

The most common plant intoxications in horses

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Agenda

- Introduction
- Alkaloid-containing plants
- Glycoside-containing plants
- Tannin-containing plants
- Toxalbumin-containing plants
- Others



Introduction

- Phytotoxins most common toxicants after pesticides^{1,2}
- Poisoning occurs by ingestion of the fresh plant or through contamination of hay and silage
- This presentation focuses on toxic plants in Europe
- Only intoxication in horses, other species can also be affected although not mentioned



1. Guitart et al 2010, The Vet Journal 183, 249-254

2. Caloni F et al 2012, Vet Rec, 170, 315

Plants

- Alkaloid-containing plants
 - *Taxus baccata*, European yew
 - *Datura stramonium*, Jimson weed
 - *Senecio* spp, Ragworts and groundsels
- Glycoside-containing plants
- Tannin-containing plants
- Toxalbumin-containing plants
- Others



Taxus baccata, European yew



- Plant
 - Evergreen shrub or tree, ornamental landscaping in Europe
 - All species are susceptible
- Toxic compound¹
 - Most poisonous plant in Europe
 - Alkaloid-containing plant
 - All parts of the plant, except the red flesh around the seed of the berry
 - The sap contains irritant volatile oils, leaves contain taxines, ephedrine and cyanide
 - Taxine a cardiotoxic alkaloid and irritant volatile oils
 - Lethal dose 0.5 g/kg, 0,1% of body weight

1. Anadón et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1080-1094

Taxus baccata, European yew

- Clinical signs
 - Trembling, diarrhoea, hypothermia, colic, dyspnoea, ataxia, bradycardia, coma and collapse
 - Animals frequently die of cardiac arrhythmia and arrest within 1-48 h after ingestion without clinical symptoms depending on the amount ingested¹
- Treatment
 - Activated charcoal, atropine, lidocaine



Datura stramonium, Jimson weed

- Plant
 - A weed or ornamental plant in Europe
 - Poor palatability and offensive smell
 - Contamination of silage, hay and grain crops
- Toxic compound
 - Alkaloid-containing plant, hyoscyamine, scopolamine and atropine
 - In all parts of the plant, highest concentration in the leaves, flowers and seeds of the mature plant.
 - Tropane alkaloids -> strong anticholinergic properties^{1,2}
 - Antagonists of the muscarinic receptors in the body => prevents activity of acetylcholine esterase in the smooth and cardiac muscle, glandular tissue and the CNS².



1. Soler-Rodríguez et al 2006, Vet Rec 158, 132-133

2. Naidoo V 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1152-1160

Datura stramonium, Jimson weed



- Clinical signs
 - Colic, anorexia, tachycardia, mydriasis, dry mouth, incoordination, impaired vision, frequent urination, convulsion and coma^{1,2,3}
 - Toxic liver dystrophy, cardiac lesions, dystrophic and necrotic renal processes⁴
 - Common post mortem findings are congestion and pulmonary pathology associated with colic².
- Treatment^{1,4}
 - Activated charcoal, bloodletting, vit C, vit B, antibiotics, pilocarpine HCl, Butylscopolamine bromide, furosemide, supportive liver treatment.

1. Soler-Rodríguez et al 2006, Vet Rec 158, 132-133
2. Naidoo V 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1152-1160
3. Anadón et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1080-1094
4. Binev et al 2006, J South African Vet Assoc 77, 215-219

Senecio spp, Ragworts and groundsel

- Plant
 - Invades pastures and hay fields throughout Europe
 - Seedlings are grazed accidentally along with forage when lack of other feed¹. The plant is unpalatable.
 - Contamination of silage and hay
 - Horses are especially vulnerable
- Toxic compound
 - Alkaloid-containing plant
 - Pyrrolizidine alkaloids bioactivated in the liver -> pyrrole metabolites that inhibit cell division => cumulative hepatotoxins²



1. Vandenbroucke et al 2010, Vlaams Diergeneeskundig Tijdschrift 79, 259-268
2. Panter et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1031-1079

Senecio spp, Ragworts and groundsels

- Clinical signs¹⁻³
 - Hepatic insufficiency, secondary photosensitisation and CNS derangement.
 - Anorexia, depression, severe diarrhoea, jaundice, constipation and aberrant behaviour, head pressing, blindness, weakness, aimless walking
 - Enlargement and congestion of the liver, liver cirrhosis, ascites and nephritis
- Treatment
 - Supportive care



