THE BOOK OF VENOMS & ANTIDOTES

AUTHOR'S NOTE

Why a book on venoms and antidotes? Well, since much of my young heroes' adventures are based on facts and actual historical events and people, I thought giving a look behind the scenes of what the Eaters of Poison were all about would be interesting for readers. I was fascinated to discover in my research just how important poisons, antidotes, people's beliefs and actual facts were. I hope you will find this interesting and realise just how many poisons are out there in their natural form as well!

THE BOOK OF VENOMS

THE HISTORY OF POISON

The study of poisons in all its aspects is known as *toxicology*. This word comes from the Greek word *toxicon* which means a bow for shooting arrows. The word *toxeuma* meant an arrow. Since in ancient times, poisons were often used on the tips of arrows to render them more lethal, the word *toxicos* came to refer to such a poison. From this we get the word 'toxicology.' Today, poison is, by definition, a substance that causes injury, illness or death to organisms by chemical reaction or molecular activity. This distinguishes it from a toxin, which in the context of biology refers to naturally-produced substances that will kill quickly in small quantities.

The origin of the word 'poison' is also quite unusual. The word comes from Old French *puison*, which means drink. The French word itself comes from Latin *potio*, which has the same meaning. The word 'drink' came to be associated with poison in a very interesting way. Many times in the past, the poison was mixed with drinks. In English, the French word *puison* entered as *poison*. This term was initially applied to a drink prepared with a poison. Later, the poisonous substance itself came to be known as poison.

It has been said that anything and everything in the world can act as a poison. It is merely a matter of dose. A drug which acts as a medicine in small doses may act as a poison in a large dose. A striking example is that of common salt. We all take it daily in small doses, but half a kilogram of it can kill a man. That way it also is a poison. Of course, nobody could give common salt to his enemy in such a large dose. In a more accepted sense, the term poison is restricted to those chemical substances which kill in very small doses. The idea of classifying all known poisons has vexed scientists since ancient times.

Poison has been called 'the coward's weapon.' It is administered unemotionally and by stealth, frequently little by little over a long period, and in full recognition of the victim's often prolonged suffering. Special hatred attaches to the poisoner, who is regarded as more sinister than the gunman or knife-user. The poisoner is thus hated for his lack of pity. He kills his victim in cold blood; unlike a gunman who often kills in the heat of the moment. A poisoner carefully plans for the murder, and he knows exactly what he is going to do, and what the result of his deeds would be. The history of poison stretches from before 4500 BC to the present day. Poisons have been used for many purposes across the span of human existence, most commonly as weapons, anti-venoms, and medicines. Poison has allowed much progress in branches of medicine, toxicology, and technology, among other sciences.

Poison was discovered in ancient times, and was used by primitive tribes and civilizations as a hunting tool to quicken and ensure the death of their prey or enemies. Archaeological findings prove that while primitive mankind used conventional weapons such as axes and clubs, and later

swords and other more sophisticated weapons, they sought more subtle, destructive means of causing death—something that could be achieved through poison. Grooves for storing or holding poisons such as *tubocurarine* (the active ingredient of the curare-producing plant) have been found in their hunting weapons and tools, showing that early humans had discovered poisons of varying potency and applied them to their weapons. Some speculate that this use and existence of these strange and noxious substances was kept secret within the more important and higher-ranking members of a tribe or clan, and were seen as an indication of great power. This may have also given birth to the concept of the stereotypical medicine man or witch doctor. This use of poison grew more advanced, and many of these ancient peoples began forging weapons designed specifically for poison enhancement.

Over the centuries, the use of poisons for devious means and harmful purposes continued to escalate. The means for curing these poisons also continued to advance, but new poisons surfaced and became popular among criminals. In the present day, poisoning by harmful intent is less prevalent, and the risk of accidental poisoning now exists more in everyday substances and products. In addition, its use has widened because poison is often used as a pesticide, disinfectant, cleaning solution, or preservative, among others. Despite this, the first use of poison—as a hunting tool—still remains in remote parts of developing countries, especially those in Africa, South America, and Asia.

There are many substances readily available that will kill. Poison was usually classed with medicaments in the Middle Ages, and was numbered 'in the fourth degree of medicament, wherein the destruction or death of tissue is produced.' The Greeks attributed the discovery of poisonous plants to Hecate, the goddess of sorcery. The Assyrians knew of both vegetable and mineral poisons as long as 3000 years ago. The 4th Century Arabs brought poisoning to an art form (not a remarkable feat, when one considers the highly spiced foods that are consumed in the Near and Middle East, all the better in which to hide noxious substances!). The Greek physicians Galen (Claudius Galenus, AD 129—199/217), Dioscorides (c. AD 40—90) and Nicander of Colophon (c. 130 BC) provided the Classical world with descriptions of poisons, their actions, and treatment. These writings were then preserved and enlarged upon by Muslim physicians such as Ibn Wahshiya in his *Book on Poisons* or the Rabbi Moses Maimonides's *Treatise on Poisons and their Antidotes.*

European works on poisons were largely based on the remnants of classical works available, and on the works of the Arabs. While many harmless substances were often numbered in the lists of ingredients thought to be poisonous, these were side-by-side with many truly deadly plants and minerals known to such authors as Peter of Albano, who in the 1400s listed mercury, gypsum, copper, iron, rust, magnetite, lapis lazuli, arsenic sublimate, litharge, lead, realgar ('ruby sulphur' or 'ruby of arsenic'), cateputria, cucumber, usnea (a type of lichen), coriander, hellebore, mezereon (a poisonous shrub), fool's parsley, bryony (a flowering plant of the cucumber family), nux vomica (the strychnine tree's seed), colocynth (a vegetable), laurel berries, cicuta (water hemlock), serpentary (a plant root), and cantharides (crushed beetle) as poisons in his work, *De Remedis Venenorum*. Similarly, Magister Santes de Ardoynis mentions arsenic, aconite,

hellebore, laurel, opium, bryony, mandrake, cantharides, leopard's gall, and cat's brains among the poisons in his *Book of Venoms*, written in 1424.

Poisons were employed historically for many reasons. Albertus Magnus (AD 1206—1280), a German Dominican friar and a bishop, who achieved fame for his comprehensive knowledge of and advocacy for the peaceful coexistence of science and religion was interested in insecticides, describing a recipe using 'arsenic brayed in milk' to kill flies, as well as recommending that one whitewash one's home with a mixture of white lime, opium and black hellebore, 'when thou wilt that Flies come not nigh thy house.'

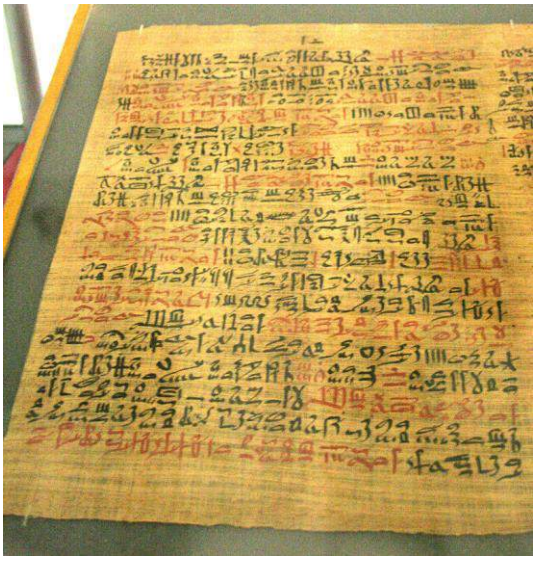
Poisons are often used beneficially in medical treatments, albeit in very small quantities. Often one poison will be antidotal to another, such as belladonna, which is used as the antidote for poisoning by any of the Amanita mushrooms. Henbane, a deadly poison, was recommended by Pliny (Gaius Plinius Secundus, AD 23—79, a Roman author, naturalist, and natural philosopher) for use in earache, though he warns that it may cause mental disorder. Since poisons were readily available for legitimate uses, those who would use them for less scrupulous ends had no trouble in obtaining their materials. Poison has been used since the very earliest times as a means to remove undesirable competitors or enemies. To poison a foe was the easiest means of getting rid of him, and the clever poisoner could work in stealth and so avoid the vengeance of relatives or friends of the deceased. To further remove oneself from suspicion, one could hire a poisoner. Much of the lore of poisons was incredibly accurate, with descriptions of the symptoms and often the treatments themselves little changed from medieval manuscript to today's toxicology text.

ANCIENT TIMES

The early history of poisoning is very much intertwined with mythology and belief. As early as 2500 BC, the Sumerians worshipped a goddess of poisons called Gula, who was also regarded as the mistress of charms and spells. She was called a goddess of healing, or 'the great physician.'

