber or sand may cause obstruction of digestive tract (fibrolith) (Radostits et al., 2007). This case is found in dairy cattle, buffaloes (especially pregnant and lactating) and in other animals as sheep and goats (Anderson, 1994). There are numerous reasons of pica including lack in certain proteins, \(\alpha\)-amino-acids, vitamins and follow components and in addition diminishment in salt store of body, unequal dietary calcium-phosphorus ratio and phosphorus deficiency (Aytekin and Kalinbacak, 2008). Inadequacy of Soda salts or phosphates in the animal food may cause this issue (Smith et al., 2000). Follow component lacks, specifically copper, zinc, and cobalt, have been implicated in the etiology of pica and fleece dietary pattern in sheep (Fahmy et al., 1980). Pica also appear in the form of soil eating, surface licking, a craving to eat non-nourishment objects, weight reduction and lessening in body imperviousness to diseases in view of the influenced resistance framework (Abdelrahaman et al., 1998). It has also been associated with a nervous derangement, probably interfering with nutrition. In some animals, pica is a reflection of boredom, as animals kept singly suffer more frequently than those kept in groups. In some lactating buffaloes, pica may be a sign of subclinical ketosis. Ketosis-associated pica is characterized by rejection of concentrate but the continuation of eating of roughages (Ranjhan and Pathak, 1992). The aim of this study was to determine the main causes of pica in cattle through the clinical, serum biochemical, metabolic and oxidative changes.

2. MATERIAL AND METHODS

2.1. Animals
Thirty two non-pregnant lactating cow aged (5±0.5) year were included in this study. These cattle were visualized and examined in different areas in Behera governorate, Egypt. All the chosen cattle have been raised correspondingly under disorderly cultivating with unacceptable models of cattle administration and eating. All cattle were previously treated with two successive doses with anthelmintic drugs, fecal examination were performed before sampling to ensure absence of internal parasite infestation. Accordingly, the chosen cattle were divided into two groups. Group (I) consisted of 22 cow showed signs of pica. Group (II) consisted of 10 healthy cows used as a control.

2.2. Blood samples:

One blood samples was collected from jugular vein into plain tubes without anticoagulant for serum collection from both group I & II. The serum was gathered by centrifugation of tubes at 3000 rpm for 10 min. then preserved at −20°C until investigation.

2.3. Biochemical analysis:

Serum Zinc (Zn), Copper (Cu), Iron (Fe), Cobalt (Co) and selenium (Se) were determined with Flame emission atomic absorption spectrophotometer – model 210 vgp, Buck scientific, USA.

Serum Phosphorus (Ph), Calcium (Ca), Magnesium (Mg), glucose, blood urea nitrogen (BUN), Creatinine (Cr), alanine transaminase (ALT), total protein (TP) and Bilirubin were measured spectrophotometrically by using commercial test kits supplied by Biomed diagnostics (Germany) as indicated by the maker's directions.

Serum Malondialdehyde (MDA) and Total antioxidant capacity (TAC) were measured by spectrophotometric strategy utilizing financially accessible test packs supplied by Bio-diagnostics (Egypt) following standard methods mentioned in the leaflet of the manufacturer.

Table (1): Micro and macro element levels (Means ± SD) in cattle suffering from Pica and control group * p< 0.05, ** p < 0.01 and *** p < 0.001

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control group</th>
<th>Diseased group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc (ppm)</td>
<td>0.396± 0.029</td>
<td>0.217± 0.037**</td>
</tr>
<tr>
<td>Copper (ppm)</td>
<td>1.334± 0.076</td>
<td>0.655± 0.521**</td>
</tr>
<tr>
<td>Iron (ppm)</td>
<td>1.108± 0.069</td>
<td>0.853± 0.082**</td>
</tr>
<tr>
<td>Cobalt (ppm)</td>
<td>0.0121± 0.001</td>
<td>0.004± 0.001**</td>
</tr>
<tr>
<td>Calcium (mg/dl)</td>
<td>9.464± 0.248</td>
<td>10.5± 0.543</td>
</tr>
<tr>
<td>Magnesium (mg/dl)</td>
<td>2.3± 0.212</td>
<td>1.14± 0.298**</td>
</tr>
<tr>
<td>Phosphorus (mg/dl)</td>
<td>4.9± 0.667</td>
<td>1.74± 0.512***</td>
</tr>
</tbody>
</table>

2.4. Statistical Analysis

All data are represented by means± SD standard deviation. All values obtained by PRISM application at 0.05, 0.01 and 0.001 probability.

