

Histological changes caused by experimental *Riedeliella graciliflora* (Leg. Papilionoideae) poisoning in cattle and laboratory animals¹

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ABSTRACT.- Riet-Correa F., Górnaiak S.L., Haraguchi M. & Dagli M.L.Z. 2001. **Histological changes caused by experimental *Riedeliella graciliflora* (Leg. Papilionoideae) poisoning in cattle and laboratory animals.** *Pesquisa Veterinária Brasileira* 21(1):5-7. Laboratório Regional de Diagnóstico, Faculdade de Veterinária, Universidade Federal de Pelotas, 96010-900 Pelotas, RS, Brazil.

Tissues from cattle, mice, rats and guinea pigs experimentally intoxicated by *Riedeliella graciliflora* were studied histologically. Cattle lymph nodes, spleen, Peyer patches and peribronchial lymphoid tissues had diffuse necrosis of lymphocytes, mainly in the germinal centers of the follicles. This lesion was less severe in laboratory animals. All species had severe enteritis with infiltration of the lamina propria by mononuclear cells. Some cells in this infiltrate were necrotic. Degeneration and necrosis of the epithelial cells, mainly in the tip of the villi, and detachment of the epithelial lining from the lamina propria were also observed. In the liver the trabecular structure was disrupted and the hepatocytes had some degree of individual necrosis and degeneration. A tubular nephrosis was observed in the kidneys. Liver, lung, kidney, intestine and lymph nodes had different degrees of congestion. Those lesions are similar than those caused by *Polygala klotzschii*, a plant that contains 5-metoxi-podophyllotoxin.

INDEX TERMS: Toxic plants, *Riedeliella graciliflora*, lymphatic necrosis, nephrosis, enteritis, cattle.

RESUMO.- [Alterações histológicas na intoxicação experimental por *Riedeliella graciliflora* (Leg. Papilionoideae) em bovinos e animais de laboratório.] Foi realizado um estudo histológico de bovinos, camundongos, ratos e coelhos intoxicados experimentalmente por *Riedeliella graciliflora*. Em bovinos os gânglios linfáticos, baço, placas de Peyer e tecido peribronquial apresentavam necrose do tecido linfático, afetando, principalmente, os centros germinativos dos folículos. Esta lesão foi menos severa em animais de laboratório. Em todas as espécies havia severa enterite e infiltração da lâmi-

na própria do intestino por células mononucleares. Algumas destas células estavam necróticas. Degeneração e necrose do epitélio, principalmente na superfície das vilosidades, e descamação das células epiteliais foram, também, observadas. No fígado havia desorganização da estrutura trabecular e alguns hepatócitos apresentavam-se degenerados ou necróticos. Os rins apresentavam nefrose tubular. Diferentes graus de congestão foram observados no fígado, pulmão, rins, intestinos e linfonodos. As lesões observadas são similares às causadas por *Polygala klotzschii*, uma planta que contém 5-metoxi-podofilotoxina.

TERMOS DE INDEXAÇÃO: Plantas tóxicas, *Riedeliella graciliflora*, necrose linfática, nefrose, enterite, bovinos.

INTRODUCTION

Farmers have associated cattle mortalities in the region of Jales, São Paulo, with the ingestion of *Riedeliella graciliflora* (Nobre et al. 1989, Dagli et al. 1995, Górnaiak et al. 1995). There are no data in the literature on post-mortem findings

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or histopathological studies of animals that died during these mortalities. The intoxication has been produced experimentally in cattle (Górniak et al. 1995, Nobre et al. 1989), rats, mice, rabbits (Dagli et al. 1995), guinea pigs (Nobre et al. 1989, Dagli et al. 1995) and sheep (Nobre et al. 1989). Clinical signs of the experimental intoxication in cattle are characterized by anorexia, salivation, severe depression, diarrhea, incoordination, recumbency and death in 18-36 hours (Górniak et al. 1995, Nobre et al. 1989). Serum levels of creatinine are increased (Górniak et al. 1995). Necropsy findings are characterized by ascites, hydrothorax, petechial hemorrhages in the trachea, endocardium and intestines, enlargement and reddening of mesenteric lymph nodes, distention of the gall bladder and congestion of the lung, liver, kidneys and brain (Górniak et al. 1995).

