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**Poisonous Plants in the Vet Practice in Germany**

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## **Introduction**

Amongst all diseases or pain animals suffer from, a big threat to animal well-being is not taken seriously enough and only a few people are educated properly about it – Poisonous plants.

My aim was it to bring awareness to which plants are poisonous in Germany, how their poison affects the animals and how serious the threat by poisonous plants is.

Throughout my researches I became aware of how underestimated the power of plants is and that their dangerous potential needs to be addressed.

In my studies I tested 50 vets (25 small animal vets and 25 large animal vets) on their knowledge about poisonous plants with the aim to find out how big the need for further education in this field is.

The results underline how underestimated the topic about poisonous plants is and I hope my researches, especially the questionnaire will help other vets, pet owners and farmers to take this topic more serious.

## **Literature review**

### **Why are plants poisonous?**

The diversity of plants also comes with a diversity of poisons though not every part of the plant is (equally) poisonous. Sometimes a plant is only poisonous in certain stages of its development and once past that stage it is completely harmless.

Some plants are poisonous for all animals, others restrict poisonous effects to certain animals.

But why is that?

The plant's aim is to survive, spread and colonise new areas!

A poison can be seen as a defence mechanism of the plant to protect itself against harm, whether it may be the competition with other plants for optimal nutrition or for protection against consumption by animals or humans. <sup>1</sup> (Wink,2010)

Without the help of animals, plants are restricted to being spread by wind alone, therefore colonisation is aided by those animals which can tolerate plants which are poisonous to other animals.

The deadly nightshade (*Atropa belladonna*) for example is poisonous for most animals except some birds which help the widespread of the plant.

Most immature berries on the other hand contain oxalic acid which breaks down once ripe. Oxalic acid together with other organic acids in the immature berries prevent early digestion by causing gastrointestinal problems. In this way they ensure that only the ripe mature berries are eaten and spread with the animals' faeces. <sup>2</sup>

## **Plant poisons**

Now what are the exact poisons in the different plants and why are some more poisonous than others?

To begin with we need to define what 'poisonous' means.

A substance is poisonous if consumed in certain amounts and causes medical conditions varying from feeling unwell to neurological signs that might be temporary or permanent as well as leading to death.

The most common and dangerous plants' poisons are as followed:

### **Alkaloids:**

Tropane alkaloids which can be found in the families of Solonaceae, Brassicaceae and Euphorbiaceae for example have anticholinergic (scopolamine) and hallucinogenic (hyoscyamine, atropine) effects resulting in gastrointestinal and neurological disorders. These chemicals act by competitively blocking the binding of acetylcholine to the central nervous system and parasympathetic postganglionic muscarinic receptors.

Pyrrolizidine alkaloids show toxic carcinogenic, genotoxic and hepatotoxic effects. These alkaloids can be found in plants of the Asteraceae, Fabaceae and Boraginaceae family.

Their toxic effect occurs when they are transformed into reactive pyrroles by oxidase in the liver and start alkalinizing nucleic acids and proteins. <sup>3</sup> (Matsuuro, Fett-Neto, 2015)

### Amino acids:

Nonprotein amino acids (NPAA's) can replace protein amino acids in the protein synthesis resulting in abnormal proteins. It can be described as a missense mutation in single base DNA by replacing a similar protein amino acid and resulting in a different polypeptide chain. This can result in loss of enzyme activity or even loss of function if the NPAA is similar in shape, size and charge as the protein amino acid. The NPAA is then referred to as a proteomimetic amino acid.

The protein amino acid and the NPAA both fight for the same binding spot in the synthesis and the protein amino acid has a naturally higher affinity. At certain concentrations though, the NPAA randomly binds with a higher affinity and quicker and gets bonded into the polypeptide chain. <sup>4</sup> (Rodgers et al, 2015)

### Glycosides:

The most troublesome group of glycosides is the cardiac glycosides which can be found in a large variety of plants.

The cardiac glycosides have a direct effect on the myocardium and an indirect effect on the electrophysiological aspects of the heart leading to gastrointestinal irritation and severe cardiac arrhythmias with fatal outcome.

