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FATAL EUROPEAN YEW (*TAXUS BACCATA*) POISONING IN TWO HORSES

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ABSTRACT

A clinical case of European yew tree poisoning in two geldings in a mountain ranch for adventure riding is described. According to the owner, the horses have become suddenly ill. A more detailed history revealed that horses have eaten twigs and needles of coniferous tree, located in the immediate vicinity of a paddock. Prior to death nervousness, incoordination, muscle trembling, difficulty breathing, weakness and convulsions were observed. At necropsy the most prominent gross lesions include the presence of partially clotted blood, lung edema, cardiac dilatation and hyperemia of the stomach and small intestinal mucosa. In gastric content the presence of partially digested twigs and large number of needles of European yew was identified.

Key words: horses, poisoning, yew, paddock, heart.

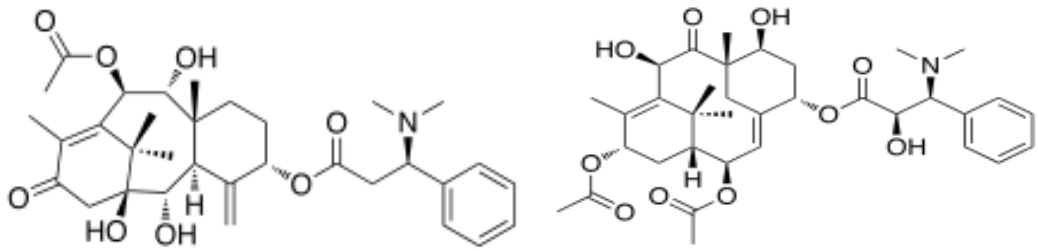
Introduction

European yew (*Taxus baccata*) is an evergreen coniferous tree from Taxaceae family widely distributed throughout Europe. In Bulgaria as well as of other countries (e.g. in the Czech Republic, Slovakia, Romania, Russia, Iran), *Taxus baccata* is included in the Red Books (Hageneder, 2007). Its height rarely exceeds 20 m, but its trunks can be up to 4 m in diameter. The yew is a very long-living tree of up to 4000 years old (Benham et al., 2016). It is found in almost all Bulgarian mountains, but is represented by single trees or small groups. The largest habitats of yew in Bulgaria is the Stara Planina mountain over Skobelevo village. In Vitosha mountain the yew trees population is most dense over the area of the Boyana waterfall at an altitude of 1100–1200 m. Its bark is rust red and its dark green leaves (2–4 cm length) with pointed ends are closely spaced on the branches. Yew fruits are not strictly berries, but a naked seed wrapped on a fleshy, red-colored mucilaginous appendage called an aril.

Yew is highly poisonous plant for humans and animals because it contains the alkaloid *taxine* and the glycoside *taxicatin* in the whole plant and the seeds, except for the aril (Dilov, 2005). The seeds and leaves are most hazardous due to their content diterpenoid alcaloids, taxine A (Fig. 1a) and taxine B (Fig. 1b) (Wilson et al., 2001). Both taxine alkaloids are cardiotoxic, but taxine B is considered the most toxic. Taxine B exerts both negative inotropic and atrioventricular conduction delay effects and therefore occurs increase in the electrocardiographic QRS complex and the P wave may also be depressed or absent (Wilson et al., 2001; Cope, 2005). The metabolites of taxines (paclitaxel and docetaxel) have a broad spectrum anticancer activity, but are also cardiotoxic (Lee, 1998). In addition yews also contain nitriles, ephedrine and irritant oils, which cause gastrointestinal inflammation and bioflavonoids that experimentally depress the central nervous system (Sula et al., 2013).

Fatal cases of yew poisonings have been reported in a variety of animal species, including humans. However, the majority of lethal poisoning occur in domestic livestock, especially cattle and horses. Horses are considered more susceptible to yew poisoning than cattle, sheep, goats, dogs and fowl (Wilson et al., 2001). The minimal lethal dose of yew leaves for horses is 200–400 mg/kg body weight. Therefore 100-200 g parts of yew are enough to kill a 500 kg horse (Tiwary et al., 2005).

