TWO UNUSUAL CASES OF PLANT INTOXICATION IN SMALL RUMINANTS

Twee ongewone gevallen van intoxicatie door planten bij kleine herbivoren

K. Baert\(^1\), S. Croubels\(^1\), N. Steurbaut\(^2\), S. De Boever\(^1\), G. Vercauteren\(^3\), R. Ducatelle\(^3\), A. Verbeken\(^4\), P. De Backer\(^1\)

\(^1\) Department of Pharmacology, Pharmacy and Toxicology, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium
\(^2\) Veterinary Practice, Keylandstraat 7, 9400 Ninove
\(^3\) Department of Pathology, Bacteriology and Avian Diseases, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium
\(^4\) Department of Biology, Faculty of Science, Ghent University, Ledeganckstraat 35, 9000 Gent, Belgium

kris.baert@ugent.be

ABSTRACT

An intoxication by \textit{Euonymus japonicus} or Japanese spindle (‘Japanse kardinaalsmuts’) in sheep and an intoxication by \textit{Pieris japonica} or Japanese Pieris (‘Japanse Pieris’) in goats is described. Eight sheep were found dyspneic and salivating; five of them died. Three goats showed signs of vomiting, were grinding their teeth and were staggering along. All three goats died. Diagnosis was made based on case history, clinical signs and necropsy findings (presence of plant material in the rumen content). The literature on \textit{Euonymus} and \textit{Pieris} plant intoxications in sheep and goats is reviewed. Finally, general remarks and guidelines concerning plant intoxications in small ruminants are given.

SAMENVATTING


INTRODUCTION

Livestock, including sheep and goats, can be poisoned by many different plant species. Most of these plants are generally ignored by the animals when there is plenty of grazing or other fodder available (Angus and Sharman, 1991; Plumlee, 1992; Frone and Pfänder, 1983). However, small ruminants and especially goats are of an inquisitive nature and browsing habit. They commonly consume small quantities of poisonous plants without showing adverse effects, particularly when the rumen is full of other feed stuffs (Popay and Field, 1996; Matthews, 1999). In special circumstances, these animals can also ingest a toxic amount of plant material. Toxicosis can occur when plant trimmings are offered as a feed source or when animals escape from their normal habitat (Plumlee, 1992). In this article, two cases of intoxication of small ruminants with toxic garden plants are described.

CASE HISTORY

Case 1

In November, a flock of eight regularly dewormed sheep that were fed on hay and grass pasture suddenly showed salivation and mortality. In a nearby garden a gardener had been trimming garden plants. Some of
the ornamental plant trimmings were available to the sheep. Five of the eight sheep died. Postmortem examination revealed numerous leaves of Euonymus japonicus Thunb. in the rumen contents. A few flowers of Pieris japonica D. Don ex G. Don were also present (Fig. 1). Other signs at autopsy were edematous lungs, hemorrhagic fluid in the trachea and hemorrhagic fluid in the pleural and peritoneal cavities. Histology of the lung and brain showed congestion of capillaries and edema. The most probable diagnosis was made based on case history, clinical signs, necropsy findings and the presence of large numbers of Euonymus japonicus leaves in the rumen.

**Case 2**

In March, three Toggenburger goats (4-5 years) managed to escape from a small pasture and ate some garden plants, such as Pieris japonica, primroses (Primula), and the bark of spruces (Picea). The goats were soon confined again and given considerable amounts of hay, which they ate. Later in the same day, one goat was gnashing and bleating. A few hours later the goat died and the other two goats had also begun gnashing, and were staggering and vomiting. Temperature, pulse and breathing frequency were within normal limits. One goat died that night and the remaining goat was treated with Vetalgine® (Intervet, contains metamizole, an analgetic and spasmyolytic drug). The following day, after a brief improvement, the symptoms progressed and it was decided to carry out euthanasia on the goat. Postmortem examination of goats 2 and 3 revealed several leaves of Pieris japonica in the rumen contents (Fig. 2). Other lesions at necropsy included the presence of large amounts of frothy fluid in the tracheal lumen and a segmental congestion of the jejunal mucosa. In the small bowel lumen, a slightly hemorrhagic watery content was

**Figure 1.** Euonymus japonica leaves and Pieris japonica flowers that were recovered from the rumenal contents of an affected sheep (left). A close-up of the Euonymus japonica leaves (right).

