

## Tremorgenic mycotoxicosis caused by *Paspalum paspaloides* (Michx.) Scribner infected by *Claviceps paspali*: a case report

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**ABSTRACT:** A natural poisoning case caused by ingestion of *Paspalum paspaloides* (Michx.) Scribner infected by *Claviceps paspali* in a bovine herd in Huelva (Spain) is described. This kind of intoxication, frequently described in South Africa and America is rare in Europe and this is the first description in Spain. Clinical signs, which affected 23 calves out of a total of 130 animals, consisted in a nervous syndrome characterized by tremor, hyperexcitability, incoordination, ataxia, depression and paralysis, signs that were aggravated when animals were subjected to certain types of exercises. The most relevant lesions were detected in the brain and consisted in microhaemorrhages diffused through the parenchyma of the brain, neuronal degeneration, satellitosis, neuronophagia, gliosis, and moderate neuropil degeneration in the peripheral zones of the brain.

**Keywords:** mycotoxicosis; tremorgenic; *Paspalum paspaloides* (Michx.) Scribner; *Claviceps paspali*; cattle

*Claviceps paspali* is a fungus that frequently parasitizes grass from the Gen. *Paspalum* (Honey graze). It colonises the ovaries of these plants replacing early flowering grasses with a body denominated sclerotia or ergots. Once these sclerotias have been ingested by grazing animals they produce a neurotoxic syndrome characterized fundamentally by tremors which give the fungi their designation of tremorgenic mycotoxins (Nicholson, 1989; Botha et al., 1996; McKenzie et al., 2004). *Claviceps paspali* can also contaminate other plants like *Paspalum dilatatum* (dallies grass), *P. notatum* (bahia grass) and *P. distichum* (couch paspalum) (Nicholson, 1989).

The tremorgenic syndrome produced by these mycotoxins has been described in South Africa and the American continent frequently, but few cases are reported in Europe including Spain.

Tremorgenic syndrome is described in different grazing species and bovines of different ages have been described to be the most sensitive. Clinical signs are provoked frequently by precipitation, and consist in nervous symptoms characterized by tremor, hyperexcitability, incoordination, ataxia,

depression and paralysis, signs that are aggravated when animals are subjected to certain exercises. On occasion these symptoms are accompanied by diarrhea and polyuria (Nicholson, 1989; Odriozola et al., 1993; Botha et al., 1996).

Tremorgenic mycotoxins contain a nitrogen atom in an indole-diterpenoid nucleus and are derived from tryptophan and geranylgeraniol. These include paspalitrem A and B and paspaline produced by *C. paspali* (Mantle et al., 1978; Plumlee and Galey, 1994; Uhlig et al., 2009). The mechanism of action of the tremorgenic mycotoxins is not known exactly but it seems that they inhibit the function of the GABA-receptor by binding at or near the receptor's site of chloride influx (Norris et al., 1979; Gant et al., 1987).

### Case description

During the month of November in the Donana N.P. marshlands in Huelva (Spain), a tremorgenic syndrome developed in bovines and horses that

were grazing in this area. These lands are usually flooded at this time of year but the weather conditions of this year meant that some areas remained dry, and thus subject to grazing by the livestock. The affected animals were 23 calves, less than one year old, between 8 and 10 months old, and three mother cows from a total of 130 animals. The most intense clinical manifestations were observed in the youngest animals. Also, two foals were slightly affected by the same symptoms.

Clinical signs included tremor, abnormal head movements, ocular globe motor alteration, and motor incoordination which was more evident in posterior members and was aggravated under stress conditions, leading to lateral recumbency. Once on the floor the animals exhibited kicking and sometimes hyperextension of the anterior members. The rectal temperature of some animals was elevated by 1°C or 1.5°C, but in most this parameter was normal. After approximately half an hour in the absence of any external stimulus, the animals recovered and could stand by themselves. In spite of the severity of symptoms, no dead animals were reported.

Euthanasia was carried out by humane methods of one of the most affected animals, an eight month-old calf, and an exhaustive post-mortem study was carried out. This revealed no macroscopic lesions,

only a certain grade of splenomegaly in the mesenteric lymph node. For the microscopic study samples from liver, spleen, lung, kidney, mesenteric lymph node, brain, cerebellum and intestine were taken. The most important histopathological changes were observed in the brain, and consisted in microhaemorrhages diffused through the whole brain parenchyma, neuronal degeneration, satellitosis, neuronophagia, gliosis, necrosis and moderate degeneration of the neuropil from the peripheral zones of the brain (Figure 1). The rest of the organs did not show any relevant lesions.