EGYPT

The earliest records of poisoning in Egypt date back to around 3000 BC, and document the research of Menes, the earliest recorded Egyptian king, on the subject of poisonous plants. Menes is reported to have cultivated and studied poisonous and medicinal plants and to have accumulated animal, mineral, and vegetable poisons. Although the documentation and release of detailed accounts were punishable by death at the time, it is now known that the Egyptians were among the first masters of distillation, knew about many classical poisons, and were no strangers to the extraction of poisons (probably cyanide) from peach kernels. The Egyptians are also thought to have known about elements such as antimony, copper, crude arsenic, lead, opium, and mandrake (among others). In Egyptian mythology, the gods Osiris and Anubis are associated with poisons. Anubis is called 'the Keeper of Poisons.'



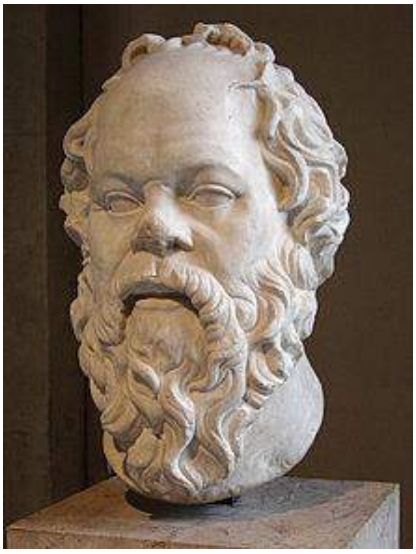
The Ebers Papyrus (image right) records the preparation of poisonous substances for the purpose of killing. This papyrus is one of the oldest medical documents available. It was found in the 19th Century, in a tomb near Luxor, a town on the east bank of the Nile in Upper Egypt. It was advertised for sale, and acquired by Professor Ebers in 1872; hence the name Ebers Papyrus. The papyrus is dated about 1550 BC, and it reveals many customs, traditions, and practices of the ancient Egyptian doctors. It describes over 800 recipes, many containing recognizable and identified poisons such as hemlock, aconite, opium, and some of the toxic heavy metals such as lead and antimony. Several of the pharaohs are known to have experimented with poisons, perhaps for practical matters of government and state.

After this, however, evidence of knowledge of poison in Ptolemaic Egypt can be traced to the writings of an ancient alchemist, Agathodaimon (ca. 300), who spoke of an (unidentified) mineral that when mixed with natron (hydrated soda ash) produced a 'fiery poison.' He described this poison as 'disappearing in water,' giving a clear solution. The 'fiery poison' was probably arsenic trioxide, the unidentified mineral having to have been either realgar (an arsenic sulfide mineral, also known as 'ruby sulphur' or 'ruby of arsenic') or orpiment (an orange to yellow mineral).

Finally, Cleopatra is said to have poisoned herself with an asp after hearing of Marc Antony's demise. Prior to her death, she was said to have sent many of her maidservants to act as guinea pigs to test different poisons, including belladonna, henbane, and the strychnine tree's seed.

GREECE

Many references to poisons are to be found in Greek mythology as well, among which is the story of Medea, granddaughter of Helios the sun god, who made a failed attempt to trick her husband Aegeus into killing her stepson Theseus (Aegeus' son) with poisoned wine by claiming the latter was an enemy and pretender to the throne. At the last moment, however, Aegeus recognised Theseus' sword, and dashed the goblet from his son's lips. In Greek legend, Hecate was knowledgeable about aconite, Medea was familiar with the properties of colchicum (a highly toxic flower also known as meadow saffron) and Hercules is said to have met his end from wearing a shirt after his wife had impregnated it with poison. Similarly the literature of classical Greek history also shows a considerable knowledge of poisons. In the *Odyssey* of Homer, Helen is described as discreetly introducing into the wine of Telemachus and Menelaus a drug that acted as a powerful anodyne. An anodyne is a drug which relieves pain.



The Greeks were certainly conversant with poisons in daily life as well, being the ones who introduced poisoning as a form of capital punishment they called 'State Poison'—it was by this method that the philosopher Socrates (image right) was executed. The first professional treatment of toxicology begins to appear in various Greek writings in around 3rd to 4th Century BC. Thus Theophrastus (370—286 BC), a pupil of Aristotle, included numerous references to poisonous plants in his work *De Historia Plantarum*. Nicander of Colophon (204—138 BC) penned *Theriaca* and *Alexipharmaca*, the two oldest extant works on the subject of poisons. These two treatises are the most ancient works devoted entirely to poisons. One was on snake poisons, the other on plant poisons, including opium, henbane, poisonous fungi, colchicum, aconite, and conium. Nicander divided poisons into those that killed quickly and those that killed slowly and he recommended emetics (to induce vomiting) in the treatment of poisoning, a recommendation which is valid even today.

The Greek physician, Dioscorides (AD 40—90) classified poisons and differentiated their origins in his treatise *Materia Medica*, which for fifteen centuries was the authoritative textbook on the subject of poisons. He classified poisons under three headings. They were the animal poisons, such as cantharides, toads, snakes; poisons from plants, including opium, hyoscyamus, mandrake, hemlock, aconite, cherry laurel, and yew; and mineral poisons, including arsenic, copper,

mercury, and lead. This simple classification remained in use for many centuries and is still vaguely recognizable in modern classifications of poisons.

THE ROMAN EMPIRE

Later in history, particularly at the time of the Roman Empire, one of the more prevalent uses for poison was assassination. As early as 331 BC, poisonings executed at the dinner table or in drinks were reported, and the practice became a common occurrence. The use of fatal substances was seen among every social class; even the nobility would often use it to dispose of unwanted political or economic opponents. These poisonings would have been used for self-advantageous reasons in every class of the social order. The Roman historian Livy (Titus Livius 59 BC—AD 17) describes the poisoning of members of the upper class and nobles of Rome, and the Roman emperor Nero (Nero Claudius Caesar Augustus Germanicus, AD 37—68) is known to have favoured the use of poisons on his relatives, even hiring a personal poisoner. His preferred poison was said to be cyanide.

Nero's predecessor, Claudius (Claudius Caesar Augustus Germanicus, 10 BC—AD 54) was allegedly poisoned with mushrooms or alternatively poisonous herbs. However, accounts of the way Claudius died vary greatly. Halotus, his taster, Xenophon, his doctor, and the infamous poisoner Locusta have all been accused of possibly being the administrator of the fatal substance, but Agrippina, his final wife, is considered to be the most likely to have arranged his murder and may have even administered the poison herself. Some report that he died after prolonged suffering following a single dose at his evening meal, while some say that he recovered somewhat, only to be poisoned once more by a feather dipped in poison which was pushed down his throat under the pretense of helping him to vomit, or by poisoned gruel or an enema. Agrippina is considered to be the murderer, because she was ambitious for her son, Nero, and Claudius had become suspicious of her intrigues.

Once the use and danger of poison was realized, it became apparent that something had to be done. Mithridates VI, King of Pontus (an ancient Hellenistic state of northern Anatolia, now Turkey), circa 114—63 BC, lived in constant fear of being assassinated through poison. He became a hard-working pioneer in the search for a cure for poisons. In his position of power, he was able to test poisons on criminals facing execution, and then if there was a possible antidote. He was paranoid to the point that he administered daily amounts of poisons in an attempt to make himself immune to as many poisons as he could. Eventually, he discovered a formula that combined small portions of dozens of the best-known herbal remedies of the time, which he named Mithridatum. This ironically backfired when, during the invasion of Pontos by Pompey the Great, Mithridates attempted

suicide by poison, failed, and had to resort to ordering a soldier to stab him to death. After being defeated by Pompey, Mithridates' antidote prescriptions and notes of medicinal plants were taken by the Romans and translated into Latin.

Pliny the Younger describes over 7000 different poisons. One he describes as, 'The blood of a duck found in a certain district of Pontus, which was supposed to live on poisonous food, and the blood of this duck was afterwards used in the preparation of the Mithridatum, because it fed on poisonous plants and suffered no harm.'

By 82 BC, poisoning had apparently become so much of a scourge in the Roman Empire that the Roman dictator and constitutional reformer Lucius Cornelius Sulla Felix (138—78 BC) found it necessary to issue the world's first law against poisoning, called the *Lex Cornelia*. This did not deter poisoners. The incidences of poisoning continued to escalate at an alarming rate to their peak in the 1st Century AD, when the Julio-Claudian emperors reigned. Among the emperors who were subsequently murdered by poison were Vitellius, Domitian, Hadrian, Commodus, Caracalla and Alexander Severus.

THE EAST

Knowledge of poisons was also developing in the east. Around 246 BC, the Chinese developed a drama form known as the Chou Ritual, which comprised six ceremonial dances carried out with feathers. The ritual involved the burning of five poisons: cinnabar (mercury), realger (arsenic), green vitriol (copper sulphate), lodestone and an unknown poison—and the catching of the fumes on a bunch of feathers for external use. The Persians were similarly interested in poisons, as shown by Queen Parysatis who, during the reign of Artaxerxes II (40—359 BC), demonstrated her love for her daughter-in-law Statira by poisoning the knife used to carve a bird at her dinner table.