Approximately 500 g of *Taxus baccata* have been reported toxic in cattle; 100–200 g in sheep, 75 g in pigs; and 30 g in dogs and fowl.



a **b**

Figure 1: a. Taxine A – chemical structure; b. Taxine B – chemical structure.

Materials and methods

The study presents a case of per acute lethal poisoning in a two mixed breed horses (geldings) of 3 and 17 years old an approximate height of 155–165 cm and 380–420 kg body weight. The horses were used for adventure riding in a mountain ranch. According to the owner, the horses have become suddenly ill. A more detailed history revealed that horses have consumed twigs and needles of a coniferous tree, located in the immediate vicinity of a paddock (Fig. 2). About 30–40 minutes later the horses become restless, starting lying down and rolling on the floor. The owner and the stableman have observed incoordination, muscle trembling, difficulty breathing, weakness and convulsions. The clinical signs continued 20-30 minutes before death actually occurs.

Necropsy examination was performed on site. The equipment for necropsy included a high-quality knife, rib cutters, saw, sharpening steel, scissors and surgical blades. The protective clothing included long gloves, impervious boots, coveralls, mask and safety glasses. Photo documentation was processed by a digital camera *Olympus T-100*.

Figure 2: Yew tree (*Taxus baccata*) located in the immediate vicinity of a paddock, which is the cause for fatal poisoning of the horses.

Results

A moderate rigor mortis with partially clotted blood was found at necropsy. Gross pathological findings in the thoracic cavity include the presence of edematous and congested lungs and hemorrhagic fluid accumulation in pericardial sac (Fig. 3).

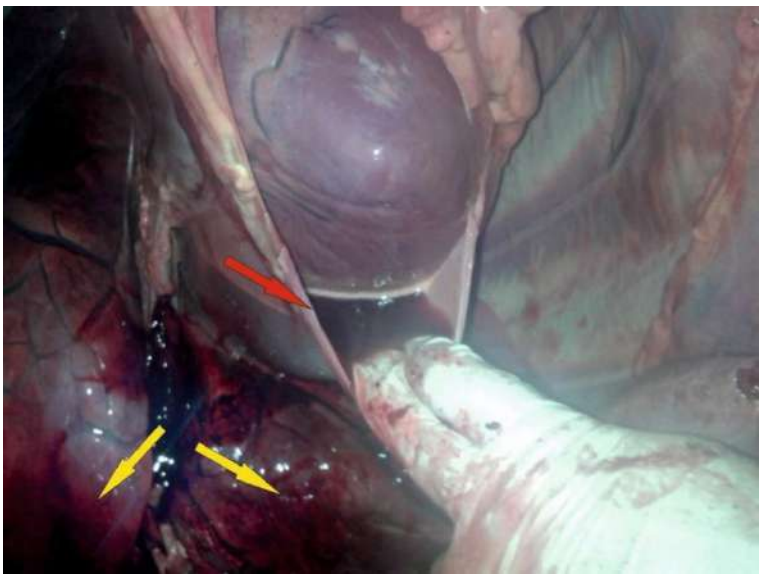


Figure 3: Pericardial hemorrhagic effusion (red arrow) with pulmonary edema (yellow arrows) in horse died of yew poisoning.

The heart was flaccid and bilaterally dilated. Hemorrhages on the endocardial surface were also observed after dissection (Fig. 4 and Fig. 5).

Figure 4: Bilateral cardiac dilatation in horse died of yew poisoning.

Figure 5: Endocardial hyperemia and hemorrhages.

In the abdominal cavity a superficial serosal hemorrhages of the stomach and intestine were observed. After dissection and removal of ingesta the gastric mucosa was found hyperemic, hemorrhagic and edematous (Fig. 6).

