



# Medicine for Managers

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## Poisoning

**Socrates, Cleopatra, Emperor Charles VI, Hermann Göring, Alan Turing, Georgi Markov and Alexander Litvenenko are linked by poisoning to end their lives, either self-administered or used to murder them. As a means of suicide it is controllable, though usually unpleasant and as a means of murder is elegant, often difficult to link to the murderer and many poisonings are not discovered.**

The case of Georgi Markov, who was assassinated in London with the poison ricin, nearly remained undiscovered. A post-mortem failed to reveal a cause of death but a small metal ball was noticed in one leg on an X-ray by a mortuary technician. That metal ball, which had been propelled into the leg from an umbrella, had minute holes which contained the poison ricin.

Alexander Litvenenko, murdered by polonium-210 and killed in 2006, is believed to have been murdered in London by Russian agents although Russia has always denied involvement. He was ill for over three weeks before he died.

The more refined poisons are a far cry from those in previous centuries such as the asp venom which Cleopatra apparently used, or the cyanide placed in an apple by Alan Turing and from which he took a bite.

These days there are a host of effective and easily accessible poisons but until one hundred years ago, the only agents really

available were animal venoms, naturally occurring elements and plant extracts. Perhaps the best known five are *Belladonna*, *Strychnine*, *Arsenic*, *Curare* and *Hemlock*.

**Belladonna** (*Atropa belladonna*) comes from the **deadly nightshade**. Its shiny black berries are most poisonous. Its original name allegedly reflects its use to dilate the pupils of Venetian prostitutes to make them



look more beautiful. It does have medical uses, such as in the treatment of motion sickness or in gastroenterological disorders, in very dilute dosage. Its deadly symptoms are the result of the ability of atropine to disrupt the parasympathetic nervous system, preventing regulation of breathing

and heart rate. The drug was used to murder the Emperor Claudius and Macbeth apparently used it to poison an army of Danes who invaded Scotland. There is an antidote, physostigmine or pilocarpine.

**Strychnine** comes from the plant *Strychnos nux vomica* indigenous to Asia and Australia. The poison was recognised in the



early 1800s and its useful component quinine, is still used to treat cramp and malaria. Strychnine kills its victims by acting on the central nervous system and causing convulsions and ultimately respiratory paralysis. The drug was favoured by Dr Thomas Cream who murdered many patients in England and the US before being executed in 1892. There is no antidote to the drug.

**Arsenic** is an element which was widely used for killing pests, treating wood and in such diverse uses as firework manufacture, strengthening copper, in car batteries and as a paint colour. It has even been used as a chemical weapon. It was a popular poison in the middle ages because it was easy to acquire and its symptoms resembled those

of cholera. Ingestion causes abdominal pain, diarrhoea, confusion, convulsions and



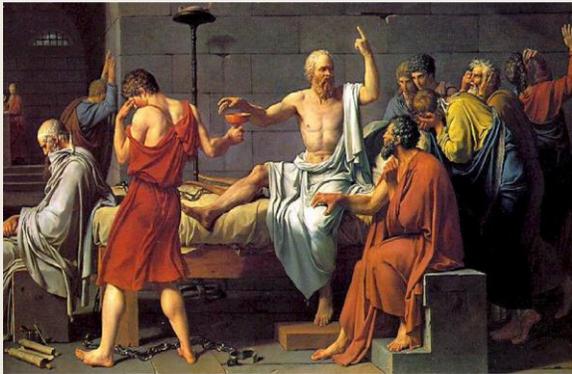
death by the disruption of enzyme manufacture. Amongst notable people who *may* have died deliberately or accidentally from arsenic poisoning are Napoleon Bonaparte, Simon Bolivar and King Faisal of Iraq.

**Curare**, as every schoolchild knows, is used in the blowpipes of South American tribes to paralyse the animals that they are hunting. It comes from various plant extracts and works by inhibiting the chemical transfer of nerve impulses between the nerves and the muscles they supply. The drug causes death by asphyxiation. It does not affect those people who eat the animals that the curare killed. The drug was used in the first half of the last century as one of the drugs available for anaesthesia.

**Hemlock**, again as every school child knows, was the drug by which Socrates died. It comes from the plant *conium maculatum* which can grow to ten feet tall. The drug contains alkaloids which can cause paralysis of various body systems. The paralysis is progressive and the victim becomes unable to move although the mind and thought is



unaffected until the moment of death. That death is usually the result of respiratory paralysis. The Greek Philosopher Socrates drank the poison by his own hand after being convicted of heresy and sentenced to death. History records that, after consuming the drug, Socrates walked around until his legs became heavy. He was surrounded by students as he died



The painting, by Jacques-Louis David in 1787, shows Socrates taking the Hemlock.