The cardiac glycosides have an inhibiting action on the (Na<sup>+</sup> - K<sup>+</sup>) ATPase which affects the conductivity of the heart. Animals with cardiac glycoside poisoning all have elevated serum potassium levels. <sup>5</sup> (Vardanyan, Hruby, 2006)

As dangerous as cardiac glycosides seem, they are irreplaceable in today's medicine for treatment of cardiac arrhythmias.

## **Most poisonous plants**

### **Belladonna** (*Atropa belladonna*)

Also known as the deadly nightshade the Belladonna is one of the deadliest of plants for humans and animals alike. It belongs to the family of Solanaceae and is very dangerous, but fortunately rarely found and then only in quarries and waste land. It contains the alkaloids atropine, hyoscyamine and scopolamine. All parts of the plant are poisonous, but the highest concentration of alkaloids is to be found in the leaves and ripe fruit. <sup>6</sup>



#### Symptoms:

The symptoms present as dry mucous membranes, difficult swallowing, thirst, mydriasis, impaired vision, excitation, constipation, increased heart- and respiratory rate and pyrexia. Severe poisonings will lead to incoordination, rabies – like behaviour and death due to paralysis of the respiratory muscles.

### **Yew** (*Taxus baccata*)

The (English) Yew is also one of the most poisonous plants for both large and small animals as it is an evergreen popular tree in local woods and carries its poison in every part of the tree except the aril (fruit body) which ‘protects’ the most poisonous part of the tree, the seed.



The Yew contains the alkaloids Taxine A and Taxine B which reach their peak concentrations in winter, but are present all year round even in fallen leaves and dead fallen branches for several months which makes this plant very dangerous. It belongs to the family of Taxaceae and even 2.3 g/kg are lethal for dogs and ca. 100-200 g of needles for horses. Ruminants' lethal doses are approximately 10 g/kg of needles. Despite its danger for humans and animals it is a protected tree in Germany. <sup>7</sup>



#### Symptoms:

First symptoms animals present are hypersalivation, foamy mouth, gastroenteritis and diarrhoea, followed by urinary tract infection. In most cases animals ingest as much as their lethal doses and the poisoning takes a quick course and they die after having tremors, incoordination, syncope and paralysis of the respiratory muscles.

#### **Foxglove** (*Digitalis purpurea*)

The foxglove belongs to the family of Scrophulariaceae and can be found in most forests or along fences on pastures that have clay soil with low contents of lime but are rich in nitrogen. Unfortunately the foxglove is a popular plant in many gardens in Germany which is a major threat not only for children but also for pets. The dangerous cardiac glycosides digoxin and digitoxin can be found in the leaves of the 'beautiful' plant and have the highest concentration of glycosides around noon, but even dry leaves remain poisonous. The lethal dose for cattle is 150 g of the dried leaves. Horses need to ingest 25 g and dogs only 5 g. <sup>8</sup>



#### Symptoms:

Low levels of glycosides lead to gastroenteritis but in more severe cases the cardiac glycosides cause several arrhythmias including first and secondary atrioventricular blocks, ventricular tachycardia and rapid weak irregular pulse. Acute poisoning leads to sudden death. <sup>9</sup>

#### **Autumn crocus** (*Colchicum autumnale*)

The autumn crocus belongs to the family of Colchiaceae-meadow saffron and flowers in autumn and only in early spring starts to grow leaves. The plant can be found on wet pastures or in gardens as well as in many households' flower pots. All parts contain the alkaloid colchicin which is poisonous for every species, but it is mostly horses and pigs which are affected. Cows and goats are more resistant but play an important role in public health as they transmit colchicin in milk. High concentrations of colchicin can be lethal for children. Colchicin blocks mitosis in multiple tissues by binding to the tubulin protein in microtubular cells and therefore leading to multiple organ failure. <sup>10</sup>



#### Symptoms:

Weak poisoning results in gastrointestinal problems such as salivation, vomiting, diarrhoea, whereas higher doses can lead to severe abdominal pain and haemorrhagic diarrhoea. Cows refuse to eat and there is a consequent drop in milk production.