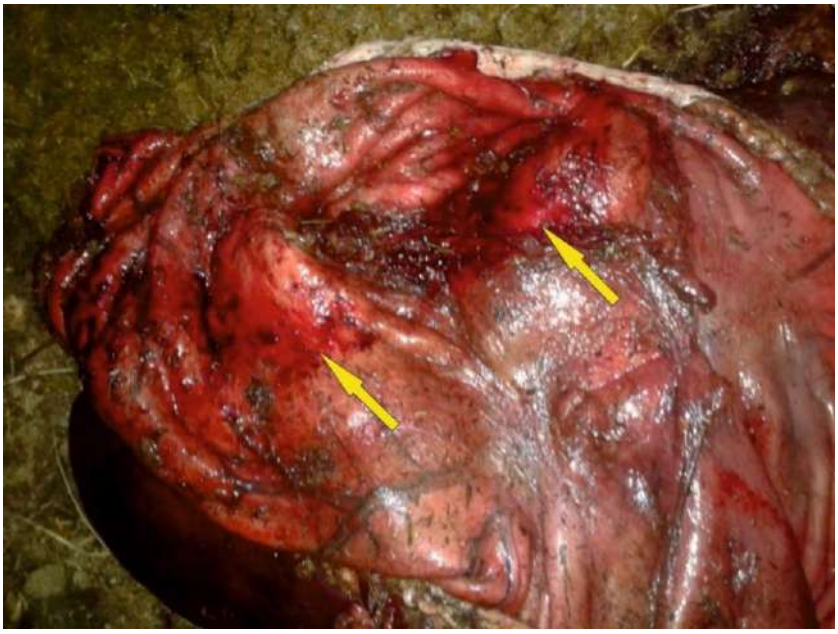


Figure 6: Hyperemic and edematous gastric mucosa.

On close inspection twigs and a large number of partially digested needles of yew tree were clearly identified in the gastric content (Fig. 7).

Figure 7: Gastric content of the horses died of yew poisoning. Presence of a significant amount of twigs and leaves (in circle) of yew is evident.

In addition the small intestine mucosa was hyperemic and edematous and spleen and liver were also found to be enlarged and congested.

Discussion

This is the first report of lethal yew intoxication in horses in Bulgaria. Sudden death, occurring 1-3 hours of ingestion is the most common observation with yew poisoning in horses (Knight 2017). The clinical signs such as restlessness, incoordination, muscle tremor, dyspnea, weakness and convulsions are generally nonspecific, but the sudden onset and rapid progression are compatible with possible acute intoxication. As horses are considered the most susceptible to taxine alkaloids and there is no effective treatment postmortem diagnosis is made in most clinical cases. Diagnostic procedure of yew poisoning is based on the evidence of consumption of twigs and leaves of yew tree, compatible clinical signs and typical necropsy findings including the presence of yew fragments in the stomach. However it should be noted that in some cases the gastric content of horses is much more difficult to assess because of the more extensive mastication and digestion processes (Tiwary et al., 2005). Other necropsy findings include cardiac dilatation with hyperemia and hemorrhages in the endocardium due to cardiotoxic effects of taxine. According to Wilson et al. (2001) cardiac lesions are more characteristic for a subacutely rather than acutely poisoned animals. However the development of cardiac lesions may be dependent on the dose, the duration of clinical signs, and the time until death occurs (Tiwary et al., 2005). The signs of acute gastroenteritis that were observed in our case were most probably due to irritant oil present in the yew tree (Wilson and Hooser, 2007).

For definitive diagnosis taxine alkaloids in gastric content can be detected using liquid chromatography and mass spectrometry.

Potential differential diagnoses for *Taxus* poisoning include exposure to cardiotoxic plants such as oleander (*Nerium oleander*), common foxglove (*Digitalis purpurea*), lily of the valley (*Convallaria majalis*), milk weed (*Asclepias spp.*), hellebore (*Veratrum spp.*), ionophore toxicosis, metal toxicity etc. (Tiwary et al., 2005).

Conclusion

It is imperative to consider yew poisoning when evaluating of free grazing horses that die acutely or have cardiac lesions, even if there is no history of exposure or no grossly identifiable toxic plant material in the stomach content.

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