

ACONITE POISONING



“Cerberus”, charcoal on paper, Paul Rumsey.

Imagine a cave with a murky entrance, inside it a sloping path up which the hero from Tiryns, Heracles, dragged along Cerberus fastened in iron-linked chains.

Persistently stopping, the dog kept blinking and turning his eyes away from the dazzling light of the sun; in a frenzy of anger, he filled the air with his barking from all three heads at the same time,

Sprinkling the green of the fields with the white of the foam from his mouth,

This foam is supposed to have then congealed; it was fertilized by the rich rank soil and acquired the power of a deadly poison.

Seeing this new plant grows and thrives on a hard rock bed, our peasant folk call it aconite, based on the Greek for a whetstone...

Ovid, The Metamorphoses, Book 7, 8 AD.

Zeus was overjoyed when his son was born, he wanted him to be a great hero and protector of the mortals, however his wife Hera always loathed any of the offspring of her husband's - all too frequent - "liaisons". She would do everything in her power to hinder, and hopefully destroy them, and her loathing applied most especially to the great Heracles. When Heracles had grown to manhood, he was given the hand in marriage of Megara, the beautiful daughter of the king of Thebes, Creon. Heracles had many children with Megara, but then Hera in a rage of jealousy cast a powerful spell over him that sent him into a paranoid rage. Thinking he was surrounded by enemies on all sides he slew all of his children. When he realized what he had done he was inconsolable and went to the Oracle of Delphi to seek a means of penance and atonement. The hero was ordered to go into the service of King Eurystheus of Mycenae, as a common slave. The evil and dishonorable King Eurystheus was in fact a protégé of Hera, and so it seems that Hera herself had malignly influenced the sacred Oracle! Hera ordered King Eurystheus, to send Heracles on a suicide mission. Eurystheus, in his extreme eagerness to please Hera, did better than that - he ordered Heracles to ten suicide missions - which he later, extended to twelve, by trickery that showed a sick genius for manipulating contract law, which would have made his fortune in a later era! And so it was that Heracles was condemned to his famous twelve labours.

King Eurystheus was beside himself. He greatly feared Hera should he fail to get Heracles killed during the course of his twelve labours. Heracles had completed eleven of the labours he had assigned him, and so now he had only one last chance left. He had already tricked Heracles into two extra labours, originally the deal had been ten, however Eurystheus had argued that Heracles had not completed two of his labours fairly. He complained that when he fought the Hydra of Lerna for his second task, he had had some assistance from his nephew, Iolaus and that when he had cleaned out the Augean Stables he refused to recognize the task had been carried out on the technicality that Heracles had been paid for the task by King Augeus. He could not trick Heracles again without bringing down the wrath of Zeus. There was now no alternative, he must assign Heracles a task that was truly impossible, one that would directly challenge one of the gods themselves - it simply had to be a "no win" scenario - the alternative was that he

must face the wrath of Hera. He had just the thing - Heracles must capture one of the most terrifying of all creatures - Cerberus, the giant three headed dog that guarded the entrance to the underworld. Heracles was dumfounded, no mortal had ever managed to leave the underworld alive, even for a demigod the task was well nigh impossible without "insider" assistance. But by now the other gods of Olympus who had been taking a keen interest in the titanic struggle between Zeus and Hera, fought by proxy through King Eurystheus, had begun to take the side of Heracles, so great had become their admiration for him. Athena and Hermes decided that the final task was unfair, and so they both decided to give Heracles some assistance. Although they were not permitted to give direct assistance they decided that they could at least accompany Heracles for powerful moral support.

Hermes guided Heracles to the gates of the underworld, where he came face to face with the terrifying ferryman Charon. He demanded that Charon take him across the Acheron. Charon was astonished to see two such powerful gods of Olympus, in Hermes and Athena at Heracles' side. He dared not challenge them, and so against all his instincts, he ferried Heracles across the Acheron, for which later Hades would punish him by keeping him in chains for a year. Once in Hades, Heracles boldly told Hades that he had come to take Cerberus away. Hades was furious at such insolence from a mere demigod, but at the same time he was also fearful of getting on the wrong side of Hermes and Athena. Hades was caught in a real dilemma, should he allow a demigod to take away his dog, or should he refuse but then attract the anger of two of the most powerful gods of Olympus. Just at this point Hades' wife the beautiful Persephone offered a suggestion that saved face and broke the impossible standoff between the gods. Persephone did not much care for her husband Hades, being forced to live with him for six months of the year, and like Queen Omphale and Hippolyta queen of the Amazons she was not unattracted to Heracles' magnificent physique and so she felt some sympathy for him. She proposed that Heracles could take Cerberus, but he would have to do so without the help of Hermes or Athena, furthermore, he would have to do so with but nothing more than his bare hands. Unlike the task involving the Ceryneian Hind he could not use his great net. Hades, agreed thinking to himself that Heracles could not possibly manage this. Heracles agreed to the terms and so did Hermes and Athena, knowing that Heracles had already proven his amazing strength, by lifting the vault of the heavens off the back of Atlas himself during his eleventh task! A titanic struggle then ensued between Heracles and the monstrous dog Cerberus, until exhausted the fearsome animal yielded and Heracles slung it over his shoulder and left the underworld.

Back at Mycenae Heracles presented a roaring and foaming Cerberus to a horrified King Eurystheus. The king was so terrified of Cerberus, he forgot all about his agreement with Hera, and immediately declared that Heracles had successfully achieved his twelve tasks and so now was discharged from his service and a free man once again, providing that Heracles immediately return Cerberus to the underworld, which Heracles happily agreed to do. And so Heracles successfully completed his twelve labours. Hera was angry, but there was nothing she could do as Zeus decreed that Heracles had paid his dues. King Eurystheus was much relieved that Cerberus had been taken away, but his lands would forever more have to live with the legacy of the visit of a beast from the underworld - its saliva upon hitting the ground had given rise to a powerfully poisonous plant - Ovid records for us that the local peasants called it aconite.

