

EXPERIMENTAL CATTLE BRACKEN POISONING IN NORTHERN PARTS OF IRAN

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Summary

Experimentally, two forms of bracken fern poisoning (short duration, fatal, and long duration, non-fatal) were reproduced in native breed local cattle in northern parts of Iran.

Attempts to identify causative substance (s) of poisoning have been made with no definite result yet, but are being continued.

Introduction

It has been known for a long time that *Pteridium aquilinum* (Kuhn 1879), which is commonly called "bracken fern" in U.K., is poisonous to horses and cattle and may cause death in these species (Penberthy 1893, Storrar 1893, Almond 1894, Muller 1897).

Cattle bracken poisoning has been reproduced many times both experimentally, and in the field by feeding fresh or sun-dried green bracken fronds and rhizomes alone or mixed with hay (Almond 1894, Stockman 1917, Hagan and Zeissig 1927, Gleeson 1499, Evans 1958, Stocks and Davies 1960).

Bracken frond or rhizome, which contains the powerful enzyme thiaminase, when mixed with any diet and fed to rat (Weswig et al. 1946, Evans 1949, Thomas and Walker 1949), horses (Roberts et al. 1963), or even sometimes to sheep (Evans et al. 1963), produced symptoms similar to avitaminosis B₂; in the first 3 species when thiamine was administered in time, no other symptoms developed.

Cattle are particularly sensitive to the effect of bracken fern toxin(s) on bone-marrow (Evans, Evans and Hughes 1954, et al. 1958). Sheep and monogastric animals (e.g. rat, pigs and horses) can tolerate high concentrations of this toxin.

The earliest direct evidence for the presence of a carcinogen in bracken was the report of Rosenberger and Reeschen (1960).

Bladder tumours in cattle are common in certain parts of the

world. Presence of tumours is usually associated with a syndrome known as "chronic enzootic haematuria" or "haematuria vesicalis cancerogenes bovis" (Dunning et al. 1950, Dunning and Curtis 1957, Pamukcu 1955, 1963). Bladder tumours are rare outside areas where enzootic haematuria occurs and are relatively infrequent in the absence of bracken fern (Brobst and Olsen 1963). Tumours in enzootic areas and those induced with bracken fern were complex.

Two of the most striking features of the "bovine chronic enzootic haematuria" are its geographical distribution and endemic nature.

Bovine enzootic haematuria has been recognised in northern parts of Iran (i.e. in the two northern Provinces, Ghilan and Mazandaran) on the border of the Caspian Sea, where bracken fern is widely found; e.g. in Ghildeh, which is a village of Astara City in the Ghilan Province.

At the time of investigation (1975) there were about a hundred cattle, of both sexes, affected with enzootic haematuria; all the affected ones were more than four years old (Koohy 1975).

In this study, an attempt was made to reproduce the disease experimentally by feeding bracken fern to cattle.

Materials and methods

Experimental animals (local animals) and the diet: The animals which were selected for the experiment had not been exposed to bracken fern previously. These animals consisted of: A one-year-old male calf (No. 1), a 1½-year-old female calf (No. 2) and a 3-year-old bull (No. 3).

The animals were fed a diet consisting of dried rice stem (a local food for animals), hay and 250 g. of sun-dried green bracken frond per animal, mixed with bran. This mixture was fed twice a day. 500g. of sun-dried green bracken fronds were equivalent to 1700g. of fresh frond. The animals consumed the diet for the duration of the experiment.

Results:

Calf No. 1 died on September, 1975. It had consumed the diet for about five months. The calf developed fever which lasted for three days before death occurred. It had also anorexia which started about three weeks before fever. Complete anorexia developed a few days before death. One month before death the animal started to lose weight and a large oedematous swelling was observed on the left buttock, causing lameness in the same leg three days before the animal's death.

About two months before death, small quantities of a liquid discharge from nostrils and eyes were at times observed. During the last two months blood stained urine was observed several times.

On post-mortem there were extensive sub-cutaneous and internal haemorrhagic lesions (haemorrhage, petechiae, echymoses) and also blood clot in the small intestine. Histopathologically, congestion was seen in most organs such as spleen, abomasum, kidneys, urinary bladder, heart and brain. Haemosiderosis was observed in spleen and in mesenteric lymphnodes (acute haemosiderosis). There were acute haemorrhagic enteritis, sub-endocardium haemorrhage, sub-epithelial haemorrhage in urinary bladder, haematome, acute haemorrhage and necrosis in some of the muscle fibers.

Calf No. 2 and bull No. 3 were slaughtered on January, 1981. They had consumed the same diet for about $5\frac{1}{2}$ years. No symptoms were seen in calf No. 2 except leanness, and apparently painful urination. The only important sign with regard to bull No. 3 was intermittent haematuria which started about three months before slaughtering; usually there was some bleeding from the penis after urination, or haematuria.

On post-mortem there were only limited haemorrhagic foci on the surface of the slightly thickened urinary bladder mucosa of calf No. 2. In bull No. 3 the thickness of the urinary bladder mucosa was three times the normal size and there were old ulcers on its surface. In some parts of the bladder mucosa there were also papilloid projections with congestion and/or ulcer on their surfaces. Histopathologically, hyperplasia of urinary bladder mucous cells and acute congestion, with infiltration of inflammatory cells between them, was observed in calf No. 2; the mucous cells of the urinary bladder in bull No. 3 had changed into a transitional carcinoma, with young fibrous and inflammatory cells between the mucous cells.

Fig. I shows the lesions on the urinary bladder mucosa of bull No. 3.

Discussion

Both acute and chronic cattle bracken poisoning have been reproduced experimentally, in northern parts of Iran.

Clinically and histopathologically, the experimental chronic form of cattle bracken poisoning was very similar to the naturally occurring bovine enzootic haematuria observed in northern parts of Iran.

The toxic factor(s) responsible for the acute form (aplastic anaemia factor(s)) and for the chronic form (carcinogenic factor(s)) of cattle bracken poisoning is not known yet. For determination of the

aplastic anaemia and carcinogenic factor(s), some biochemical experiments has been carried out on different extracts of bracken fern (Evans and Koohy 1978), (Evans et al. 1982).



Fig. 1, the urinary bladder of bull No. 3. Notice the lesions on the mucosal surface.

In Iran, according to the results obtained and considering the conditions of this experiment, it seems that there has been some special and individual responses and natural resistance to the toxicity of bracken fern.

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