Despite the negative effects of poison, which were so evident in these times, cures were being found in poison, even at such a time where it was hated by the most of the general public. An example can be found in the works of Persian physician, philosopher, and scholar Rhazes (Muhammad ibn Zakariyā Rāzī AD 865—925), writer of Secretum *Secretorum* the *Secret of Secrets*, which was a long list of chemical compounds, minerals and apparatus. He was the first man to distil alcohol and use it as an antiseptic, and the person who suggested mercury be used as a laxative. He made discoveries relating to a mercury chloride called corrosive sublimate. An ointment derived from this sublimate was used to cure what Rhazes described as 'the itch' which is now referred to as scabies. This proved an effective treatment because of mercury's poisonous nature and ability to penetrate the skin, allowing it to eliminate the disease and the itch.

Poisoned weapons were used in ancient India, and war tactics in ancient India have references to poison. A verse in Sanskrit reads '*Jalam visravayet sarmavamavisravyam ca dusayet*,' which translates to 'Waters of wells were to be mixed with poison and thus polluted.'

Ancient Hindu physicians were very well-versed in the art of poisons. The famous Indian surgeon Sushruta (known by the title "Father of Surgery" because of his seminal and numerous contributions to the science and art of surgery) lived in the 7th Century BC. He defined *agadatantra*, which is very much akin to the modern term of 'toxicology.' It dealt with the diagnosis and treatment of any person bitten by poisonous insects or venomous reptiles or affected by any natural, artificial, or compound poison. Sushruta defined the stages of slow poisoning and the remedies of slow poisoning. He also mentions antidotes and the use of traditional substances to counter the effects of poisoning.

Tradition also tells us that many Indian kings used to have poison damsels or *Vish Kanyas* in their courts. The Indians, whose secret service was among the first of its kind in the ancient world, used these poison damsels to assassinate monarchs. These were secret service women whose bodies were saturated with gradual doses of poison, or who flirted their way into the trust of their victim, only to mix poison in his food or drink. Legend has it that because they were fed on poisons right from their birth, they were thus made so venomous a mere kiss would prove fatal to a lover. It is said that when Alexander the Great (Alexander III of Macedon, 356—323 BC), invaded India, King Chandragupta sent such poison damsels to him, in consultation with his minister Chānakya**.** Chānakya (c. 350—283 BC), also known as Kautilya, was adviser and prime minister to the first Maurya Emperor Chandragupta (c. 340—293 BC). Kautilya suggested employing means such as seduction, secret use of weapons, and poison for political gain. He also urged detailed precautions against assassination—tasters for food and elaborate ways to detect poison. In addition, the death penalty for violations of royal decrees was frequently administered through the use of poison. The Eaters of Poison, the strange monks that the kids meet in Book 2, are something like these poison damsels. A mere scratch can administer a lethal dose, as Ink finds out after he fights with one of them in the train.

However, not every civilisation was simply obsessing about the application of poisons. As early as 500 years before the birth of Christ, Indian physicians were already writing the first forensic texts on how to detect poisoners via their personality traits.

EUROPE

THE MIDDLE AGES

In the 8th Century AD, poisoning took another step forward when an Arab chemist successfully transformed arsenic into an odourless, tasteless powder that would elude detection for at least ten centuries, thus providing the sinister world of poisoners with the convenient and deadly 'inheritance powder.' In Medieval Europe, poison became a more popular form of killing, though cures surfaced for many of the more widely known poisons. Despite the fact that the medicinal uses of poisons were now known, it was no secret that people bought poisons for less useful and lawful reasons. Sellers and suppliers of potions and poisons were known as apothecaries. These shops sold various medicinal wares, were open to the public, and from there, substances that were traditionally used for curative purposes were employed for more sinister means.

While knowledge in other fields degenerated in the West as a result of religion, knowledge of poisons continued to bloom. There were also academic texts discussing the subject, and both non-fiction and fiction were written for the most part by monks, whose knowledge and wisdom were respected, and as such authored a large portion of published works on the subject. Among these texts was *The Book of Venoms* (1424) by Magister Santes de Ardoynis, which told of known poisons at the time, how they worked, and how they could be treated. Though most of these texts were unavailable to the public, the populace had their own knowledge of poisons as well as some bizarre methods of dealing with poisoning, which included drinking from vessels with alleged magical properties and using charms and religious talismans to ward off poisoning.

If the truth was kept from the public, it did not prevent the spawning of folklore and rumors about poisons, and use of them for purposes that were distasteful to the public. This caused a level of paranoia within areas of the societies of England and Europe. This wave of concern was furthered by the availability of 'medicine' potent enough to be lethal when secretly administered in sufficient quantity—it provided an easy way to kill, and one which was subtle, quiet, and generally allowed the criminal to remain undetected. Perhaps it was this wave of paranoia that swept the streets, or the public need for answers about these toxins, but books about ways of counteracting poisons became sought after, and fed off the mounting anxiety, even though generally being wholly inaccurate.

Naturally, crafty book salesmen would have sought to inflame the issue as a marketing ploy, and exaggerate the risk so that people would buy their books in search of a non-existent security. Other salesmen such as jewellery traders offering a supposedly poison-weakening amulet, or a doctor selling a magical cure would have profited greatly in such times of doubt. The information the public craved was kept from them, a treasure only for scholars and scientists, and so the public was left to make their own assumptions.

THE RENAISSANCE

By the Renaissance, the use of poisons for unlawful and reprehensible intentions had peaked; it was arguably becoming any assassin or murderer's essential tool. This peaking of poison's popularity within crime syndicates and circles would probably have been due at least in part to the new discoveries that were then being made about poison. Italian alchemists were, in the 14th and 15th Century, realizing the potential of the combining of poisonous substances—compound poisons—to create even more potent brews than the ones that had been put together, and other new properties of poison were becoming clearer. A science of the study was forming, something today known as toxicology. So prominently used for homicide in society was poison that one would be fearful even to attend a dinner party for fear of having the food or drink poisoned by either the host or perhaps one of the guests.

An excerpt from Chaucer's *The Canterbury Tales*, a text that existed sometime in the 14th to the 15th Century describes a killer buying poison from an apothecary to rid a rat infestation:

And forth he goes—no longer he would tarry—
Into the town unto a 'pothecary
And prayed him that he woulde sell
Some poison, that he might his rattes quell…
The 'pothecary answered: "And thou shalt have
A thing that, all so God my soule save,
In all this world there is no creature
That ate or drunk has of this confiture
Not but the montance of a corn of wheat
That he ne shall his life anon forlete.
Yea, starve (die) he shall, and that in lesse while
Than thou wilt go a pace but not a mile
The poison is so strong and violent
—Canterbury Tales—*The Pardoner's Tale*. Lines 565–581.

By the 16th Century, the use of poison had become an art of sorts and in several cities of Italy, including Venice and Rome, there were actual schools teaching the ways of poison and the art which had been born. Earlier, in the 15th Century, a guild of alchemists and poisoners known as the Council of Ten was formed. This cult of poison-wielding assassins carried out contracts for people who paid them enough money, and usually anyone contracted for death ended up slain, killed by an undetected dose of lethal substances of varying descriptions. The Council of Ten met regularly to arrange poisoning for the State and their written records are preserved. Victims were named, prices agreed, and contracts with poisoners recorded. When the deed was accomplished the marginal note 'Factum' was written in the record and payments were made, sometimes in the

form of a regular pension. The Council of Ten appears to have had a number of poisons in their repertoire. Three of them are preserved as the *'Secreta Secretissima'* in archives dating from 1540—1544 AD. Their chief ingredients were corrosive sublimate (mercuric chloride), white arsenic (arsenic trioxide, also known as *Sankhya* or *Somalkhar* in Hindi), arsenic trisulfide, and arsenic trichloride. So rampant was poisoning in 15th to 17th Century Italy, that expert poisoners ran schools for would-be-poisoners, complete with examinations. Even the great Italian Renaissance artist Leonardo da Vinci (1452—1519) experimented with poisons.

Leonardo invented the so-called technique of 'passages' in which an animal was killed by an injection of poison and the essential organs that had been impregnated with the poison, such as the liver, spleen and lungs were then removed. An extract was prepared from these organs and administered to another animal and the process was repeated. With each 'passage' the strength of the poison was supposed to increase. He also studied the procedure in plants. In an effort to produce most innocuous looking poisons such as fruits, he injected the bark of certain fruit trees with potassium cyanide. The idea was that it would rise up along the conducting system and be incorporated in the fruits. The resulting fruit were of course poisonous, but contained only small amounts of cyanide. They had to be eaten for weeks before they could cause death. Legend has it that at a banquet in the house of Lodovico Il Moro, fruit from Leonardo's garden was presented to Giangaleazzo Sforza, the 6th Duke of Milan (1469—1494), who was fighting for Italian unity. More fruit was sent to him during the following days, until he finally died of poisoning.