ACONITE POISONING

Introduction

Aconite is one of the most toxic plant alkaloids known.

In ancient times it was a favourite agent for suicide or murder by poisoning.

Since medieval times it has been used for supposed medicinal purposes in small specially prepared doses. **There are however no proven therapeutic uses for this substance and it remains a potentially lethal toxin.**

Today it nonetheless continues to be used as a component of so called “herbal medicines” or “homeopathic medicines”.

Toxicity may not be recognized due to a perception that herbal and homeopathic “medicines” are harmless or because of a failure of labelling of these to include aconite as an ingredient.

In overdose or inadvertant excessive ingestion, deaths may occur due to **cardiotoxicity**. Aconite toxicity is most commonly seen in Asia, however deaths have been reported in Australia.³



Left: Aconitum variegatum Right: Eranthis hyemalis or winter aconite, (two of a host of species containing aconitum, commonly referred to as “Monkshood” or “Wolfsbane”).

Historical

In Europe aconitine was principally derived from the species Aconitum napellus, known as “Wolfsbane” or “Monkshood”. It was used as a “therapeutic agent” or as a poison used to kill.

The name “wolfsbane” derives from medieval times. Apparently in medieval times it was useful for repelling werewolves!

Aconitate last appeared as a “therapeutic” agent in the British Pharmacopoeia in 1953.

Its last medical utility in the “western world” was as a *proarrhythmic* agent used in animal studies to test the efficacy of antiarrhythmic drugs!

Today it remains in use in two contexts:

- As a common component of Chinese “herbal medicines”.
 - ♥ Examples include: **Chuan Wu**, **Cao Wu** and **Fu Zi**.
- As a component of “homeopathic medicines”

Biology

The genus **Aconitum** belongs to the family **Ranunculaceae**

The genus is widely distributed throughout the Northern hemisphere.

There are over 350 different species worldwide with approximately 170 of these found in China alone.

Pathophysiology

Aconite alkaloids are among the most potent plant toxins known.

They are essentially sodium channel activators and can as such have effects on all excitable tissues.

The activity of the aconite toxin from highest to lowest is roots > flowers > leaves > stems.³

The aconite alkaloids can be absorbed from both dermal and mucosal surface contact.

Clinical Features

Symptoms of poisoning usually occur within one to two hours of ingestion.

Symptoms may last up to 30 hours post ingestion.

The clinical features of toxicity seen with aconite include:

1. GIT upset:
 - Nausea, vomiting and diarrhea.

2. Neurological:

- Numbness and parasthesiae are characteristic and are often the first sign of toxicity.

These can be perioral or may extend to involve the limbs or even the whole body.

- Seizures

3. Cardiovascular:

- Conduction delays
- Bradyarrhythmias
- Tachyarrhythmias, including **sustained VT** or **ventricular fibrillation**.

Ventricular arrhythmias are the usual cause of death.

- Hypotension.

Inapparent aconite poisoning:

The incidence of aconitum poisoning may be higher than suspected as lesser degrees of toxicity may go unrecognized.

Additionally homeopathic or herbal decoctions may not uncommonly even list aconite as an ingredient even though subsequent laboratory testing detects it! ²

Investigations

Bloods tests:

1. FBE
2. U&Es/ glucose
3. Troponin.

Other tests are done as clinically indicated.

Urine toxicology screen:

It is possible to detect aconite alkaloids in urine in specialist toxicological laboratories. It is important to recognize that there is range of aconite alkaloids

(yunaconitine, aconitine, hypaconitine, mesaconitine) and each will need to be specifically looked for if aconite toxicity is suspected.

ECG:

All patients suspected of having aconite toxicity should have a **12 lead ECG** and be commenced on continuous **ECG monitoring**.

Management

1. Attend to any immediate ABC issues.
 - IV access, take blood tests and **establish ECG monitoring**.
2. Charcoal:
 - May be considered if the patient presents within one hour, however the benefits of this are unknown.
 - It will be contraindicated in symptomatic patients with seizures, altered conscious state, hypotension or arrhythmias.
3. Antidotes:
 - There are **no** specific antidotes to aconite poisons.
4. Seizures:
 - Seizures are treated along usual lines.
5. Hypotension:
 - Fluids should be given in the first instance.
 - Inotropes may be necessary in refractory cases.
6. Arrhythmias:
 - These should be treated along conventional lines, however the arrhythmias induced by aconite poisoning can be extremely refractory to both drug and electrical therapy.⁴
7. Cardiopulmonary bypass:
 - Aortic balloon pump support.
 - Cardiopulmonary bypass, via ECMO may be a last option in cases of cardiac arrest or cardiogenic shock unresponsive to other measures.

Disposition:

Any patient suspected of having any degree of aconite poisoning should be admitted and have ECG monitoring for a minimum of 24 hours.

References

1. Ellenhorn M.J and Barceloux D.G. Medical Toxicology, 2nd ed 1997, p. 1816-17.
2. Poon WT et al. Aconite poisoning in camouflage. Hong Kong Med J 2006; 12:456-9
3. Fatovitch D.M Aconite, a lethal Chinese herb. Annals of Emerg Med, March 1992, 21:3, p. 309-311.
4. Tai Y.T. Cardiotoxicity after accidental herbal-induced aconite poisoning. Lancet 1992 Nov 21; 340 (8830): 1254-6
5. **Deadly remedy:** warning issued about Chinese herbal medicine ACEM Media Release August 2014.

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