**Figure 2.** Pieris japonica leaves (1) that were recovered from the rumenal contents of an affected goat (left). A close-up of the Pieris flowers (right).
found. Histologic examination of different organs in the two goats revealed extensive pulmonary congestion and edema. In goat 3, a mild bronchopneumonia was present. This could be due to a recent aspiration of food particles. No other microscopic lesions could be observed. The most probable diagnosis was made based on case history, clinical signs, necropsy findings and the presence of Pieris japonica in the rumen.

DISCUSSION

Euonymus japonicus or Japanese spindle (‘Japanese kardinaalsmuts’) belongs to the family of the Celastraceae and is regularly grown in gardens. A native member of this family is the Euonymus europaeus or Spindle-tree (‘Wilde kardinaalsmuts’). The name is derived from the typical shape and color of the berries. The four brightly colored lobes are reminiscent of the red hats of the Roman Catholic cardinals. The seeds (inside the berries), the leaves and the bark are poisonous. Birds can eat the berries without intoxication, because the seeds are not digested by the birds. The poisonous substances are alkaloids (evonin, Figure 3) and to a lesser extent cardiac glycosides or cardenolides (evonoxide, evonomoside and evobioside) (Frohne and Pfänder, 1983; Van Genderen et al., 1996a). It is not known which toxic substances are responsible for the symptoms (De Cleene, 2000). The symptoms occur 8-15 hours after intake and include vomiting, abdominal pain, inflammation of the intestines, severe, slimy, watery or bloody diarrhea, disturbances of circulation, collapse and coma. If the animal survives, liver and kidney degeneration occurs (Clarke et al., 1981; Frohne and Pfänder, 1983; Van Genderen et al., 1996a; De Cleene, 2000). Few reports can be found in the literature about animal toxicity. One book mentions goats and sheep that ingested the young sprigs of the spindle tree and either died (Van Genderen et al., 1996a) or showed diarrhea (Anonymous, 2004). The final diagnosis of intoxication by Euonymus japonica was based on the abundant presence of Euonymus leaves in the rumen, but in many of such cases several confounding factors exist. Here, a possible dual diagnosis (Euonymus – Pieris poisoning) could be made, since, to a lesser extent, Pieris flowers were also present in the rumen.

Pieris japonica or Japanese Pieris (‘Japanse Pieris’) belongs to the family of the Ericaceae. Many ornamental plants are members of this family but belong to another subfamily such as azalea and rhododendron (Rhododendron spp.), and mountain laurel (Kalmia spp.) (Frohne and Pfänder, 1983). Pieris and Kalmia are not native species but are commonly found in gardens. The toxic substances are grayanotoxins. They consist of diterpenes with a unique tetracyclic skeleton called andromedane. The most abundant and best known grayanotoxin is acetylandromedol (grayanotoxin I, Figure 3). Others are andromedol, andromedeno1 and acetylandromedenol. They exert their effect by binding to sodium channels in excitable cell membranes of nerve, heart and skeletal muscle. Grayanotoxins are found in nectar, flowers, stems and especially the leaves. The clinical symptoms are similar after Ericaceae poisoning, whatever the species responsible for the intoxication (Visser et al., 1988). After exposure, a rapid onset (within 6 hours) of clinical signs is seen and the