1. Panter et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1031-1079
2. Osweiler 1996, Toxicology. Williams and Wilkins, Media PA, USA, pp. 361-407
3. Anadón et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1080-1094

Plants

- Alkaloid-containing plants
- Glycoside-containing plants
 - Nerium oleander (Oleander)
 - Rhododendron spp.
 - Prunus spp
- Tannin-containing plants
- Toxalbumin-containing plants
- Others



Nerium oleander (Oleander)



- Plant
 - Common ornamental evergreen shrub from the Mediterranean
 - All animal species are susceptible
- Toxic compound
 - Cardiac glycoside-containing plant
 - All parts of the plant are toxic, but conc are highest in the seed, fruit, flowers and immature leaves
 - Cardiac glycosides e.g. oleandrin, neriin, difitoxigenin, folinerin and rosagenin¹
 - Lethal dose 30-50 mg/kg BW

Nerium oleander (Oleander)

- Toxic compound (cont.)
 - Cardiac glycoside interferes with the electrical conductivity of the heart
 - Causes damage via inactivation of Na/K-ATPases in plasma membranes of cardiac myocytes =>
 - Inhibits activity of Na-Ca channels => increased influx of Ca ions and release of intracellular Ca =>
 - Irregularities in the heart rate and rhythm.
- Clinical signs
 - Damage to cardiovascular and gastrointestinal system
 - Difficulty breathing, irregular heart rate (brady- and tachycardia), colic, tremors, recumbency
- Treatment
 - IV fluids, antiarrhythmic drugs, anti-inflammatory, antibiotics, activated charcoal, GI protectants



Rhododendron spp.



- Plant
 - Rhododendron and azaleas are hardy, ever-green or deciduous flowering shrubs/trees
 - All species are susceptible
- Toxic compound
 - All parts of the plant are toxic¹
 - Grayanotoxin = andromedotoxin => depolarizes cell membranes facilitating entry of Ca into the cell²
- Clinical signs
 - Gastrointestinal, nervous, cardiac and respiratory signs
 - Death occurs due to cardiovascular and respiratory effects²
- Treatment
 - Activated charcoal and oil, atropine, lidocaine

1. Campbell and Chapman 2000, Handbook of Poisoning in Dogs and Cats.

2. Botha & Penrith 2009, JSAVA 80, 63-74

Prunus spp



- Plant
 - Fruit tree e.g. peach, apricot, black cherry, bird cherry
- Toxic compound
 - Cyanogenic glycoside-containing plant
 - Cyanogenic glycosides -> hydrolysis -> hydrogen cyanide => cyanide poisoning¹
 - Amygdalin and prunasin found in leaves, twigs and seeds of some spp
- Clinical signs
 - In order: Apprehension, distress, weakness, ataxia, laboured breathing, collapse, seizures and death²
- Treatment³
 - Sodium nitrite and thiosulfate=antidote

1. Vetter J 2000, Toxicon 38;1;11-36

2. Burrows and Tyrl 2001, Toxic plants of the North America, 1st ed., Iowa State Uni Press pp. 1043-1056

3. Wright B et al 2006, <http://www.equineguelph.ca>

Plants

- Alkaloid-containing plants
- Glycoside-containing plants
- Tannin-containing plants
 - Quercus spp., oak
- Toxalbumin-containing plants
- Others



Quercus spp., oak

- Plant
 - Common deciduous tree
- Toxic compound
 - Tannin-containing plant
 - Tannins, phenolic and polyphenolic compounds and tannin metabolites
 - Acorns and leaves: large amount of tannic acid and small amount of volatile oil
- Clinical signs^{1,2}
 - Gastrointestinal, liver and renal dysfunction
 - Severe diarrhoea, colic, hypothermia, tenesmus, depression anorexia, weakness and inability to walk.
 - Clinical signs develop >1 week after ingestion
- Treatment
 - IV fluids, plasma, antimicrobial therapy, NSAID and Di-trioctahedral smectite



1. Gwaltney-Brant, SM 2012, Gupta, RC, Vet Tox: Basic and Clin Princ, 2nd Ed. Elsevier, pp. 264-277
2. Anadón et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1080-1094
3. Smith S et al 2015, Eq Vet J; 47: 568-572

Plants

- Alkaloid-containing plants
- Glycoside-containing plants
- Tannin-containing plants
- Toxalbumin-containing plants
 - Robinia Pseudoacacia, black locust
 - Ricinus communis, castor bean
- Others



