The chicken excrete intoxication in fattening cattle of European breeds

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Abstract: In Mexico, there is not enough information about cattle poisoning. A clinical case in a feedlot in Michoacán, Mexico, is described. In November 2017, 35 out 130 bulls were affected (27%), with clinical signs of anorexia, diarrhea, tachycardia, tachypnea, incoordination, low weight gain and corneal opacity. Animals were fed with grains (50%), chicken manure (35%), soybean paste (10%) vitamins, mineral salts (5%) and roughage. The initial treatment consisted of antibiotics and vitamins; after 3 weeks, without a clear improvement, antihistamines and hepatic modulators were added. Three months later, seventeen animals became blind, and the rest showed recovery. It was not possible to perform a necropsy or collection of organ samples, just samples of chicken excrete and water were collected for lead (Pb), mercury (Hg), chromium (Cr), copper (Cu), arsenic (As) and cadmium (Cd) determination by the atomic absorption spectrophotometry technique coupled to a flame detector and also phosphorus and sulfates were determined by UV light spectrometry. The clinical diagnosis was intoxication due to excess of chicken excrete into diet joined with metallic elements present in drinking water. It is concluded an acute poisoning by excess of ammonia, copper, arsenic and mercury in young bovines by contaminated water and chicken excrete.

Keywords: excrete poultry, intoxication, water, bovine meat

Resumen: Intoxicación por pollinaza en ganado de engorde de razas europeas.

En México no existe suficiente información sobre intoxicaciones en el ganado. Se describe un caso clínico ocurrido en un engorde de bovinos en el estado de Michoacán, durante el invierno 2017. De un total de 130 bovinos, 35 de ellos enfermaron (27%), todos de raza europea. Al examen clínico los enfermos mostraron, anorexia, diarrea, taquicardia, taquipnea, incoordinación, fasciculaciones musculares y diecisiete bovinos opacidad de córnea. La alimentación de los animales compuesta por granos de cereales (50%), pollinaza (35%), pasta de soja (10%), vitamina y sales minerales (5%) y forragio seco. Se sospechó de una intoxicación por pollinaza y por una infección gastroentérica. Se ofreció un tratamiento a base de antibióticos y vitaminas ADE, después de tres semanas y sin una clara mejoría se indicó la adición de un antihistamínico y hepatoprotector. No fue posible realizar ninguna necropsia ni colectar tejidos para su estudio histopatológico, utilizando muestras de la pollinaza y del agua para remitirlas al laboratorio de toxicología de la Universidad, para esclarecer el diagnóstico. Se realizaron análisis de cobre (Cu), plomo (Pb), mercurio (Hg), cromo (Cr), arsenico (As) y cadmio (Cd), mediante la técnica de espectroscopía de absorción atómica acoplada a un detector de llama y la espectrofotometría de luz ultravioleta para el fósforo y sulfatos. Los resultados del laboratorio mostraron niveles de cobre en la pollinaza inusuales y en el agua elementos metálicos. Tres meses después los animales se recuperaron. Se concluye una intoxicación aguda por exceso de amonio, cobre, arsénico y mercurio.

Palabras clave: pollinaza, intoxicación, bovinos de carne, agua.

Introduction

In Mexico it does not exist a reference center where the clinical veterinarians can request information about specific poisonings; this lack of data makes a difficult diagnosis in field, so the epidemiology information in cattle poisoning is almost null in several countries as mentioned by Guitart et al, 2010. The chicken excrete from intensive production poultry, is a common feedstuff in feedlots in Central Mexico. The inclusion of 25% poultry litter in the bulls ration and also a copper content minor to 50 ppm, has been indicated as safe; however, it is important to know their chemical composition due to variability in humidity, non-protein nitrogen and heavy metals as copper, arsenic, lead, mercury. Moreover, some external situations as stress or genetics (race), are additional factors that can cause an unusual intoxication (Fernández et al, 2010).

The water quality in the municipality of Aculutzio, in the state of Michoacan is unsafe, due to the contamination of Cuitzeo lake, where manganese, iron, arsenic, copper, cadmium, lead and phosphates have been detected (Israde et al, 2008). The cattle herd (feedlot) was located in Aculutzio, Michoacán, at Central Mexico, which has a temperate climate with rains in summer, a temperature range from 12 to 22 ºC, and a pluvial precipitation of 600 to 1500 mm per year; in addition, the main economic activity is the agriculture. The cattle herd is dedicated to fattening bulls and it has 130 cattle of European breeds such as Charolais, Simmental, Swiss, Brangus of 2 years old, from different states of the country. Thirty five animals became ill in November 2017 which represents 27% of the total animals. The diet of all animals was based on 35% chicken manure, 50% (cereal grains), 10% soybean paste and 5% mineral salts.

