NOTA TÉCNICA

BOVINE INTOXICATION

INTOXICACIÓN EN BOVINOS

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RESUMEN

Quince vacunos adaptados al consumo de una mezcla de residuos de la industria azucarera (bagazo crudo y tratado con vapor a presión, residuos de la destilación alcohólica y melaza) sufrieron trastornos neurológicos. Dos murieron y no tenían lesiones hepáticas ni renales. Había basidiocarpos de *Coprinopsis atramentaria* y *Volvariella volvacea* en el bagazo. El alimento restante en el comedero contenía etanol. La coprina interfiere en el metabolismo del alcohol. La volvatoxina es una proteína cardiotóxica. Los diversos materiales contenían esporos de termoactinobacterias y 14 géneros de mohos.

Palabras clave: bagazo, coprina, etanol,vacunos, volvatoxina

SUMMARY

Fifteen cattle adapted to the consumption of a mixture of sugar cane bagasse, (raw and steam treated bagasse, residues from alcohol distillation and molasses) suffered from neurological disorders. Two cows died but they did not have any liver or kidney lesions. There were *Coprinopsis atramentaria* and *Volvariella volvacea* basidiocarps in the bagasse. The remaining feed in the trough contained ethanol. Coprine interferes alcohol metabolism. Volvatoxin is a cardiotoxic protein. The various materials contained spores of thermoactinobacteria and 14 molds genera.

Keyword: bagasse, cattle, coprine, ethanol, volvatoxin

INTRODUCTION

Fifteen bovines adapted to a feed made with mixture of raw sugarcane bagasse, steam-exploded bagasse, bottom of alcohol distillation and molasses, showed erratic behavior. Some mushrooms grew on bagasse and feed. Two cows died and necropsy did not show any liver and kidney damages. The task was to know the possible cause of neurological disorder and death.

MATERIALS AND METHODS

Mushrooms were identified by macro and microscopic features (Dutta *et al*. 2011; Schaffer, 2010; Wright & Albertó, 2002). Some of them were preserved by drying at 45ºC.

Moulds and thermoactinobacteria spores were removed from raw sugarcane bagasse, steam-exploded bagasse, or feed, by shaking into aqueous tween 80 (0,5 mL/L). Aliquots were spread on malt yeast agar and half-concentration nutrient agar plates that were incubated at 28ºC and 45ºC, respectively. The identification was made by morphological characteristics (Pitt & Hodking, 2009; Carrillo & Benítez-Ahrendts, 2004).

RESULTS

Mushrooms were identified as *Coprinopsis atramentaria* (Bull.) Redhead, Vilgalys & Moncalvo and *Volvariella volvacea* (Bull.) Singer. After ate the mixed ingredients, cows were restless, dizzy, and unable to walk normally. Ethanol was found in feed resting into the trough.

Moulds isolated from raw sugarcane bagasse, steam-exploded bagasse, and feed were *Acremonium, Aspergillus, Chaetomium, Chrysosporium, Cladosporium, Dictyostelium, Gliocladium, Humicola, Mucor, Paecilomyces, Penicillium, Syncephalastrum, Trichoderma,* and *Verticillium.* Also some yeasts were isolated.

The bagasse contained 10^5 thermoactinobacteria spores/g.

DISCUSSION

Coprinopsis atramentaria (Buillard) Redhead, Vilgalys, & Moncalvo [= *Coprinus atramentarius* (Bull. ex Fr.) Fr..] grow on decaying wood or debris in soil (Redhead, 2001). It is most commonly responsible for coprine poisoning, although a few other species have also been implicated (Haberl *et al*., 2011).

C. atramentaria is an edible mushroom, but it contains coprine [N^5-(1-hydroxycyclopropyl)-L-glutamine] which is metabolised to 1-aminocyclopropanol. This latter compound inhibits the enzyme alcohol dehydrogenase, that normally oxidizes ethanol, resulting in an accumulation of acetaldehyde which is responsible for the symptoms. After alcohol intake under the influence of coprine, the concentration of acetaldehyde in the blood may be 5 to 10 times higher than that found during metabolism of the same amount of alcohol alone (Hodgson, 2012).

C. atramentaria poisoning is manifested by a variety of symptoms. Flushing and tingling sensations, nausea, vomiting, headache, tachycardia and cardiovascular disturbances, occur shortly after alcohol is drunk for up to 48 h or 72 h after eating the mushroom. The symptoms abated within a few hours with no sequelae but could be re-provoked by further alcohol consumption up to 48 h later (Kendrick, 2017).

In rats pre-treated with coprine, blood-pressure and heart-rate were recorded before and after intraperitoneal injections of ethanol. Ethanol caused a marked and rapid fall in blood-pressure. This effect was accompanied by tachycardia only in animals treated with coprine (Carlsson et al. 1978). The inky cap mushroom *C. atramentaria* is most commonly responsible for coprine poisoning, although a few other species have also been implicated (Haberl et al., 2011) and carry a range of prognoses, depending on the amount consumed (Michelot 1992).

The volvatoxin A is a cardiotoxic protein from *Volvariella volvacea* that causes cardiac arrest by activation of Ca^{++}-dependent ATPase activity and inhibition of Ca^{++} accumulation in the microsomal fraction of the sarcoplasmic recticulum of the ventricular muscle. It is composed of volvatoxin A1 and volvatoxin A2, of which only A2 is endowed with hemolytic and cytotoxic activity (Weng *et al*. 2004).

The only presence of moulds spores does not indicate the possibility of mycotoxins. Thermoactinobacteria can cause in animals allergic

alveolitis similar to farmer's lung (Constable *et al*. 2017).

Mushrooms toxins caused the neurological disorders and they could have led to death.

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