Other pathologies such as transmissible spongiform encephalopathy and other infectious processes characterised by nervous symptoms such as pesticide or metal poisoning were ruled out.

Inspection of the grass revealed a low-growing ergotised grass subsequently identified as *Paspalum paspaloides* (Michx.) Scribner by the Botanical Laboratory of the University of Cordoba (Spain). The fungus was identified by the morphology of the sclerotia as *Claviceps paspali* by this laboratory.

## DISCUSSION AND CONCLUSIONS

This is the first time that a natural poisoning case characterized by a tremorgenic syndrome in

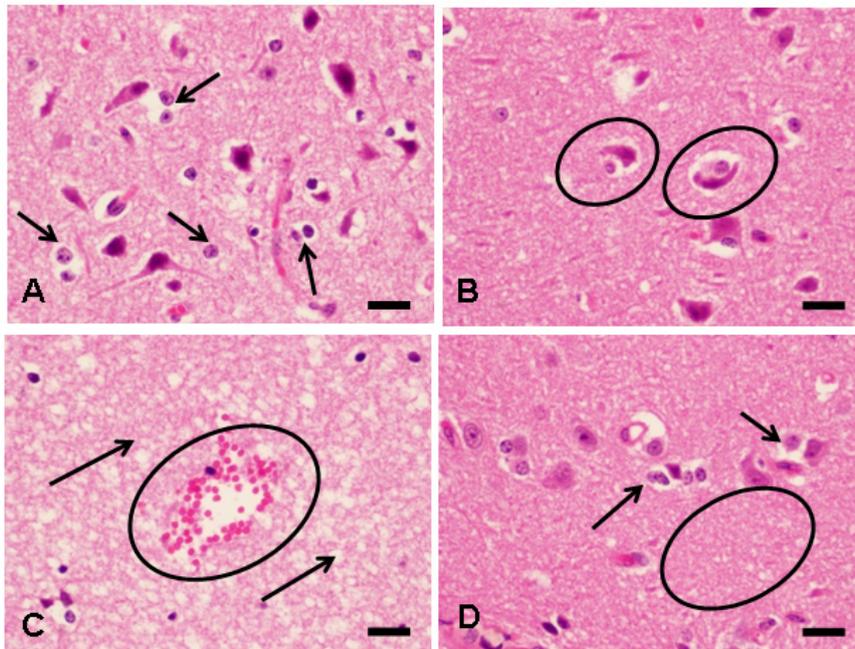


Figure 1. Section of the brain of a bovine with tremorgenic syndrome. Bars: 25 µm. (H&E stain). A = neuronal degeneration (arrow); B = neuronophagia (circle); C = haemorrhage in whole brain parenchyma (circle) and necrosis (arrow); D = degeneration of the neuropil from the peripheral zones of the brain (arrow) and satellitosis (circle)

bovines and horses caused by ingestion of *Paspalum paspaloides* (Michx.) Scribner infected by *Claviceps paspali* is described in Spain. The mechanism of action of the tremorgenic mycotoxins remains to be elucidated but seems to involve inhibition of the GABA-receptor through binding at or near the receptor's site of chloride influx (Norris et al., 1979; Gant et al., 1987).

Clinical signs showed by the affected animals were similar to the signs described by other authors (Nicholson, 1989; Odriozola et al., 1993; Botha et al., 1996) characterized by tremor, hyperexcitability, incoordination, ataxia, depression and paralysis, signs that were aggravated when the affected animals were under stress conditions, leading to lateral recumbency, kicking and sometimes hyperextension of the anterior members. The inhibition of the GABA-receptor by binding at or near the chloride influx receptor seems to be the mechanism of action of the tremorgenic mycotoxins (Norris et al., 1979; Gant et al., 1987). Nevertheless, the most important pathological findings were found in the brain and consisted in microhaemorrhages, neuronal degeneration, satellitosis, neuronophagia, gliosis, necrosis and moderate degeneration of the neuropil from the peripheral zones of the brain. These clinical signs have not been reported by other authors.

In conclusion, the diagnosis of this tremorgenic syndrome involved ruling out other pathologies which also affect the nervous syndrome. Inspection of the grass revealed a low-growing ergotised grass. This was subsequently identified as *Paspalum paspaloides* (Michx.) Scribner and the fungus was identified based on the morphology of the sclerotia as *Claviceps paspali*.

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