Clinical case presentation

The animals presented 40ºC of temperature (hyperthermia), heart rate of 110 pul / min (tachycardia), respiratory rate of 60 breaths / min (tachipnea), anorexia, diarrhea, jugular ingurgitation, nasal fluid, apathy, prostration in lateral decubitus, muscle tremors, convulsions and seventeen steers with corneal opacity. The initial treatment was with antibiotics benzathine and procaine penicillin in a dose of 40,000 IU per kg by IM via for five days, B complex vitamins in doses of 1ml, per 20 kg every third day, diphenhydramine hydrochloride, 10 mg / mL, at a dose of 1ml / 10kg, by IM two applications every third day and genabolic acid 50 mg / mL, at a dose of 1ml / 20, by IM, three applications every third day.

The samples collected were chicken excrete (1 kg) and 1 L of water which were sent to the toxicology laboratory of the University (UAM-X), for copper, chromium, mercury, arsenic, lead and cadmium detection in chicken manure and sulfates and phosphates in water. The mineral ions were analyzed from 2 g of the sample, an acid digestion was carried out using nitric and perchloric acid 2: 1 v/v during one hour, after they were applied in an atomic absorption chromatograph and flame detector, using the procedures of Environmental Protection Agency guide methods, with a detection limit of 1 ppm (EPA, 2004). The clinical diagnosis was chicken manure intoxication and its withdrawal was ordered.

Results

The laboratory results can be noted in table 1 and 2, where the mercury and copper in the chicken excrete were found out of the recommendations; arsenic, mercury and sulfates were found outside the recommendation guide of the National Water Commission, 2009. (Table 2).

<table>
<thead>
<tr>
<th>Sample</th>
<th>Hg</th>
<th>Cr</th>
<th>Cu</th>
<th>As</th>
<th>Cd</th>
<th>Pb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken manure</td>
<td>0.1</td>
<td>0.3</td>
<td>116</td>
<td>0.42</td>
<td>0.126</td>
<td>0.54</td>
</tr>
<tr>
<td>L.M. A.</td>
<td>0.01</td>
<td>0.1</td>
<td>30-50</td>
<td>0.20</td>
<td>0.005</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Table 1. Levels of chemical elements detected in the waste poultry (expressed in mg L).
Table 2. Levels of chemical elements in water for animal consumption on fattening cattle (expressed in ppm).

<table>
<thead>
<tr>
<th>Sample</th>
<th>sulphate</th>
<th>P</th>
<th>Hg</th>
<th>Cu</th>
<th>Cd</th>
<th>Pb</th>
<th>As</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L.M.A.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.1</td>
<td>1.03</td>
<td>0.19</td>
<td>0.13</td>
<td>0.15</td>
<td>0.12</td>
<td>0.79</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>10.0</td>
<td>0.01</td>
<td>0.20</td>
<td>0.005</td>
<td>0.05</td>
<td>0.004</td>
<td>0.05</td>
</tr>
</tbody>
</table>

L.M.A. Maximum level allowed

Most of the animals recovered slowly in the next months after the chicken excrete was out of diet. Finally, three months after of outbreak started, the animals recovered.

Discussion

The levels of chicken excrete recommended by different authors as a source of protein in ruminants diet were not the ones used in the feedlot where the problem was presented (Silanikove and Tiomkin, 1992), the excessive levels were quickly absorbed such as ammonia (NH₃) and ammonia (NH₄) from non-protein nitrogen by young bulls, and its crossing to the liver leading to an increase in its blood levels which induced the ingurgitated jugular vein, convulsions, brain disorder like blindness and other signs that could be noticed in the ill animals (Ahmet Uzatici, 2012). The copper excess (>50 ppm) found in the chicken excrete, might sustain the intoxication by an excess of chicken excrete in diet (Pacheco et al, 2003; Van Reyssen 2015; Bolan, 2010), so it is necessary to consider the nutritional quality of these feedstuff. Also, the chicken excrete, can be a danger because of the arsenic (As), copper (Cu) and zinc (Zn) that could be present (Amaron, 2008). Copper is capable to accumulate in the liver, producing a hepatomegaly that it could not be observed due to the lack of necropsy in any animal, nevertheless we could observe their suffering by its vocalization. In the other hand, the released mercury into the bloodstream destroyed red blood cells, causing weakness, apathy, muscle tremors, prostration in lateral decubitus and incoordination (Fourie et al, 1991). So, the poisoning case was due to a synergistic effect between copper and mercury, increasing its individual toxicity; coupled with the European race, which is probably less tolerant of the excess of these inorganic chemicals, in comparison with other races.

Mercury and arsenic levels found in drinking water, agrees with Delgado et al, 2015, which ensures that these metals are pollutants of Lake Cuitzeo. So, its toxicity caused in bovines lack of appetite, muscle tremors and diarrhea; the latter by a laxative effect of the sulfates, which cause the alteration in the digestive process and poor use of diet nutrients (García RRJ, 2003; Pérez & Fernández, 2004).

Conclusions

The chicken excrete and water were the sources of ammonia, copper, mercury and arsenic exposure at non-tolerable levels in young bulls of European race, which might cause an acute intoxication in young bovines.

Bibliography