More severe poisoning takes its course over a couple of days and results in multi-organ failure affecting the kidneys and liver, as well as the heart. Once the musculoskeletal system is affected the poison leads to weakness and collapse and finally to death due to failure of the respiratory muscles.

As the colchicin blocks mitosis it leads to congenital malfunctions such as cleft palates in unborn foetuses. <sup>11</sup>

#### **Thorn Apple (*Datura stramonium*)**

The thorn apple is the next candidate from the family of Solanaceae and is very poisonous for humans and animals alike. It contains the alkaloids S-Hyoscyamine, Atropine and Scopolamine which are often misused for their hallucinogenic effects. The Thorn Apple has become a rather rare plant but can still be found along public footpaths and in fields on loose nitrogen-rich clay soil. All parts are poisonous to all animals. The highest concentration (0.6%) can be found in the black seeds which are encapsulated by the spiny fruit body.

The thorn apple has a very distinct odour and animals tend to avoid the plant, unless food is scarce. Cows and horses are exposed to the danger of the alkaloids more frequently when the seeds burst and are loose on the pasture.

The thorn apple flowers from June-November.<sup>12</sup>



#### Symptoms:

Unlike in humans, the plant does not have a hallucinogenic effect on animals, though it can lead to mydriasis and impaired vision.

More commonly cows have decreased salivation, dry muzzles, increased thirst, loss of appetite, rumen stasis and bloat.

Horses usually present with signs of colic and small animals with vomiting and diarrhoea.

All animals poisoned by the thorn apple have increased heart rate and may get arrhythmias which can lead to death if consumed in large amounts.<sup>13</sup>

#### **Spotted hemlock** (*Conium maculatum*)

The spotted or poison hemlock belongs to the family of Apiaceae and is one of the first plants growing on pastures in early spring, therefore causing severe losses in livestock.

Cattle and horses wouldn't normally eat the spotted hemlock, as long as there is alternative feed. All parts are poisonous to all animals. The poisonous alkaloid Coniine affects the central nervous system and blocks spinal reflexes. Large amounts overstimulate the skeletal muscles and later cause neuromuscular paralysis. The most poisonous parts are the swallowed unripe fruits, but the poison also finds its way transcutaneously by contact with the leaves into the body.<sup>14</sup>



#### Symptoms:

Early signs of poisoning are salivation, abdominal pain, cyanosis, increased heart rate and muscle tremors. If Coniine is taken up in larger amounts it will lead to respiratory paralysis and death within hours.

Even small amounts of Coniine will cause great damage as it affects unborn foetuses if consumed in the first trimester: congenital deformities such as scoliosis, cleft palate or deformed limbs are common. Acute poisoning will lead to abortion.<sup>15</sup> (Panter et al., 1988)

#### **Monkshood** (*Aconitum napellus*)

The monkshood is Europe's most poisonous plant and belongs to the family of Ranunculaceae. It is more commonly found on pastures in the mountain ranges in southern Germany but also in the hilly regions in the west. Its relative the Vatsanabha / Indian aconite (*Aconitum ferox*), which is home to the Himalayan mountain range, is considered amongst the most poisonous plants on this planet.

Unfortunately the monkshood has also found its way into the garden thanks to the beautiful deep blue-purple flowers.

All parts are poisonous containing the alkaloid aconitine, which even penetrates the skin. The seeds, roots and preflowering leaves contain the highest concentration of aconitine. The lethal dose for horses is ca. 200 g of the fresh plant, whereas 5 g of the dried root is enough to kill a dog.<sup>16</sup>



#### Symptoms:

The course of monkshood poisoning is usually very rapid and painful. First the animal presents with hypersalivation, dilated pupils, excitation, muscle tremors, difficult and increased respiration. After only a few minutes only the animals are unable to walk or stand due to muscle paralysis and finally die due to paralysis of the respiratory muscles. Sudden death also occurs in acute cases after severe cardiac arrhythmias.<sup>17</sup>

#### **Castor oil plant** (*Ricinus communis*)

The castor oil plant belongs to the family of Euphorbiaceae and originates from Africa, but nowadays is a common plant / little tree in German gardens as well as occurring on wet pastures and along public footpaths. It is poisonous for every animal as well as humans. The poisonous glycoprotein ricin can be found in the leaves, but it has its highest concentration in the seeds. Swallowing castor beans itself is not dangerous unless the beans have been chewed thoroughly which releases the poison. The oral lethal dose for horses is ca. 60 beans, for cattle 20 beans and small animals approximately 1-2 g/kg.