This paper reports the histologic lesions in cattle and laboratory animals intoxicated experimentally with *P. graciliflora*.

MATERIALS AND METHODS

A histological study was performed on animals that succumbed during experiments with *Riedeliella graciliflora* previously reported (Dagli et al. 1995, Górniak et al. 1995). The histological study in cattle was performed in brain, lung, liver, spleen, kidney, lymph nodes, small and large intestine and abomasum from three calves intoxicated experimentally with 10g/kg body weight of fresh leaves of *Riedeliella graciliflora*. The histological study in laboratory animals was performed in brain, lung, liver, spleen, kidney, lymph nodes, stomach, small and large intestine and thymus from five mice, five rats and five guinea pigs intoxicated experimentally. All tissues were fixed in 10% buffered formalin, embedded in paraffin, cut in 5mm sections and stained by haematoxylin and eosin. The methods used for the experimental intoxication, and the clinical signs and gross lesions observed had been reported previously (Dagli et al. 1995, Górniak et al. 1995).

RESULTS

Cattle

Lymph nodes spleen and Peyer patches had diffuse necrosis of lymphocytes, mainly in the germinal centers of the follicles (Fig. 1). The large and small intestine had severe enteritis with infiltration of the lamina propria by lymphocytes, plasma cells, macrophages, undifferentiated mononuclear cells and, occasionally, eosinophils. Some of this mononuclear cells showed necrosis characterized by picnosis, caryorrhexis or caryolysis. Degeneration and necrosis of the epithelial cells, mainly in the tip of the villi, and detachment of the epithelial lining from the lamina propria were also observed.

In the liver the trabecular structure was disrupted; some isolated hepatocytes were necrotic and others had a vacuolated cytoplasm. Many hepatocytes had a vesicular nucleus with scant chromatin. A tubular nephrosis, characterized by vacuolization or necrosis of epithelial cells and presence of hyaline cast in the tubules was observed in the kidneys. Necrosis of lymphoid tissues was also observed in the lungs. Different degrees of congestion were observed in lung, kidney, lymph nodes and liver.

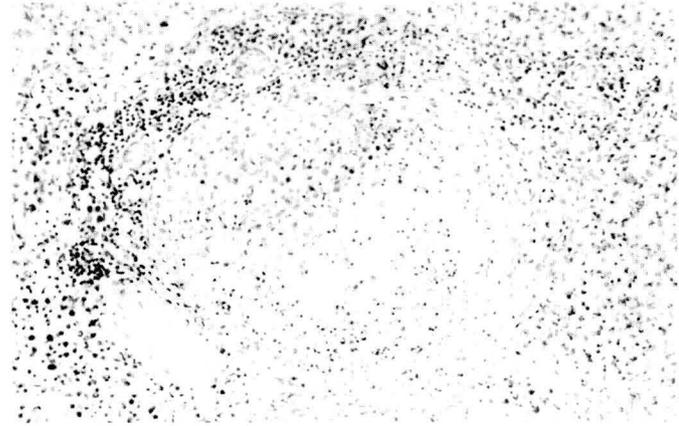


Fig. 1. Diffuse necrosis of the germinal center in a lymphoid follicle of the spleen of a calf intoxicated experimentally by *Riedeliella graciliflora*. HE, obj. 10.

Laboratory animals

In rats, mice and guinea pigs the histologic lesions of the liver, kidney, lung and intestine were similar than those observed in cattle. The kidneys of some rats had an interstitial mononuclear nephritis with necrotic lymphocytes in the exudate. In some animals depletion of lymphocytes was observed in the medullary and cortical regions of the lymph nodes, lymphoid follicles of the spleen and medullar region of the thymus. Necrotic lymphocytes were also observed but in less amount than in cattle. In some animals severe hemorrhages were observed in the medulla of the thymus.

DISCUSSION

The histologic study of cattle and laboratory animals intoxicated experimentally with *R. graciliflora* demonstrated that this plant causes necrosis of the lymphatic tissues. This lesion has not been mentioned in previous reports (Nobre et al. 1989, Górniak et al. 1995, Dagli et al. 1995). Other lesions including generalized congestion and hemorrhages, nephrosis, enteritis and hepatic alterations had been reported previously (Nobre et al. 1989, Dagli et al. 1995). It is possible that at least in cattle such necrosis is partially responsible for the death of the animals intoxicated by this plant.