Robinia Pseudoacacia, black locust



- Plant
 - Native to the US but planted and naturalized in Europe
- Toxic compound¹
 - Toxalbumin-containing plant
 - Ingestion of roots, bark, sprouts, seeds and pods
 - Robitin = emetic and purgative glycoside
- Clinical signs^{1,2}
 - 1-2h after ingestion
 - Anorexia, abdominal pain, diarrhoea or dark and firm faeces, laminitis, lethargy, weakness, posterior paralysis, head pressing and absence of menace response and pupil reflexes.
- Treatment
 - Detoxification and symptomatic treatment



1. Anadón et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1080-1094

2. Vanschandevijl K et al 2010, Eq Vet Ed 22, 336-339

A photograph of a large, healthy castor oil plant (Ricinus communis). The plant features numerous large, green, palmately lobed leaves with prominent veins. Several clusters of developing seed pods are visible on reddish-brown stems. The seed pods are small, green, and covered in fine hairs. The plant is growing in a container, with a wooden structure visible in the background.

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- Ricinus communis* L.

1. Anadón et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1080-1094

2. Olsnes S & Pihl A 1972, FEBS letters Feb Vol 20:3; 327-329

Plants

- Alkaloid-containing plants
- Glycoside-containing plants
- Tannin-containing plants
- Toxalbumin-containing plants
- Others
 - *Pteridium aquilinum*, bracken fern
 - *Ranunculus abortivus* and *acris*
 - *Acer* spp., Maple



Pteridium aquilinum, bracken fern

- Plant
 - Vascular plant found in woods and fields
- Toxic compound
 - Different poisonous agents
 - Ptaquiloside
 - Thiaminase
- Clinical signs
 - Thiamine deficiency in horses¹ => neurological impairment
 - Symptoms 1-2 months after ingestion
 - Neurological symptoms: Weakness, tremors, incoordination, blindness, head press and gait abnormalities^{1,2}.
- Treatment
 - Thiamin IV or IM for days or weeks, supportive therapy



1. Anadón et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1080-1094
2. Vetter j 2009, Acta Vet Hungaria 57, 183-196

Ranunculus abortivus and acris, small flower and tall buttercup



- Plant
 - Weeds found in pastures, meadows and fields
 - Increased risk of poisoning in overgrazed pastures
- Toxic compound
 - The flower contains most toxin
 - Ranunculin which becomes protoanemonin when chewed or crushed
 - Protoanemonin irritant of the mucous membranes of the GI tract
- Clinical signs
 - Facial oedema and blistering after direct contact
 - Blistering of mouth, oropharynx and oesophagus
- Treatment
 - Activated charcoal, supportive care e.g. fluid therapy, GI protectants and analgesics

Acer spp., Maple



- Plant
 - Many species of maple tree, not all are toxic.
- Toxic compound
 - Unknown oxidizing toxin, damages the RBC => hemolytic anemia
 - Gallic acid causes methemoglobinemia
 - Ingestion of dry or wilted leaves remain toxic for up to 4 weeks, fresh leaves are not toxic
- Clinical signs
 - Depression, lethargy, anorexia, reddish-brown urine, pale yellowish gums and mucous membranes, dyspnoea, inability to rise
- Treatment
 - Activated charcoal and mineral oil to decontaminate.
 - Aggressive IV fluids, Vit C, NSAIDs and corticosteroids

Summary, equine plant intoxications

- Many intoxications occur due to
 - Overgrazed pastures
 - Contamination of hay or silage
- Range of symptoms depending on plant ingested
- Treatment depends on the plant
 - Removal of exposure
 - Activated charcoal
 - Symptomatic and supportive care



References

1. Guitart et al 2010, The Vet Journal 183, 249-254
2. Caloni F et al 2012, Vet Rec, 170, 315
3. Anadón et al 2012, Vet Tox: basic and Clinical Principles 2nd ed. Elsevier, pp. 1080-1094
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9. Renier AC et al 2013 JAVMA 242:540-549.
10. Campbell and Chapman 2000, Handbook of Poisoning in Dogs and Cats.
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16. Smith S et al 2015, Eq Vet J; 47: 568-572
17. Vetter j 2009, Acta Vet Hungaria 57, 183-196
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19. Vanschandevijl K et al 2010, Eq Vet Ed 22, 336-339