Castor beans, once they have been heat treated, are a good source of protein and are often mixed into cattle feed. Unfortunately accidents still happen and cattle suffer from castor bean poisoning which have not been treated properly.

Another source of poisoning is the with ricin coated wood chips in the garden which are often chewed by our pets or even children. <sup>18</sup>



#### Symptoms:

Although the castor beans are more dangerous, swallowing the leaves can also be unpleasant. Signs are transitory muscle tremors, ataxia and excessive salivation.

Early signs after chewing and swallowing the beans are nausea, salivation, gastroenteritis with intense diarrhoea, pyrexia and muscle tremors. Colic presents in horses, bloat and rumen stasis in cattle followed by damages to liver and kidneys and destruction of red blood cells which leads to hypovolemic shock and death. <sup>19</sup>



## **Most common plant poisonings**

### **Dogs:**

#### **Black locust (*Robinia pseudoacacia*)**

The black locust belongs to the family of Fabaceae and is a common tree all over the country, but can be found mainly in parks, local forests and even in gardens. After awareness of its toxicity was made aware to farmers the black locust has been mostly deforested along pastures and cattle poisonings have been reduced to a minimum.

The dangerous glycoprotein robin (which has similar effects as ricin from the castor oil plant) is in all plant parts. The highest concentration of poison can be found in the seeds and bark and this is exactly the reason why dogs are presented with symptoms of robin poisoning.



As this tree is very frequently found in parks and forests where people take their dogs for walks black locust sticks are readily at hand to play 'fetch'. The sticks, which are coated with the dangerous bark, have a sweet taste which dogs love to chew.

Early symptoms are hypersalivation, excitation followed by apathy, increased heart rate, mydriasis and gastroenteritis. Without early detection and treatment dogs become unable to keep their balance, develop muscle tremors and the liver and kidneys get damaged. Some dogs suffer from blindness after chewing the poisonous bark.<sup>20, 21</sup>

Early detection and treatment is imperative to prevent permanent damage. If the dog is brought to the vet immediately emetics can be applied to make the dog vomit the bark.



Robin is released relatively quickly so activated charcoal is the first choice of drug to bind the toxins in the body as well as supportive fluid therapy.

Dog owners have to be made aware of the dangers of this plant by their vets to prevent such poisonings.

### **Daffodil** (*Narcissus pseudonarcissus*)

The daffodil belongs to the family of Amaryllidaceae and is a popular garden flower. Everyone knows the beautiful flower which rises from their bulbs, but hardly anyone knows of the high concentration of alkaloids in the outer layers of the bulb. Multiple alkaloids, lycorin being the most dangerous, can be found in the plant even in the water of the flower pot. The bulbs are an easy target for dogs which love to dig in the garden, as bulbs poke out of the soil and have an attractive smell for dogs.

Poisoned dogs present with gastroenteritis and intense vomiting and diarrhoea. In more severe cases dogs have muscle tremors and cardiac arrhythmias which can be life threatening. 15 g of the fresh bulb can be lethal for a medium sized dog.

Early detection and supportive fluid therapy as well as antiemetics are treatments of choice, although the best treatment is prevention. The vet should make dog owners aware of the dangers and dog owners should educate themselves in garden centres which plants might be poisonous despite their beauty. <sup>22</sup>



## Cats:

### **Easter lily** (*Lilium longiflorum*)

Nearly every member of the Liliaceae family is highly toxic specifically for cats and not advisable to have in any household owning cats. All known forms of lily are equally poisonous for cats, the Easter lily seems to be amongst the most popular lilies in Germany and therefore puts cats at highest risk. Every part of the plant is poisonous with the actual poison yet to be discovered. Ingestion of only small amounts of the flower is highly nephrotoxic leading to acute abdominal pain, hypersalivation, vomiting and anuria. If the cat is not treated immediately it will lead to kidney failure and death.