As the Renaissance surged through Europe, so did the popularity of poison as a method of disposing of people who were in the way. Poisoning had become fashionable—certainly it was the most convenient way of migrating into the upper circle of society. The most infamous example from this era is that of the Borgia family, who migrated from Spain to Italy around 1455 and whose name became synonymous with dinner-party executions. The most well-known member of this family was the notorious femme fatale Lucrezia Borgia, who formed a ghastly poisoners' triumvirate with her father Pope Alexander VI and brother Cesare, and whose reputation as a poisoner has achieved a sort of mythic immortality. The beautiful, wicked and amoral daughter of Pope Alexander VI was supposedly renowned for hosting the powerful family's extravagant parties, at which it was alleged, incest, poisoning, and murder were among her esteemed vices. Lucrezia's favoured method of administering poison to her guest's drinks was from a ring or a hollow goblet stem. However, these rumours have never been proven.

The study of poisons during the 14th and 15th Centuries, coupled with the experimentation by Italian alchemists to create more potent poisons from classical bases, spread from Italy to Paris, thanks to the efforts of Queen Catherine De Medici, and paved the way for a boom in the poisoners' industry as the poisoning epidemic (and, subsequently, paranoia, especially in the upper class) surged through Europe. By 1572, at least 30,000 self-named poisoner 'sorcerers' were running rampant in the streets of Paris. A publication called *Neopoliani Magioe Naturalis* (1589) by Giovanni Battista Porta served as a textbook for poisoners, especially with regard to

lacing wine with a deadly concoction called *Veninum Lupinum*, composed of aconite, taxus baccata (yew), caustic lime, arsenic, bitter almonds, powdered glass and honey, and shaped into walnut-sized pills.

An arsenic-infused solution called *Acqua Toffana*, invented by a Neapolitan woman by the name of Toffana, was marketed as a ladies' cosmetic under the guise of a 'miraculous substance oozing from the tomb of St Nicholas di Bari,' but was famous among widows for more sinister purposes. By the 17th Century, schools of poisoning had been established in both Venice and Rome, and women who had been elbow-deep in poisoning schemes from the start, now took their murderous crimes to a higher level by forming secret societies in which they received not only instructions on the administration of poison, but the weapons themselves. Poisoning had transcended mere murder to become an art form. Assassins also had inventive ways of disguising the tools of their trade, as can be seen in this image of a 17th Century assassin's poison cabinet disguised as a book!

Meanwhile, members of nobility were becoming frantic and with good reason, as many of them were targets of poisoning. Several attempts were made on the life of Queen Elizabeth I (1553—1603), including a failed plot to smear opium-based poison on her saddle pommel. Henry VIII was also reportedly targeted by Anne Boleyn, his mistress-turned-wife. One successful murder involved the poisoning by arsenic of Marie Louise, wife of Carlos II of Spain, in September 1689.

Even members of the royal household who weren't poisoned began imagining they were. When Princess Henrietta Anne of England, wife of the Duke of Orleans, fell ill due to peritonitis, she automatically assumed that her condition was caused by deliberate poisoning, and not a duodenal ulcer, as was actually the case. Others were taking steps that went past precaution into sheer paranoia. Henry IV was said to shun served food while at the Louvre, preferring to cook eggs himself and draw his own water from the River Seine. Meanwhile, in the East, the Qing Dynasty (AD 1644—1911) emperors in China were practising their own interesting method for avoiding poisons: they inserted small silver plates into their food before tucking in. Apparently these plates, which were supposed to change colour in the presence of poison, were not failsafe. The emperors further protected themselves by making court eunuchs partake of the food first.

An attempt to limit the sale of poison to the populace was made in 1662 by Louis XIV, who passed a decree forbidding apothecaries to sell poisonous substances to persons not known to them, and requiring purchasers to register their purposes for the substance. When priests at Notre Dame informed the king of all the horrifying confessions of poison homicide they were receiving, Louis XIV established a body called the *Chambre Ardente* ('Burning Chamber') to investigate poisonings, with the result that 442 persons were charged with murder. This series of investigations had two consequences: the public learned that anybody with influential contacts could get away with murder, while the poison vendors earned a date with the hangman; and much attention was drawn to the subject of poisons, with the result that even more people learned how to use them.

The usual method was to conceal the poison in either food or wine. Although this method is exceedingly simple, it works very well. A bribe to the proper servant could mean the demise of the victim, or the murderous banquet-goer might conceal a small quantity of poison in his ring. While most of the so-called 'poison rings' were used to hold *memento mori*, such as a lock of hair from a deceased loved one, the practice of concealing poison in rings goes back to ancient Rome. If this did not suffice, the assassin might poison the fruits in a garden, to catch the prudent person who ate only foods that they themselves had picked. The first emperor of the Roman Empire Gaius Julius Caesar Augustus (63 BC—AD 14) was reported to have been so poisoned by the figs in his own garden. In later periods, the devout (and highly placed) worshipper might be given poison concealed in the Eucharist or in sacramental wine.

Since nosegays and pomanders were often used by the gentry to protect their delicate noses from the unwashed masses, flowers were often poisoned in the fields, and pomander balls made ideal receptacles for finely powdered poisons. One of the strangest methods of olfactory poisoning was that of Pope Clement VII, who is reported to have died of the fumes of a poisoned torch (although why the torch-bearer was not affected is not explained.)

Another method of poisoning was through the victim's clothing. Gloves, boots, shirts, and other garments might be impregnated with poisons such as corrosive sublimate, arsenic, or cantharides. If the absorption of the poison through the skin was not enough to kill the victim outright, often it would produce syphilis-like lesions. This doesn't seem so bad until one realizes that the standard medieval treatment for syphilis was draughts of mercury … another poison.

If none of these methods sufficed, or none caught the fancy of the would-be killer, perhaps specially-made tableware might be the answer. One might present one's host with a goblet impregnated with poison, especially arsenic, which would gradually do him in. Or one might use the more ingenious and cunning method of the poison knife. Such an implement used a blade connected to a pivot in the handle. When the slightest pressure was placed on the cutting edge of the blade, three small, envenomed, needle-sharp spikes were driven into the hand. The poison

would ideally act immediately, and the tiny punctures would not even be noticed, leaving coroners to postulate heart attack or stroke as the cause of death.

Since poisoning was so widespread, it became a matter of great concern to protect oneself from such a fate. In addition, persons of note often employed tasters, who ate and drank of their employers' food and wine. If, after a suitable period of time, the taster was still alive and well, the food was declared safe.

MODERN TIMES

THE GOLDEN AGE OF POISONING

The Victorian era is generally regarded as the heyday of poisoners. Indeed, it is the period from which many of the world's most notorious poisoners hail. While people who poisoned for personal gain are to be found through the ages, now that poison was readily available to commoners, potential poisoners now had a new incentive: life insurance. In fact, poison was so popular as a homicide weapon and so readily available in various forms (from flypaper to rat poison) that laws such as the Arsenic Act of 1851 had to be introduced to bring the crime under control. An earlier bill had been brought up in 1819 to regulate the distribution and sale of arsenic, but it had been heavily opposed by the Committee of Associated Apothecaries on the grounds that it would 'embarrass the dispensing of medicines, and [was] not calculated to affect the object intended.'

Meanwhile, developing in conjunction with the rise of poisoning as fashionable murder was the field of toxicology. Recognizing the weaknesses of current methods for detecting poisons, scientists rose to the challenge to develop reliable standards for poison detection. Among them were Marsh and Riensch who, in 1836 and 1841, independently introduced methods of detecting arsenic. Thanks to this research, many poisoners were eventually apprehended although not before they had done considerable damage.

Interestingly, one of the most well-known contemporary deaths by arsenic may not have been homicide after all. When Napoleon became ill in the autumn of 1820, he was convinced that he was the target of poisoning. For years it was believed that he had been poisoned by French and British conspirators. It wasn't until recently that it was shown that the wallpaper in his house contained arsenic, and that the metabolism of mould on the wallpaper would likely have caused release of the poison in gaseous form. It should also be pointed out that many medicines of the period contained arsenic, which could have also contributed to Napoleon's demise.

By the 20th Century, literature concerning the manufacture of poisons had left its cobwebby corners in the apothecary for the bookshelves of those who sought the knowledge. And it wasn't just about getting rid of unwanted family anymore. Governments were carrying out research into

the possibility of using poisons as weapons. On the other hand, the growth of the field of toxicology also brought about the controlled use and circulation of poisonous substances.