3.1. Clinical findings

Biting or ingesting materials other than normal food and varies from licking (hair, earth and manager) to actual eating (wood, paper, plastic and so on), loss of body conditions, decrease in the body weight, ended by depraved appetite and excessive demand for water drinking.

3.2. Biochemical findings

In table (1), there is moderate significant decrease (p < 0.01) in serum Zinc, Copper, Iron, Cobalt and Magnesium concentrations in group (I) when compared to control group. Also there is severe significant decrease (p < 0.001) in Phosphorus concentrations in Pica group compared to control one. In the other hand there is no significant difference in serum calcium concentration between two groups.

As shown in table (2), there is mild significant increase (p < 0.05) in BUN concentration and moderate significant increase (p < 0.01) in Creatinine, AST and Bilirubin concentrations with severe significant increase (p < 0.01) in ALT concentration in group (I). In the other hand there is mild significant decrease (p < 0.05) in serum glucose concentration in diseased group. Also there is no significant difference in serum protein concentration between two groups.

In table (3), there is mild significant increase (p < 0.05) in serum Malondialdehyde, while Total antioxidant capacity concentrations show mild significant decrease in group (I) than group (II). Also there is moderate significant decrease (p < 0.01) in serum Selenium concentrations between two groups.
Table (2): Biochemical parameters (Means ± SD) in cattle suffering from Pica and control group *p < 0.05, **p < 0.01 and ***p < 0.00

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control Group</th>
<th>Diseased Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose (mg/dl)</td>
<td>64.74± 3.498</td>
<td>52.64± 3.445</td>
</tr>
<tr>
<td>Protein (mg/dl)</td>
<td>7.84± 0.343</td>
<td>7.12± 0.311</td>
</tr>
<tr>
<td>BUN(mg/dl)</td>
<td>26.98± 2.794</td>
<td>32.26± 1.956</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>1.056± 0.084</td>
<td>1.29± 0.073</td>
</tr>
<tr>
<td>ALT(u/l)</td>
<td>16.46± 3.690</td>
<td>39.56± 3.721***</td>
</tr>
<tr>
<td>AST(u/l)</td>
<td>31.9± 3.238</td>
<td>58.38± 6.989**</td>
</tr>
</tbody>
</table>
| Bilirubin(mg/dl)     | 1.176± 0.175  | 1.70± 0.098     

Table (3): Oxidant and antioxidant profile (Means ± SD) in cattle suffering from Pica and control group *p < 0.05 and **p < 0.01

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control Group</th>
<th>Diseased Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selenium (ppm)</td>
<td>2.64± 0.180</td>
<td>2.07± 0.174**</td>
</tr>
<tr>
<td>Malondialdehyde MDA(μmol/L)</td>
<td>47.88± 6.537</td>
<td>52.64± 1.594*</td>
</tr>
<tr>
<td>Total antioxidant capacity TAC (mmol/L)</td>
<td>0.198± 0.008</td>
<td>0.163± 0.006*</td>
</tr>
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</table>