Most importantly the kidneys must be supported by fluid therapy followed by emetics and activated charcoal first to empty the stomach of further poisonous parts and then to bind all absorbed toxins. If the kidneys still fail to function properly, dialysis is the next step with only a moderate success rate.<sup>23</sup>

In the case report from Balka et al, 2011 a case of Lily poisoning is described with acute kidney failure. The cat had to be euthanised and post mortem findings revealed acute tubulonecrosis. The owners reported to have seen the cat eating parts of a Lily 2 days prior.<sup>32</sup>



### **Christmas flower** (*Euphorbia pulcherrima*)

The Christmas flower is a member of the Euphorbiaceae family and is a traditional friendly gesture / present in Germany and therefore very popular at this time of year. The Christmas flower originates from Mexico and in its original form is very toxic, less so the hybrids that we find in Germany. Still several poisonings are recorded every year when cats get in contact with the plant's milk which contains the poisonous diterpine esters. Cats generally don't eat the plant as it has a bitter taste but they still tend to lick or rub their face in the milk which the plant excretes when leaves bend and crack.

Cats show signs of contact irritation in the oral mucosa, the skin and eyes leading to conjunctivitis. If swallowed cats soon start to vomit and might develop diarrhoea and abdominal pain. It is not a severe poisoning unless cats eat large amounts which is very unlikely due to its taste, but still causes restlessness and pain and therefore cat owners should be aware of this plant.

Washing the oral mucosa, skin and eyes with clear water is in most cases helpful enough. If the cat suffers from gastroenteritis and more severe pain, the vet will administer pain relief, antiemetics and fluid therapy if needed. <sup>24</sup>



### Large animals:

#### **Ragwort** (*Senecio jacobea*)

Seneciosis is a fatal disease caused by chronic poisoning with the hepatotoxic pyrrolizidine alkaloids. The ragwort (*Senecio jacobea*) is the most dominant one in Germany containing the alkaloid jacobine. This disease is also known as “Schweinsberg disease” in Germany.

Cattle and horses are more sensitive to the alkaloids than small ruminants, goats even seem to be insensitive. Potentially all animals can get poisoned if very large amounts are consumed over a long period. The ragwort is a widely distributed plant on pastures in Germany, which animals don't tend to eat unless there is not enough fresh grass available. Ragwort poisoning becomes a serious problem when accidentally being cut and mixed into the feed. It sustains its toxicity even in the dried form for several months.

Upon chronic ingestion of ragwort contaminated feed, the pyrrolizidine alkaloids start forming cytotoxic pyrrole metabolites in the liver which bind to the nucleic acids and proteins causing liver cirrhosis. <sup>25</sup> (Petzinger, 2011)

Clinical signs may not present for several months. First signs to notice are loss of condition, anorexia, dullness, constipation or blood-stained diarrhoea. Change of behaviour, aggression or head-pressing due to hepatic encephalopathy are also common as described in Giaretta et al, 2014. <sup>33</sup>

Cattle and horses die either suddenly or after prolonged lateral recumbency with hepatic coma. There is no cure for this disease so extreme precaution is required when mixing the feed. <sup>26</sup> (Bildfell)

**St. John's wort** (*Hypericum perforatum*) and **buckwheat** (*Fagopyrum esculentum*)

Photosensitisation is a disorder of the skin which becomes more sensitive to ultraviolet light due to the presence of photodynamic agents. Often the parts of the skin which are affected are less protected with hair, wool or pigmentation. Primarily cattle, horses, sheep and goats are affected, but in theory all animals are susceptible.

When photons react with such a photodynamic agent, high-energy molecules are formed which cause a reaction in the skin leading to release of free radicals. These free radicals cause increased permeability and damage to the lysosomal membrane which leaks lytic enzymes into the cells resulting in skin necrosis, ulceration or oedema.