Despite the fact that most classic poisons are easily detectable today, the use of these poisons still persist as both homicide and suicide weapons, whether in their pure form or in flypaper and in rat poison—a popular homicide weapon in rural China, it seems. The infamous Dr. Crippen chose to take care of his wife with hyoscine and Belle Gunness, whose long line of disappearing (rich) suitors were found buried all over her farm, used arsenic with great gusto. Thomas Young's victims met their end through antimony and thallium. Care assistant Donald Harvey killed several of his 24 victims by cyanide, as did the mob hit man Richard 'Iceman' Kuklinski. Ronald O'Brien, who, in the tradition of Victorian poisoners killed his own child for insurance money, spiked the child's sherbet powder with the same poison in 1974. In 1998, arsenic trioxide in pots of curried beef was found to be responsible for the deaths of four people and the morbidity of 40 others at a village festival in Japan. New poison societies were also being established, including the notorious Philadelphia Poison Ring, disguised as a matrimonial agency.

At the same time, new and obscure poisons were beginning to emerge in the market, many of them legal medical drugs such as fentanyl, insulin, and various muscle relaxants including succinylcholine and Pavulon. New methods of poisoning were introduced, as well the resourceful use of common household chemicals such as antifreeze. Antifreeze was introduced as a murder weapon in the 1980s by Shirley Allen, who used it to kill off her husband for insurance money.

The race between the quest for the 'perfect poison' and advances in toxicology keeping pace with new poisons continues. Today, we can be sure that, no matter the poison, a method can and will be developed to trace it. The question is how much damage can be done before the perpetrator is caught. But while the progress of toxicology will guarantee apprehension of the poisoner every time, it is doubtful that it will put an end to the crime altogether. For, after all, where there is a will, there is a way.

COMMON POISONS

ACONITE (*Aconitum napellus*) or Monk's-Hood was known even in Anglo-Saxon times, when it was called 'thung.' 'Thung' became the word used for any very poisonous plant. The Greeks termed it 'lycotonum' or Wolfs-Bane. The superstitious called it by other names such as leopard's bane, women's bane, Devil's helmet, blue rocket. The Greeks hailed it as the Queen of Poisons, created by Hecate from the saliva of three-headed Cerberus, mythical guardian of the underworld. And until the 20th Century, it was the deadliest toxin known to man. The name aconite is derived from the garden plant monkshood, *Aconitum anglicum*, whose leaves and root yield its active ingredient, a potent alkaloid called aconitine, which was frequently used to poison the tips of hunting darts or javelins. Until its toxic properties were discovered, tincture or liniment of aconite was used to relieve sciatica, neuralgia, and rheumatism because the heat-production and mild anaesthetic properties of the potion gave comfort to many an aching joint. However, its popularity took a plunge when it was discovered that the mere rubbing of preparations on skin produced symptoms like poisoning by ingestion, and thereafter was sought primarily by those who had more sinister uses for the plant. The author Nicander of Colophon (ca. 130 BC) said of aconite toxicity: *It is established that of all poisons the quickest to act is aconite….* Gerard, an herbalist of Queen Elizabeth's time, wrote, *'There hath been little heretofore set down concerning the virtues of aconite, but much might be said of the hurts that have come thereby.'*

ANTIMONY is derived from the Greek word *anthemonium*, which means flowerlike (referring to the shape of the crystals). It is fitting a name for something once used for delicate purposes—ancient Egyptian women used it as cosmetic for darkening their eyelids and eyebrows, under the name stibium. One Urs-maat-Ra princess, who probably fancied herself as an experimenter, fed her handmaid an oral dose and that was how the ancient world came to realise that stibium was a deadly poison. In its natural metallic state, antimony is often mixed with arsenic and silver, and the greatest problem in purifying the metal in the past was getting rid of the arsenic. The extracted metal is often obtainable as tartar emetic (antimony tartrate), a

white powder which leaves a strong taste of metal in the mouth. The early Romans found great use for antimony in their gourmand practices. The metal was fashioned into little goblets, which would be filled with wine and left to ferment on the banquet table. When a bloated reveller had eaten all he could, he would simply reach out for the emetic cup and take a swig of the wine—whereupon he would throw up all the food in his stomach, thus making room for more gorging.

The reason why merrymaking Romans were able to go on partying into the night instead of collapsing dead on the banquet table was that, although antimony is highly poisonous in small quantities, a dose of more than one grain at a time induces severe vomiting, causing the poison to be ejected before it can do harm. However, if repeated low dosage of antimony is administered, it will produce the symptoms of poisoning with a strong irritant. Indeed it is because of this that antimony was favoured by poisoners of old who wished to kill their victims without attracting attention, as the symptoms of antimony poisoning were compatible with common diseases of the stomach.

ARSENIC, which has probably claimed more victims than any other poison, would be King of Poisons. Occurring commonly in many living organisms—especially fish and crustaceans—and in ores, coal, and soil, arsenic is a metallic ore once thought by alchemists to be a source of gold. (And indeed it is, to many poisoners). Although it was administered as yellow sulphide in the old days, it is more commonly found in its white oxide form. Its production involves roasting the metallic ore, putting the product into a vessel and applying even greater heat to form a deadly vapour that condenses as heavy white powder or a crystalline mass. Although arsenic is poisonous at high levels, we are constantly exposed to low levels of the metal. The average person ingests about 8 mg of arsenic daily, and the toxin finds its way into the blood, heart, lungs, liver, hair, and fingernails. The lethal dose is 0.6 mg per kg per day, which means that the ingestion of 42 mg in a day would bring down a 70-kg adult. Never was there a more widely used poison in domestic life in the history of civilisation, especially during the Victorian age. Arsenic was in flypaper and curtains, in fabric and floor covering, in ornaments, in candles, and tobacco. It was virtually everywhere, and in practically everything, that even if you could not walk right up to the apothecary to buy a pound of arsenic powder (which you could), you could always find it someplace else.

BELLADONNA (*Atropa belladonna*) or Deadly Nightshade plant takes its name from the practice of certain women who would use eye drops of the substance to dilate their pupils. This was thought to enhance their beauty, hence ‘bella donna’ or beautiful woman. In Chaucer’s time, it was known as ‘dwale’ from the French ‘deuil’ for grief. Marc Anthony’s troops were supposedly poisoned with belladonna in the Parthian Wars, and according to Buchanan’s *History of Scotland*, when Duncan I

was King of Scotland, Macbeth's soldiers poisoned a whole army of Danes with liquor treated by an infusion of dwale. Atropine is the chief chemical constituent of belladonna, from the Greek Atropos, the Fate who held the shears that cut short the thread of human life. Symptoms of belladonna poisoning include extreme dryness of the mouth and throat, scarlet rash and convulsions. The symptoms very closely resemble those of rabies, but may be distinguished by the dilation of the pupils.

CANTHARIDES or Spanish Fly is a powerful urinary irritant, much used as an aphrodisiac. Cantharides can cause burns and blistering all through the digestive and urinary tracts. Overdoses may result in convulsions like those produced by tetanus.

CYANIDE is found naturally in the stones of cherries, plums, and peaches, the cores of apples, and the leaves of the laurel plant. Cyanide evolved as a plant protection mechanism of grazing animals (interestingly, a number of bacteria, fungi, and algae are also found to produce the chemical). Ingestion of moderate amounts of these natural substances cause headaches accompanied by mild heart palpitations, more than enough to steer animals—two-legged or four—clear. However, the Middle Eastern people of ancient times made the discovery that the distillation by evaporation of laurel leaves produced lethal concentrations of this innocent plant product. Although cyanide has found usage in the gold industry and butterfly collection (collectors used hydrocyanic acid produced by the fermentation of crushed laurel leaves in their collection bottles), its most notable use throughout history was as a poison. One of the first administrators of cyanide was said to be Livia, the wife of Augustus who, in AD 14 killed her husband by soaking his figs in the poison. A number of people elected to end their lives by cyanide: Adolf Hitler, Eva Braun, Hermann Goering, and Alan Turing. The poison was stockpiled by both the United States and the Soviet Union during the 1950s and 1960s: indeed, it was thought that the Soviet Union had plans to use them to clear their way right into enemy territory.

HELLEBORE (Helleborus niger) from the Greek 'elein, to injure' and 'bora, food.' Pliny reports the use of hellebore as much as 1400 years before Christ by a man named Melampus, a soothsayer and physician. For this reason, one will occasionally see hellebore referred to as Melampode.

HEMLOCK (Conium maculatum) comes from the Anglo-Saxon 'hem, shore' and 'leac, a plant.' The scientific name, conium, is derived from the Greek 'konas, to whirl about,' since hemlock causes vertigo. Hemlock, like many poisons, is antidotal to another, and is used to treat strychnine poisoning. Poisoning by hemlock is characterized by a peripheral numbness which spreads inward until the heart and lungs are paralyzed. Hemlock is a poison hailing from the ancient world. Its poisonous properties were fully realised by the Greek, who not only devoted much of their

literature to it, but also sanctioned the use of the ‘suicide cup’ in situations where suicide was considered a noble act, and used it as a form of capital punishment. Hemlock was the State Poison of Athens, and was the death decreed for Socrates, according to the account by Plato. In 399 BC the philosopher Socrates was found guilty by the Athenian jury of corrupting the youth and interfering with the religion of the city. Socrates gracefully accepted the verdict and, in the presence of his friends and disciples, ended his own life with a goblet of poison.