3- DISCUSSION

Pica is a generally issue in the world, particularly the mineral inadequacies furthermore, lopsided characteristics for dairy cattle (Garg et al., 2013). In this study, the most clinical findings are aberration of feeding habit as biting or ingesting materials that are generally unaccustomed for a cows like wood, sticks, paper, plastic and so on, continuous licking of hair, manager, walls, floors and other equipment in nearby (Blood and Radostits, 1989; Davenport et al., 1990; Aytekin and Kalinbacak, 2008). Animals suffering from pica will want to feed more but will not have a proportionate weight increase, finally ended by decrease in the body weight, depraved appetite and excessive demand for drinking water. The body condition was slightly weaker than normal and no significant clinical signs suggesting any mineral deficiency were detected (Aytuğ, 1991). Until now previous researches failed to confirm any specific deficiency as a main cause, also our results indicated a collection of many deficiencies. There are many reasons effective in the etiology of pica, which are mainly the deficiency in some proteins, α-amino-acids, vitamins and trace elements as well as reduction in alkali reserve of body, unbalanced dietary calcium-phosphorus ratio and phosphorus deficiency (Davenport et al., 1990; Sahin et al., 2001; Aytekin and Kalinbacak, 2008). It generally occurs with a complication of the dietary deficiency (Aytuğ, 1991). There is moderate significant decrease in serum Zinc, Copper, Iron, Cobalt and Magnesium concentrations in diseased cows when compared to healthy group, these results coincided with (Ghergariu et al., 1994; Jain and Chopra, 1994; Smith et al., 2000). In buffalo (Ranjhan and Pathak, 1992). In sheep (Sahin et al., 2001). In camel (Singh et al., 1986), these attributed to Copper plays an important role in transporting iron across membranes (Rosen et al., 1995). Large proportion of copper circulatting in plasma is combined with serum glycoprotein, ceruloplasmin, which has ferroxidase action and is required to deliver iron to circulation, so, low iron level might resulted from copper deficiency (Haris et al., 1995) and the last of trace elements deficiencies in pica may be caused directly by deficiency of these minerals in the feed intake. An iron deficiency was also suspected in pica in various animal species (Lawlor et al., 1965). Also there is sever significant decrease in Phosphorus concentrations in diseased cows, these results agreed with (Jain and Chopra, 1994) and this attributed to decrease of phosphates in the diet. Phosphorus deficiency has been recognized as primary etiological factor in depraved appetite (Aytuğ, 1991; Blood and Radostits, 1997). Phosphorus deficiency and concomitant Zn and Fe deficiency (Ellis and Schnoes, 2005). (McDonald et al., 1995) similarly reported that pica is not a disorder solely related to phosphorus deficiency. (Aytekin and Kalinbacak, 2008) reported significant decrease of phosphorus and copper mineral concentrations in the sera of calves having earth eating behavior. (Faye and Bengoum, 1994; Ghergariu et al., 1994) stated that circulating inorganic phosphorus levels were significantly lower in the animals with pica than in healthy
controls in camels, cattle and buffalos respectively. On the other hand, there is no significant difference in serum calcium concentration between two groups and this disagree by (Ghergariu et al., 1994). (Akgüll et al., 2000) reported that serum phosphorus, calcium, iron, sodium, manganese, and chloride concentrations in sheep with pica were not changed from the healthy sheep. While, in the same study, reported that serum copper and zinc concentrations from sheep with pica were lower compared with sheep without pica, however, at the present study, iron, manganese, calcium, phosphorus, copper and zinc concentrations were decreased than normal in diseased group. Although the causes of pica in animals are not well understood, there is high consensus that animals behaving pica deficient in Ca and P (Knottenbelt and Pascoe, 2003). (Naci Öcal et al., 2008) found that, Zn, Cu, Ca deficiency with high iron concentration are predisposed with pica and may play an important role in its cause. The levels of trace elements (Se, Zn, Cu, Co, I, Ca, P) in blood of diseased cattle were adjusted after treatment of depraved appetite (Haili et al., 2014). There is increase in ALT, AST and Bilirubin concentrations in group I, these results agreed with (Abdelrahaman et al., 1998; Aytekin and Kalınbacak, 2008); these may be returned to an expand in liver metabolism. Also there is increase in BUN and creatinine which act on catabolizing of the protein in the muscles when large qualities of body reserves are mobilized. This is accordance with condition score of the body and body weight of the cattle (Pambu-Gollah et al., 2000; allaam et al., 2014). Decreased glucose level may attribute to the high demand for energy (Kaneko et al., 1997) and in sheep (Aly and Elshahawy, 2016). While (Aytekin et al., 2011) found there is no change in ALT, AST, TP and Glucose concentration between affected and non-affected horses with pica. (Blood and Radostits, 1989) reported that insufficiency of certain amino acids and a few proteins play an important role in the cause of pica, however the consequences of protein level of present study were contrary of this proposal. Pica is the greater condition which leads to stress in animal particularly ruminant like cows and buffaloes. What's more, this case initiates oxidation process; the oxidation procedure is predominantly joined by release of oxidizing substances or decrease in the impact of the activity of cell reinforcement barriers depend primarily on the period and seriousness of the stressors (Aly et al., 2016). Critical decline in serum Total antioxidant capacity (TAC) and selenium with expansion in Malondahyde (MDA) concentrations these levels expand in oxidants and reduce in the antioxidant levels along the sick time frame. Selenium required in antioxidant agent impact and direction of thyroid capacity by shaping glutathione peroxidase and iodine enzyme, respectively (Berry et al., 1991; Wenzheng et al., 1996). (Haili et al., 2014) noticed that, there are critical diminishing in some antioxidant levels as glutathione peroxidase and superoxide dismutase levels in cows with pica than normal ones and these levels adjusted after treatment of pica with multinutrient pieces. In conclusion, pica is considered as a multifactorial conditions including mineral deficiency in addition to expanded levels of oxidative stress that represent an additional load on animal, these lead to poor profitability and deteriorated body condition unless furnished with adjusted good mineral mix and antioxidant agents.

4- REFERENCES:


Haili, Li, Keling Wang, Limin Lang, Yali Lan, Zihua Hou, Qi Yang, Qinfan Li. 2014. Study the use of urea molasses multinutrient block on pica symptom of cattle. J. Anim. Plant Sci. 21 (2) 3303-3312.


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