The clinical signs depend on the type of photodynamic agent which classifies the photosensitisation into different types.

Primary photosensitisation:

This type occurs when the photodynamic agent is ingested, injected or absorbed through the skin. Mainly the photodynamic agent hypericin from St. John's wort (*Hypericum perforatum*) is responsible for this type. Another common agent is fagopyrin found in buckwheat (*Fagopyrum esculentum*).

Tetracyclines and some sulfonamides as well as phenothiazine anthelmintics can cause primary photosensitisation.

Once the agent enters the blood circulation it causes damage to the skin cell membrane after being exposed to ultraviolet light.

Affected animals should be kept inside and only graze at night. Secondary skin diseases must be avoided and otherwise treated immediately.

Animals often show spontaneous recovery.

Abberant pigment metabolism:

This syndrome occurs in cattle and cats and is an inherited or acquired defect of enzymes involved in the haemoglobin synthesis. The defect lies in the agent porphyrin, which leads to uro- and copro-porphyrin in the bloodstream.

Bovine congenital erythropoietic porphyria belongs to the most common disease of this form.

### Secondary photosensitisation:

Also known as hepatogenous photosensitisation this third type is the most common.

This form is caused by the inability to excrete phylloerythrin through the bile duct which might be due to structural or functional changes/damages in the liver. This photodynamic agent is produced in the gastrointestinal tract when chlorophyll breaks down.

Phylloerythrin accumulates in the plasma, reaches the skin, absorbs and releases light energy and initiates a phototoxic reaction.

Animals suffering from this type generally don't recover and are euthanised. <sup>27</sup>

(Barrington)

## **Everyday edibles**

Dangers for our beloved pets lure not only when left unattended with a poisonous plant in the house or garden, but even when we actively feed them.

By now awareness should be risen that chocolate and raisins do not belong on a dog's menu, but there is more that should be banned from their menu:

### **Fruits:**

Apples, apricots, plums, peaches and cherries - Who would have thought that?

Their fruit flesh itself is not toxic, but the seeds, stem and leaves contain cyanogenic glycosides especially when they start rotting.

Symptoms are reddened mucous membranes, difficult breathing, mydriasis, and even shock-like symptoms when consumed in high amounts. The best way to prevent poisoning is to cut away the stem and remove all seeds before feeding and to collect all apples from the ground after they fell of the trees. <sup>28</sup>

### **Avocado:**

The avocado berry (fruit) is highly valued for us humans because of its healthy fats, but is poisonous to most animals.

The berry and its golf ball-sized stone contain persin which can be lethal to birds and small animals.

Symptoms are difficult breathing, coughing, increased heart rate, followed by an enlarged heart, water retention in the subcutis of the neck and abdomen and ascites. <sup>29</sup>

### Onions:

Onions can be found in many dishes and quickly happen to be given to dogs especially that get fed from the table. The onions contain the poisonous N-propyl-Disulphide, S-Methyl-Cysteine-Sulphoxide and essential oils which cause haemolysis (classical haemoglobinuria), icteric mucous membranes and diarrhoea. Animals present with a fast, weak pulse and some may be recumbent due to the severe anaemia.

The dangerous dose is 5 g/kg in dogs. Cats are more sensitive. Onions are poisonous in raw, cooked or pulverised form. <sup>30, 31</sup>



## Study

### Topic:

In a questionnaire about the most poisonous and most common plant poisonings I have asked 50 vets in Germany about their knowledge. 25 of these are small animal vets and 25 large animal vets. The questionnaire has been distributed to most areas of Germany, but I mainly received answers from vets located in southwest - west Germany. All vets graduated at least 5 years ago.

In the questionnaire I asked about 12 plants, which were presented in pictures together with 4 alternative names for each provided.

I have asked the vets to identify the plants, decide whether or not they are poisonous and what symptoms they may cause.