HENBANE (Hyoscamus niger) is a poison related to belladonna. The symptoms are similar to those of nightshade.

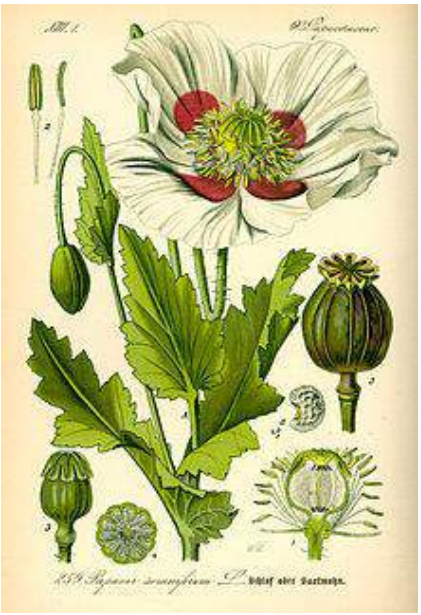
HYOSCINE (commonly called scopolamine to distinguish it from hyoscyamine) is a vegetable drug found in a number of plants. Hamlet was visited by the ghost of his father, who tells him that his uncle killed him by pouring ‘hebenon’ into his ear. Early Sanskrit writings spoke of datura, or Jimson Weed. All of them different plants, but with one chemical property in common: hyoscine. Hyoscine’s toxic properties, regardless of whether it is administered internally or externally, makes it a highly useful drug for physicians and poisoners alike. Its depressive action of the central nervous system makes it suitable for use in very tiny amounts in the treatment of anxiety-related problems and travel-sickness (in the form of hyoscine hydrobromide, which is a type of anticholinergic drug). In larger doses, it breaks down a person’s ability to discriminate and make reasoned judgment, making it a potential ‘truth drug.’ Hyoscine in the form of nightshade was also used by practitioners of witchcraft in the concocting of flying potions—large amounts of it caused hallucination and a sensation of floating. Witches believed that the nightshade, ruled by Hecate, Queen of the Night, conferred flying abilities. And for the aspiring poisoner, fatal doses of hyoscine cause the heart to cease functioning, which results in death. Indeed, it was because of its sedative properties that Dr. Hawley Harvey Crippen, the man notorious for introducing hyoscine as a murder weapon, decided upon it as a homicide tool, not realising that the drug’s unpredictable effect in different people made it hazardous to administer even in small quantities. Alas for Dr. Crippen, he learnt the hard way that dosage was everything.

MERCURY is a metal that is liquid at room temperature, whose soluble compounds and vapours are extremely dangerous. Its salts are much used in medicine, horticulture, paint manufacture, and as wood preservatives; the metal itself is mostly used for scientific instruments. Over the years, however, there has been growing concern about the association between mercury amalgams with conditions such as autism and chronic fatigue syndrome, as well as mercury contamination of the environment. While some of the associations are controversial and hard to prove (or disprove), it is nevertheless known that mercury is a potent neurotoxin, as evidenced

by the case of the ‘mad hatters’ of the 19th Century who inhaled the mercury used to cure the fur used to make their hats and subsequently developed personality changes, uncontrollable muscular tremors and twitches, nervousness, distorted vision, hallucinations, and even dementia.

POISONOUS MUSHROOMS such as those in the Amanita family and others are easily identified by their white gills, warty cap, and hollow stem. They may have a milky juice, and often change colour when cut or broken. Symptoms of mushroom poisoning include prostration, headache, stupor, wild delirium, and fever. Death occurs due to cardiac paralysis. Several cultures utilise hallucinogenic mushrooms in their rites. Eating these mushrooms may well cause one to see visions of God, or die, or possibly both, so extreme caution should be used by any who wish to pick their own mushrooms.

OPIUM is the juice of the unripe seed capsules of the poppy (Papaver somniferum). Morphine is the alkaloid derived from opium, and is named for the Greek god Morpheus, deity of sleep. Opium causes a deep sleep and gradual paralysis of the heart and lungs, resulting in death. An intense itching of the nose is sometimes an important symptom of opium poisoning. Opium has many medicinal uses. Opiate abuse was a lifestyle of the 19th Century. Originally used as a universal panacea, opium was introduced by Chinese sailors to both Europe and America in the 1800s, where it was smoked in dimly lit dens and houses of dubious repute in Chinatown districts of seaports. In China, the opium trade with Westerners—particularly the British—boomed, although the government became increasingly concerned that the foreigners seemed ‘intent on bringing down the Chinese through the opium trade.’ To discourage the trade, heavy custom duties were imposed and attempts were made to stop the trade altogether. However, political problems in China caused her to lose the upper hand in the trade, giving the British the chance to force the issue of increased trade rights. This culminated in the burning of the British opium stock and the subsequent Opium Wars of 1839—42 and 1856—60. China lost both wars, was forced to open a total of 16 ports, permit foreign legations in Beijing, sanction Christian missionary activity, and legalise the opium trade. China lost Hong Kong to Britain in the process.



The drug responsible for these wars comes from the poppy (*Papaver somniferum*), an annual plant with white or red flowers growing on a central bulbous pod. The active constituent in opium is the drug morphine, a fine white crystalline alkaloid. First extracted in 1805 by the German chemist Friedrich Sertner, it is a powerful analgesic and is used today in pain-relief medication. Because of its properties, it was widely available to medical practitioners, some of whom, it must be said, had intentions in mind other than curing their patients. Alas for the law, there were no means of proving the drug’s presence in the bodies of victims back in the early days, allowing goodness knows how many poisoners to get off scot-free.

RICIN comes from castor seed oil. If you have ever picked up a tube of lipstick, chances are that you would have seen the innocent words 'castor seed oil' listed under ingredients. While this is no cause for panic, it is worth pointing out that the seed also yields a deadly compound common to the homicide world, known as ricin. Ricin is obtained from the waste 'mash' left over from the production of castor oil by the simple process of chromatography (hence its popularity). It is a stable substance, affected little by extreme conditions, with a basic structure similar to those of the botulinum, tetanus, cholera, and diphtheria toxins. One gram of it is sufficient to kill about 36,000 people. Because of its availability and sheer lethality, ricin was under serious consideration for use in chemical warfare during World War II. The toxin has recently also been linked with terrorist activity among anti-government militia in the US as well as the Al Qaeda, and was supposedly used by the Bulgarian secret service in 1978 to assassinate a Bulgarian dissident in what is known as 'The Case of the Umbrella Murder.'

SOLANUM (Solanum dulcamara), known as Bittersweet, Garden Nightshade (Solanum nigrum), and the common potato are all members of the same family. Any competent mediaeval herbalist examining a potato plant would have immediately recognized its strong resemblance to the other, toxic Solanum species, and hence assumed that it, too, was poisonous. This is the major reason potatoes were not swiftly incorporated into the European diet after their discovery. Bittersweet and Garden Nightshade have poisonous berries, and in fact the very young shoots of the potato may also contain the toxin.

STRYCHNINE comes from a berry. Though the active component of the poison called strychnine wasn't determined until the 19th Century, the qualities of the poison berry, *Nux vomica*, have been known to the Arabs as early as the 5th Century. The first reliable record of *Strychnos nux vomica*, documented in 17th Century medicine textbooks, highlights the use of the berries for poisoning vermin and birds, but even before then strychnine was already being used as a tonic and to treat fever, in the form of St. Ignatius' Bean, a berry brought back from India by Jesuit missionaries, which contained a safe level of 1% strychnine. *Strychnos nux vomica* is a plant with dark shiny leaves and long cylindrical pods with disc-shaped seeds about the size of a small coin. The seeds are slightly convex on one side and correspondingly concave on the other, and are covered with fine silky hairs radiating from the centre to the edge. They may be light brown, greenish-grey, or silver grey in colour, depending on the state of maturity at the time of collection, and are tough to break or powder. They are largely found in Malabar, India, where the inhabitants are said to use it as a prophylactic for snake bites.

TARES (Lolium temulentum) is a grass with poisonous seeds. Mediaeval peasants were sometimes poisoned with tares when they failed to follow the Biblical injunction to separate the weeds from the grain.

THALLIUM is the least well known of the classical poisons. Thallium is a heavy metal discovered by Sir William Crookes in 1861. It is closely related to mercury and lead, but more toxic, and is used in industry in the manufacture of pesticides (although the sale of thallium-based products is no longer permitted in many cases). Its salts are colourless, almost tasteless,

and will readily dissolve in water-based liquids; the symptoms tend to be confused with that of many viral diseases including influenza, thus impeding its detection. Despite this convenience, however, it has rarely been used in homicide, with the case of Graham Young (an English serial killer who used thallium on his victims) being an exception.