Poisoning in general occurs when anyone is exposed to a noxious substance that can damage health or endanger life. In this day and age, most accidental poisonings occur in children under five years of age. One in four cases is a deliberate attempt at self-harm or suicide.

Generally poisons ingested have their most dramatic effect on the gut causing abdominal pain, vomiting and diarrhoea but there are

usually general signs of acute ill health such as confusion, disorientation, headache, blurred vision, convulsions and collapse. The temperature may rise quickly and may be accompanied by difficulty breathing and swallowing.

An individual discovering anyone who might have been poisoned and who is ill should do three key things:

1. Call an ambulance
2. Provide medical support (recovery position if appropriate, etc.)
3. Look for evidence of anything that the individual might have taken, e.g. pill bottles, household fluid bottles, etc.

Of course poisoning is not confined simply to medication and household products. Other easily available poisons include plants, pesticides, carbon monoxide, cosmetic agents and alcohol. In addition illicit drugs in overdose or from impure sources may also result in physical damage or death.

Prescribed drugs may be taken in overdose, sometimes accidentally and sometimes deliberately. Commonly overdose results in some of the symptoms described above but some symptoms are specific to the drug concerned.

**Aspirin** is potentially very serious in overdose and may lead to serious morbidity, collapse, coma and death. Nausea and vomiting and abdominal pain are followed by tinnitus (ringing in the ears), dizziness, headache, confusion, seizures and collapse. The terminal event is heart and lung failure.

**Paracetamol** is a dangerous and insidious toxin. Overdose may be associated with only minimal symptoms in the first 24-hours apart from some nausea and sweating. Between 1 and 3 days there are increasing signs of liver involvement with abdominal pain on the right side (over the liver), loss of ability for blood to clot and it may be associated with acute renal failure. After three days there is considerable liver failure with death of liver cells, with biochemical disturbances leading to mental disorder, development of infection and seizures. Patients die in about seven days if they have taken doses of approximately forty tablets or more. Patients who survive the liver and kidney damage gradually recover and, although the liver is capable of considerable regeneration, there is usually some persisting liver and kidney complications. In those patients quickly discovered to have taken the overdose, gastric washout, to remove the tablets before they are absorbed can be lifesaving. This is combined with the use of a drug called *acetylcysteine* which works by replenishing stores of body *glutathione* which is an antioxidant which prevents damage to liver and kidney cells.

**Antidepressants** may be used for suicide attempts. The medical circumstances surrounding the prescription of such drugs to depressed patients clearly increases the risk of misuse.

Tricyclic antidepressants such as *amitriptyline* produce blurred vision, dry mouth agitation and excitability leading on to a rapid and irregular heartbeat and, in high enough overdose, to fatal cardiac arrhythmias.

Selective Serotonin Reuptake Inhibitors (SSRIs) produce increasing agitation, uncontrollable shaking, rapid eye movements (nystagmus) and

generalised muscle spasms which may lead to death in high enough overdose.

**Analgesics** containing morphine or other opioids may produce small pupils, drowsiness, inco-ordination, shallow breathing and, in high enough dosage, death through respiratory failure.

There are many other prescribed medications which may be used in overdose and the symptoms they produce depends on the target organs on which they have effects.

Once in A&E work to minimise the effects of any drug overdose starts. It is easier to manage a patient if the drug(s) involved in the exposure or overdose are known. If they are of unknown nature then a generic approach must be made towards the patient. Treatment involves:

1. Antidotes if the toxic agent is known
2. Activated charcoal. This is sometimes used and works by binding to the poisonous agent and prevents more of it entering the blood stream.
3. General supportive care, including, fluid balance, temperature control, electrolyte adjustment, artificial ventilation and drugs to correct cardiac arrhythmias. It may also be necessary to suppress neurological disturbances including seizures.

Once all the response measures are in place, every treatable complication is managed and the response of the patient is awaited. Success depends on the nature of the poison, the speed with which remedial treatment is provided, the general health of the patient, the availability of resuscitative facilities. . . . and sometimes a degree of luck.

Modern life is awash with poisons to eat, to drink, to inhale or even to be in contact with. Many poisonings are accidental, a lesson hard-learned by many, but not new. I end with the statement of Phillipus Aureolus Theophrastus Bombastus von Hohenheim Paracelsus (1493-1541), a Swiss German philosopher, botanist, astrologer and occultist who is credited with being the founder of toxicology. As he so accurately said *“All things are poisons, for there is nothing without poisonous qualities. It is only the dose which makes a thing poison.”*

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