### Prerequisites:

7/12 plants are poisonous to small and large animals alike:

Autumn crocus, Belladonna, Foxglove, Monkshood, Spotted hemlock, Thorn apple and the Yew, with the Autumn crocus and Spotted hemlock being more commonly poisonous to large animals though.

3/12 plants are more poisonous to small animals:

Daffodil, Easter Lilly and Black locust.

2/12 plants are more poisonous to large animals:

Ragwort and St. John's wort.

I asked the vets to be honest and not to search the internet, books or ask colleagues about the plants as I sent the questionnaire via email and was not able to supervise them. The results are based on their honesty.

Questionnaire:

Plant 1



- ☐ Foxglove
- ☐ Easter Lilly
- ☐ Autumn crocus
- ☐ Daffodil

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 2



- ☐ Thorn apple
- ☐ Black locust
- ☐ Belladonna
- ☐ Ragwort

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 3



- ☐ Foxglove
- ☐ Monkshood
- ☐ Black locust
- ☐ St. John's wort

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 4



- ☐ Yew
- ☐ Easter Lilly
- ☐ Foxglove
- ☐ Monkshood

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 5



- ☐ Ragwort
- ☐ Belladonna
- ☐ Autumn crocus
- ☐ Spotted hemlock

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 6



- ☐ Thorn apple
- ☐ Autumn crocus
- ☐ Belladonna
- ☐ St. John's wort

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 7



- ☐ Belladonna
- ☐ Autumn crocus
- ☐ Daffodil
- ☐ Yew

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 8



- ☐ Easter Lilly
- ☐ Daffodil
- ☐ Ragwort
- ☐ Foxglove

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 9



- ☐ Daffodil
- ☐ Easter Lilly
- ☐ Foxglove
- ☐ Ragwort

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 10



- ☐ Yew
- ☐ Spotted hemlock
- ☐ Black locust
- ☐ St. John's wort

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?



Plant 11



- ☐ Daffodil
- ☐ Ragwort
- ☐ St. John's wort
- ☐ Monkshood

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

Plant 12



- ☐ Daffodil
- ☐ Ragwort
- ☐ St. John's wort
- ☐ Foxglove

Is this plant poisonous?

- ☐ Yes
- ☐ No

If this plant is poisonous, what symptoms does it cause?

## Results:

50 (vets) x 12 plants could have possibly been named correctly which is a total of 600 correct identifications.

407 out of these 600 identifications were correct which equals 67.8 %.

The small animal vets (25 vets) identified 175/300 plants correctly which equals 58.3 %.

- Most correctly identified plants were the Thorn Apple (88%), Monkshood (84%) and the Daffodil (80%). Only 28% identified the Autumn Crocus correctly which was the least correctly identified plant.

The large animal vets (25 vets) identified 232/300 plants correctly which equals 77.3 %.

- Most correctly identified plants were the Monkshood, Spotted Hemlock and the Ragwort all by 92%. Only 44% identified the Black locust correctly which was the least correctly identified plant.

Results for the identification might have been influenced by the provided 4 names been given to choose from for each plant and could have been worse if the names were not given.

In the **second step** the vets had to choose between poisonous or non-poisonous for each plant (not knowing that all plants are poisonous):

No vet has identified all plants to be poisonous.

Small animal vets:

- 5/25 vets have identified 8 or more from the 12 plants to be poisonous.
- 7/25 vets have identified 6 or 7 from the 12 plants to be poisonous.
- 13/25 have identified less than 50% of the plants to be poisonous.
- 68% identified the Belladonna to be poisonous and 52% identified the Yew to be poisonous.



Large animal vets:

- 8/25 vets have identified 8 or more from the 12 plants to be poisonous.
- 7/25 vets have identified 6 or 7 from the 12 plants to be poisonous.
- 10/25 vets have identified less than 50% of the plants to be poisonous.
- 72% identified the Ragwort to be poisonous and 68% identified the St. John's Wort and the Belladonna to be poisonous. 52% identified the Spotted Hemlock as poisonous.

In the **last step** the vets were asked to name the poisoning symptoms of the plants they thought to be poisonous. No answers to choose from were provided.