COMPOUND POISONS

While any individual poison can kill, many people, especially the Arabs, had a preference for compound poisons. These might contain some very unlikely ingredients, along with some very toxicones. A compound poisoner's pantry might contain such ingredients as swamp frogs, cantharides, chicks stung to death by hornets, cinnabar, venomous spiders and snakes, ammonium chloride, nenuphar oil, iron sulphide, verdigris, sal ammoniac, crocodiles stung to death by asps, asafoetida (herb), salamanders, sulphur, rabid dogs, cherry pits, poppies, black crows drowned in brine, and pennyroyal.

A compound poison was most effectively administered in highly spiced foods where the ingredients were minced or chopped fine. Curries, meat pies, and haggis were all particularly suitable for the concealment of poison. *The Book on Poisons* of Ibn Wahshiya was written in the 9th Century laying out recipes for compound poisons.

THE BOOK OF ANTIDOTES

Justin, Adam and Kim (and Smudge) have a nasty and close encounter with the Eaters of Poison. When one of these strange people tries to drug them with a sleeping powder during their train trip to Scotland, Ink and Smudge come off worst. The Eater of Poison scratches Ink with his nails, and Smudge bites the creature on the ankle. Both Smudge and Ink end up with something horrible in their systems. Dr. Mercury Jones, a scientist, saves them later, with his universal antidote!

What is an antidote: An antidote is a substance that can counteract a form of poisoning. The term ultimately derives from the Greek *antididonai*, 'given against.'

The antidotes for some particular toxins are manufactured by injecting the toxin into an animal in small doses and extracting the resulting antibodies from the host animal's blood. This results in antivenom that can be used to counteract poison produced by certain species of snakes, spiders, and other venomous animals. A number of venoms lack viable antivenom, and a bite or sting from an animal producing such a toxin often results in death. Some animal venoms, especially those produced by arthropods (certain spiders, scorpions, bees, etc.) are only potentially lethal when they provoke allergic reactions and induce anaphylactic shock; as such, there is no antidote for these venoms because it is not a form of poisoning and anaphylactic shock can be treated by the use of epinephrine.

Some other toxins have no known antidote. For example, the poison aconitine, a highly poisonous alkaloid derived from various aconite (plant) species has no antidote, and as a result is often fatal if it enters the human body in sufficient quantities.

A universal antidote: The search for a universal antidote may have started with the ancient Greeks. The earliest written account of the use of an antidote can be found in *The Odyssey*, where Ulysses was told to protect himself with 'moly,' now believed to be derived from the plant Snowdrop (*Galanthus nivalis*), which contains a substance that may have counteracted the effects of poisonous plants such as Jimsonweed (*Datura stramonium*). The Greeks called their universal antidotes *theriacs*, the most famous being the Mithridatum and the Theriac of Andromachus.

Poisons were used by the ancient Greeks as a means of capital punishment, the best remembered case being that of the philosopher Socrates, who was given hemlock. It was also used as a means of political assassination, though this use was later developed on a much greater scale by the Romans. As knowledge and use of poisons grew and developed, so did the search for antidotes for poisons. In fact, it became a practical necessity if a ruler wished to survive in office.

Once the use and danger of poison was realized, it became apparent that something had to be done. Mithridates VI, King of Pontus (an ancient Hellenistic state of northern Anatolia, now

Turkey), circa 114–63 BC, lived in constant fear of being assassinated through poison. He became a hard-working pioneer in the search for a cure for poisons. In his position of power, he was able to test poisons on criminals facing execution, and then work out if there was a possible antidote. He was paranoid to the point that he administered daily amounts of poisons in an attempt to make himself immune to as many poisons as he could. Eventually, he discovered a formula that combined small portions of dozens of the best-known herbal remedies of the time, which he named *Mithridatum*. This ironically backfired when, during the invasion of Pontos by Pompey the Great, Mithridates attempted suicide by poison, failed, and had to resort to ordering a soldier to stab him to death. The Romans took Mithridates' antidote prescriptions and notes of medicinal plants and translated them into Latin.

Mithridates' recipe: Aulus Cornelius Celsus details one version of the antidote in *De Medicina* (c. AD 30). *'But the most famous antidote is that of Mithridates, which that king is said to have taken daily and by it to have rendered his body safe against danger from poison. It contains costmary 1·66 grams, sweet flag 20 grams, hypericum, gum, sagapenum, acacia juice, Illyrian iris (probably I. germanica), cardamom, 8 grams each, anise 12 grams, Gallic nard (Valeriana italica), gentian root and dried rose-leaves, 16 grams each, poppy-tears (Papaver rhoeas, a wild poppy with low opiate content) and parsley, 17 grams each, casia, saxifrage, darnel, long pepper, 20·66 grams each, storax 21 grams, castoreum, frankincense, hypocistis juice (Cytinus hypocistis), myrrh and opopanax, 24 grams each, Malabathrum leaves 24 grams, flower of round rush, turpentine-resin, galbanum, Cretan carrot seeds, 24·66 grams each, nard and opobalsam, 25 grams each, shepherd's purse 25 grams, rhubarb root 28 grams, saffron, ginger, cinnamon, 29 grams each. These are pounded and taken up in honey. Against poisoning, a piece the size of an almond is given in wine. In other affections an amount corresponding in size to an Egyptian bean is sufficient.'*

The Roman emperor Nero showed a great interest in poisons. Andromachus, one of Nero's personal physicians, improved the formula of Mithridatum. It then became known as *Theriac of Andromachus*, containing 64 ingredients and this included the flesh of vipers. For some strange reason, people have always thought that the flesh of vipers is a good antidote to poison. Perhaps this thought arose because the snakes are poisonous yet they do not die of their own poison, so it is rather reasonable to think that the snake's flesh acted as an antidote. Viper's flesh was a very common ingredient of any antidote that was developed in ancient times.

Later, Theriac became not only an antidote against poison but also a panacea against all diseases and it was actually in medical use until the 18th Century. To prevent fraud, in many cities, including Venice, Montpellier, Toulouse, and Strasburg, Theriac was carefully compounded and prepared in public under official supervision. In 1529 in Nuremberg, Germany, the city fathers made it mandatory that Theriac could be produced only with the express permission and supervision by the city council. In other words, it had to have the official sanction so that no substitutes or inferior ingredients could be used. The manufacture of antidotes called mithridate

or theriac (English ‘treacle’) continued into the 19th Century. Ephraim Chambers, in his 1728 *Cyclopaedia*, says, *‘Mithridate is one of the capital Medicines in the Apothecaries’ Shops, being composed of a vast Number of Drugs, as Opium, Myrrh, Agaric, Saffron, Ginger, Cinnamon, Spikenard, Frankincense, Castor, Pepper, Gentian.’* It is described as a Cordial, Opiate, Sudorific, and Alexipharmic. Late versions of the antidote incorporated dried blood or the dried flesh of lizards or vipers or Malabathrum (the name used in classical and medieval texts for the leaf of the plant *Cinnamomum tamala).* The last recorded public preparation took place in 1754 at the Nuremberg Apotheke. Even today, theriac jars can be seen in museums.

Although many of the ingredients of the original formula were left out, here is what might be found in the recipe!

Recipe for Mithridate: 2 oz opium, 2 oz myrrh, 2 oz frankincense, 1/2 oz spikenard, 1 oz saffron, 1 oz agaric, 1 oz ginger, 1 oz crushed cinnamon, 1 tablespoon pepper
1 oz gentian, the dried flesh of 1 viper (approx. 2 oz), 1 oz Malabathrum, 1 cup castor oil, 1 cup honey

Directions: Take all dry ingredients and crush them together using a large mortar and pestle. Pour dry ingredients into the mixed liquid ingredients. Bring to a boil, take off the heat, and leave on a low simmer, covered, for 3-4 hours. Let cool. Store in a very cool, very dry, secure storage area for 2-5 years to mature. (Sounds gross!)

It was only in the 18th Century, that people began to question this antidote. In 1745, William Heberden (1710—1801), one of the most outstanding physicians of London of the mid-18th Century published a critical analysis of this antidote. It was entitled *Antitheriaka: An Essay on Mithridatium and Theriaka*.

The search for antidotes to the growing number of poisons resulted in several books or treatises listing possible antidotes. The *Book of Theriac* has been attributed to Pseudo-Galen, supposedly written by Galen, a Greek doctor during the 2nd Century AD, whom the Arabs of the Middle Ages preferred to Hippocrates. In the 13th Century Peter of Albano wrote the *Book of Antidotes*, listing ingredients he thought could act as antidotes against known poisons of the time.

Of course, the lack of scientific or medical knowledge among the general population resulted in people using what they thought would work, or else old wives' tales, or supposed cures based on mythological sources. Here are some of the most unusual antidotes ever devised.