Figure 3. The chemical structure of acetylandromedol (1), a toxic substance in the Pieris species, and evonine (2), a toxic substance in the Euonymus species.
duration of clinical signs is usually about 1-2 days. Initially, depression develops with severe salivation and abdominal pain, vomiting or regurgitation. Rarely, diarrhea occurs. Later on the animals may become recumbent and develop seizures, tachycardia, tachypnea and pyrexia. In severe poisonings, opisthotonus, ataxia and convulsions may occur. The poisoning is usually not fatal but recovery can take several days. Postmortem lesions are generally nonspecific. Mild hemorrhagic enteritis, renal tubular damage and aspiration pneumonia may be present. Fragments of leaves of ericaceous plants may be found in the gastro-intestinal tract. Recently a thin layer chromatography method for detection of grayanotoxins in plant material and stomach contents was described, as well as a liquid chromatography method with mass spectrometry for the analysis of urine and serum (Holstege et al., 2000). Grayanotoxins can be detected in the urine of exposed animals up to 3 to 5 days after exposure (Holstege et al., 2001; Puschner, 2003). No specific antidote is available for grayanotoxin poisoning (Plumlee et al., 1992; Puschner, 2003). There are reports of lethal Pieris intoxication in goats (Smith, 1978; Visser et al., 1988; Plumlee et al., 1992) and sheep (Power et al., 1991). Fresh foliage equaling approximately 0.1% of a goat’s body weight can be toxic (Smith, 1978). Fetal mummification in a pregnant goat was also diagnosed as being the result of a Japanese Pieris poisoning (Smith, 1979). Other evidence of teratogenic effects after Pieris intoxication is not available (Plumlee et al., 1992).

In the present case the temperature of the goats was not elevated and only minor lung pathology was observed. Other intoxication cases of Pieris in goats also showed no increase of body temperature, but distinct lung pathology was observed (Visser et al., 1988; Plumlee et al., 1992). Vomiting in goats is almost always due to plant poisoning (Matthews, 1999).

For both cases described here, no antidotes are available. The general principle of plant intoxication treatment is to separate the animal from the plant. Sometimes it is possible to remove some plant material from the mouth of the animal. First aid should be continued together with symptomatic treatment such as oral activated charcoal (75 g/animal), spasmolytics, intravenous fluids, oral laxatives, B vitamins and antibiotics (if there is a danger of inhaling vomit). Etamiphylline camsylate (Milophylline V®, Arnold Veterinary Products) can be used as a cardiac and respiratory stimulant at a dose of 20 mg/kg. Rumenotomy can be considered if this can be done before clinical signs of poisoning have developed (Visser et al., 1988; Plumlee et al., 1992; Matthews, 1999).

Prevention is primarily based on education of veterinarians and animal owners regarding the toxicity of these plants, since most cases of poisoning are caused by garden shrubs (Matthews, 1999). The best prevention is to keep animals away from the plants, to minimize the possibility of escape, not to offer plant trimmings and to ensure that other feed is available (Plumlee et al., 1992; Puschner, 2003).

REFERENCES
KOEIENMEESTERS EN PAARDENMEESTERS IN DE JAREN 1600 (III)

De zeventiende-eeuwse koeien- en paardenmeesters (zie pag 116 en 139) stonden er niet alleen voor. Ze konden ‘natuurlijke’ ziektegevallen behandelen, maar er waren zoveel ‘bovennatuurlijke’ aandoeningen veroorzaakt door hekserij of door kwade geesten of duivels.

Op de heksenprocessen verklaarden de meesters dat ze niet konden uitmaken of een dier natuurlijk ziek dan wel betoverd was. Maar wanneer hun middeltjes niet hielden, durfden ze wel eens te suggereren dat er misschien wel toverij in het spel kon zijn. Meester Guillaume van de Velde, marichael (hoefsmid) te Gent, wist echter dat alleen geestelijke het onderscheid goed konden maken. Er was volgens hem een vermoeden van hekserij als paarden groot ramoer ende tempeest maakten, wanneer een geestelijke tijdens een belezing (poging tot genezing via gebed) zijn stoel (stola, onderdeel van priesterkleed) gedragen bij geestelijke handelingen) op hun kop of rug legde.

Voor dergelijke belezingen deed men beroep op de plaatselijke pastoors of op paters uit naburige steden.


Het waren lang niet altijd geestelijken die men voor aanspraak. In sommige gevallen riep men oude vrouwen of mannen te hulp die magische spreuken kenden of magische handelingen verrichtten.

Bron: Monballyu J., 2003 (zie pag 116)