Small animal vets:

Only 6/25 vets could name the symptoms or parts of the symptoms of only 1 poisonous plant correctly. This plant was the Belladonna.

Large animal vets:

15/25 vets could name the symptoms or parts of the symptoms of Ragwort poisoning correctly.

11/25 vets could name the symptoms or parts of the symptoms of St. John's Wort poisoning correctly.

Still 6/25 vets named symptoms or parts of the symptoms of poisoning from the Spotted Hemlock correctly.

The large animal vets achieved better results in all 3 parts of the questionnaire.

- They identified each plant more often correctly than the small animal vets.
- They identified more plants to be poisonous than the small animal vets.
- Out of the plants chosen to be poisonous the large animal vets named more correct symptoms or parts of the symptoms of the plant poisonings.

The results are very clearly in favour of the large animal vets which is perhaps unsurprising as large animal vets set up herd health and management plans and oversee the feedstuff and conditions on the farms and pastures and suggest improvements. In order to do so properly the large animal vets have to be aware of the most common mistakes and dangers which include poisonous plants in feedstuff and on pastures. More surprising and shocking at the same time though is that only a few small animal vets were able to identify the poisonous plants correctly, especially the ones causing most plant poisonings in small animals.

## **Conclusion**

In my researches I focused on finding out about the poisonous plants present in Germany. There has been no particular poisonous plant that only occurs in Germany - they all occur in other European countries as well.

I did not only find the most poisonous plants, but also those causing the most severe and most common poisonings divided into groups for cats, dogs and large animals which local vets both for small and large animals confirmed with their case histories.

The most poisonous plant in Germany and Europe is the Monkshood, but the most common plant poisonings are caused by the Black locust in dogs as well as from members of the Liliaceae Family for both dogs and cats. Large animals are mostly affected by the poisoning after ingestion of Ragwort and St. John's Wort.

In a short chapter I focused on the biochemical background of some plant poison groups which proved to be causing most poisonings.

Not only are there plants in the garden, forest or pastures which are poisonous to animals, especially small animals. In the chapter about food for human consumption which often finds its way into our pets' stomach I made some interesting findings which will hopefully prevent pet owners from feeding certain fruits or even meals to their dogs and cats.

To bring awareness of the importance of poisonous plants I asked 50 vets to complete a questionnaire about poisonous plants and then I evaluated their knowledge. I found that the large animal vets performed better in every section of the questionnaire and small animal vets need to update their knowledge as many poisonings still seem to be undetected and therefore not always the correct treatment is applied.

## **Summary**

In summary, the results from my thesis reinforce that there is a serious amount of poisonous plants in Germany that put the animals' health at risk. Not only can these poisonous plants be found in the forest, pastures or other remote places, but also in nearly everyone's garden, inside the house and even on the dinner table.

Furthermore I could prove that the vets' knowledge about poisonous plants in Germany is not sufficient enough, especially that of the small animal vets.

There are hotlines available to call like the Animal Poison Control Centre (ASPCA), "Informationszentrale gegen Vergiftungen Bonn" and Clinipharm of the University of Veterinary Medicine Zurich, Switzerland which are very helpful. In order to get the correct information the vet still needs to be able to identify the plant correctly, which often fails as my researches show.

Local authorities have to make the vets aware of which poisonous plants are posing a threat to animals in their region. Vets should spend at least one CPD on poisonous plants and tell their colleagues about their new gained knowledge. Only if the vets are informed properly, only then the pet owners can be warned accordingly. This information could be implemented in a clinic's newsletter or their homepage and should be part of the first check-ups of puppies and kittens as especially the young ones tend to be more interested in their surrounding and bite and swallow things they shouldn't.

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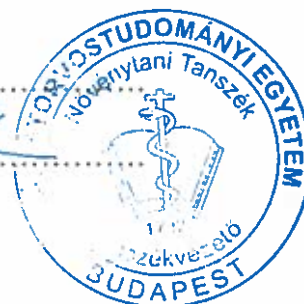
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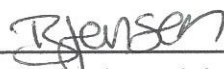
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