ALICORN: The unicorn is a legendary animal commonly portrayed as a white horse with a goat's beard and a large, pointed, spiraling horn projecting from its forehead. This horn is called the alicorn. Unicorn's horn was first described as far back as 398 BC by the Greek historian Ctesias. The ancient Greeks considered the unicorn to be a real animal, not a mythological creature. However, from this first mention by the ancient Greeks, it became the most important imaginary animal of the Middle Ages and Renaissance when it was commonly described as an extremely wild woodland creature, a symbol of purity and grace, which could only be captured by a virgin. In the encyclopedias, its horn was said to have the power to make poisoned water drinkable and to heal sickness. People would buy cups made of horn, in the belief that the alicorn would protect them from poisoning. Until the 19th Century, belief in unicorns was widespread among historians, alchemists, writers, poets, naturalists, physicians, and theologians.

GEMSTONES: For those who could not afford unicorn horn, many gems and stones were reputed to neutralize the effects of poison. Emeralds were the best gem to use. Maimonides (AD 1135—1204), a Jewish philosopher, reported that powdered emerald in wine would counteract any poison, although he warns that the gem must be large and of good quality. Emerald, when waved over suspicious food or drink, was believed to make it safe from poison. Amethyst was also reputed to be effective against poison. It was said that poison placed in a cup carved from a single amethyst would be harmless, and those who drank from such a cup would not become drunk. While gemstones were more affordable than unicorn's horn, the good stones of sufficient quality were not cheap, and even if the buyer had sufficient funds to allow him to purchase and powder stones worth a king's ransom, often stones of the necessary quality were just not available. This was not a cause for despair however, since bezoar and toadstones were available and very nearly free for the taking.

BEZOAR: Those of you who've studied natural history—or those of you who've read *Harry Potter and the Half-Blood Prince*—are familiar with term 'bezoar.' These stones, extracted from the gut of wild goats, cows, and apes, are actually stomach or intestinal calculi formed by calcium phosphate deposition around foreign bodies. The Persians called these stones *pad Zahr* ('expeller of poisons') and the ancient Hebrews called them *bel Zaard* ('every cure for poisons'). Bezoar stones when swallowed were said to counteract every poison known to man.

There seems to have been an active belief in such objects in Peru before the Spanish conquest. Long known in the Orient and still used there, Portuguese traders brought these stones to Europe in large quantities by from India and were often sold for ten times their weight in gold. They were usually enclosed in delicately wrought baskets of gold filigree hung on chains so that they might be dipped into wine. There are frequent references to the bezoar owned by Queen Elizabeth I and to many others belonging to European monarchs. During the great plagues in Lisbon (1580—81 and 1596—1602) bezoar-stones were hired out to sufferers for ten shillings per day. Bezoar stones were placed in goblets to protect against poison.

PORCUPINE STONE: Also called 'lapis porcinus' the bezoar stone found in the gall of the Indian porcupine has an intensely bitter taste, and was also thought to be a universal antidote

CERASTES: The cerastes (English translation: 'having horns') is a creature of Greek legend, a serpent that is incredibly flexible—so much so that it is said to have no spine. Cerastae can have either two large ram-like horns or four pairs of smaller horns. The legend probably originated from the habits of the horned viper, whose genus, *Cerastes*, is named after the mythological creature. In the late Middle Ages and Renaissance the horns were set in elaborate goldsmiths' work and placed on the dining table. People believed that when poison was brought near them they would break into perspiration. Albertus Magnus mentions the 'virtue' of the cerastes. Peter of Albano gave it his full support, and all later writers on poisons and antidotes echoed this opinion, illustrated by the belief that the gates of Prester John's (a legendary Christian king) palace were composed of sardonyx mixed with cerastes' horns, so that no poison could be brought through them undetected.

SNAKE TONGUES: Even more commonly used that the horns of the cerastes were snake-tongues. It was thought that these also perspired in the presence of poison, and because of the belief that they should be kept as dry as possible, they were usually placed near the salt. When fossilized shark teeth were first discovered embedded in terrestrial rocks—sometimes high up mountainsides and far from the sea—their origin was a complete mystery. Pliny the Elder (AD 23—79), the great Roman naturalist, believed that they fell from the sky during lunar eclipses. They were later thought to be the tongues of serpents that Saint Paul had turned to stone while

visiting the islands of Malta, which is how these curious objects came to be called *glossopetrae* ('tongue stones'). *Glossopetrae* were widely believed to have magical properties, most notably the ability to counteract toxins of many kinds: from venom injected via snakebite to poison slipped by a would-be assassin into a king's chalice of wine. To work their magic, *glossopetrae* needed only to be held against a snake-bitten body part or plunked into a suspect glass of wine and any poisons therein would be quickly and irreversibly detoxified. Due to these marvelous supposed capabilities, many nobles and statesmen of the Middle Ages kept these 'tongue stones' as amulets, either worn about the neck as a pendant or in special pockets reserved for this purpose.

TOADSTONES: There is an ancient (still existing) belief in India, in a stone with similar properties, sometimes called in the 'Smaragdus,' found in a serpent's head. It was thought that the snake-charmer lures the snake out of its hole by incantations, lulls it to sleep, cuts off its head with a hatchet, and then extracts the jewel. This stone or jewel is said to contain a thin, crescent-like fibre that vibrates in the centre. From these Indian stones, comes the belief in the toad-stones of Europe, commonly worn in finger-rings as amulets and prophylactics (preventive medicines). Most of the poison-detecting agents were thought to be very difficult to obtain unless one knew the magic formula. Most of the toad-stones in actual use seem to have been greenish-brown objects about the size of a large pea, and some were certainly the fossilized teeth of the sting-ray. Finger-rings containing them still exist.

GRIFFIN'S CLAW: The 'griffin's claw' was in reality the horn of an ibex or a buffalo made into drinking-horns. They were thought to act like the beakers mentioned by Ctesias and Aelian (Claudius Aelianus, ca. 175—ca. 235), a Roman author, when poisoned liquor was drunk from them. Slices of the horn were shaped into the handles of table knives and saltcellars; they were also shaped into 'test-spoons' and sunk in the silver of table dishes.

CRYSTAL & VENETIAN GLASS: Many people had dishes and goblets made of various substances guaranteed to tarnish or otherwise warn users when poison was placed within them. In the 16th Century, it was believed that beakers of Venetian glass would explode if poisoned wine were placed within. The carbuncle or ruby—the names were commonly interchangeable in the Middle Ages—was thought to detect poison.

EAGLE STONE: More interesting than these are the 'aetites' or eagle-stones, so called because, according to Pliny, it was to be found only in the eagle's nest, and was therefore exceedingly rare.

It was believed the eagle placed it there, as she also sometimes did the amethyst, to watch over her young while she was absent. The ancients thought that aetites and amethysts had the power to dispel snakes. It was believed that if a plate containing poison was placed over this stone, no man would be able to eat the food upon the plate. The eagle-stone is a hollow nodule of clay-ironstone about the size of a walnut. In the medico-magical traditions of Europe and the Near East, it was thought to have extensive medical benefits, such as facilitating childbirth and preventing abortions.

TERRA SIGILLATA: Terra Sigillata is a special clay earth from a particular hill on the island of Lemnos. This clay was often formulated with goat's blood to make it into a paste. Like the bezoars and the unicorn's horn, there was fraud in its sale too. And it was quite easy because virtually any kind of clay (which is so easily available) could have been passed off as the real one from Lemnos. To prevent fraud, this special clay was often prepared in tablets and stamped with a seal, thus giving the substance its name. Later, other sources of similar earth were found in different parts of Europe and in the 16th and 17th Centuries, mugs were made of it, from which anyone could safely drink without fear of poisoning. In The Search for the Stone of Excalibur, the Eaters of Poison give Adam a small velvet bag containing (as Humphrey tells him) some of this famous antidote. Adam doesn't know why they have done this. Perhaps it will be useful later on in his adventures.

VULTURE'S FOOT: The vulture's foot was in common use on the dining tables of the Middle Ages. The foot was hung in such a way that the claws surrounded the flame of a candle, and it was thought that whenever poison was brought to the table the foot would clutch and extinguish the flame.

AMULETS & TALISMANS: The last forms of antidote commonly employed in the Middle Ages were amulets and talismans. An amulet was an item or a piece of parchment upon which certain holy names or words were written. An amulet had to be constantly carried upon the individual's body if it was to retain its power. The word 'amulet' comes from the Latin *amuletum*; the earliest extant use of the term is in Pliny's *Natural History*, meaning 'an object that protects a person from trouble.'

Talismans were similar to amulets, but in some respects were considered similar to an idol by the very religious. The book of Arnold of Villanova (a 13th Century physician, occultist, and alchemist) states that 'the image of a man holding a dead serpent in his right hand and its tail in his left is an antidote against poison.' The word 'talisman' derives from the Greek word *telein*, which means 'to initiate into the mysteries.