Histologic lesions in cattle are very similar than those caused by *Polygala klotzschii*, a plant from the Polygalaceae family (Tokarnia et al. 1976, Rezende et al. 1989, Tokarnia et al. 2000). The toxic principle of *P. klotzschii* is 5-methoxy-podophyllotoxin, a substance that belongs to the group of the lignans, which are C₁₈ compounds derived biosynthetically by dimerization of two C₆-C₃ units at the B-carbon of the side chains (Evans 1996). Some of these substances are used for the treatment of certain kind of cancer (Tokarnia et al. 2000).

The unique difference in the histologic lesions of the intoxications by *P. klotzschii* and *R. graciliflora* is that nephrosis has not been reported in *P. klotzschii*. Clinical signs observed in these two intoxication are also very similar. Both cause an acute disease with severe depression, anorexia, diarrhea,

incoordination and recumbency. In the experimental intoxication by *P. klotzschii* the death occurs 10-31 hours after ingestion (Tokarnia et al. 1976) and in *R. graciliflora* in 21-38 hours (Nobre et al. 1989, Górnica et al. 1995). Both plants cause death with doses of 10g/kg body weight and cattle dosed with smaller doses can recover (Tokarnia et al. 1976, Nobre et al. 1989, Górnica et al. 1995).

Another plant that causes necrosis of lymphatic tissue and severe degeneration and necrosis of epithelial cells in the forestomachs, abomasum and intestine is *Baccharis coridifolia*. In the intoxication by *B. coridifolia* digestive and lymphatic lesions are caused by the trychothecenes roridin A, B and E, verrucarins A and J and myotoxin A (Barros 1998).

The histologic lesions caused by *R. graciliflora* in laboratory animals are very similar to those observed in cattle, but in laboratory animals the necrosis of lymphatic tissue is less severe and is not observed in all animals. A similar fact occurs in the intoxication by *P. klotzschii*; in cattle the necrosis of lymphatic tissues is severe in all animals, but in rabbits it is less severe and is observed only in some animals (Rezende et al. 1989).

In the future, in cases of cattle deaths associated with the ingestion of *R. graciliflora*, the observation of the lymphatic

tissue necrosis reported in this paper and other lesions reported earlier will contribute to determine if the plant is responsible for field intoxication.

REFERENCES

- Barros C.S.L. 1998. Intoxication of livestock with *Baccharis coridifolia*, p. 572-569. In: Garland T. & Barr C. (ed.) *Poisonous Plants and other Natural Toxicants*. CAB International, Willingford.
- Dagli M.L.Z., Perrone E.A., Haraguchi M., Górnica S.L. & Hara A. 1995. The acute toxicity of *Riedeliella graciliflora* in laboratory animals. *Vet. Hum. Toxicol.* 37:544-546.
- Evans WC. 1996. *Trease and Evans's Pharmacognosy*. Saunders, London.
- Górnica S.L., Dagli M.L.Z., Perrone E.A. & Haraguchi M. 1995. The acute toxicity of *Riedeliella graciliflora* in calves. *Vet. Hum. Toxicol.* 37:447-448.
- Nobre D., Capellaro C.E.M. & Souza A.C. 1989. *Riedeliella graciliflora*: estudo toxicológico em cobaias e ruminantes. *Arqs Inst. Biol., São Paulo*, 56:39-42.
- Rezende A.N., Döbereiner J., Tokarnia H.C. 1981. Intoxicação experimental por *Polygala klotzschii* (Polygalaceae) em coelhos. *Pesq. Vet. Bras.* 1(2):61-64.
- Tokarnia H.C., Döbereiner J. & Canella C.F.M. 1976. Intoxicação experimental por *Polygala klotzschii* em bovinos. *Pesq. Agropec. Bras., Ser. Vet.* 11:73-86.
- Tokarnia H.C., Döbereiner J. & Peixoto P. 2000. *Plantas Tóxicas do Brasil*. Editora Helianthus, Rio de Janeiro.