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All the Poisons of Agatha Christie

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ABSTRACT

Agatha Christie was one of the most famous writers of all time. The British-born author is best known for her detective novels and stories that often took place in fictional settings, such as English villages, estates, exotic countries and exclusive hotels. Her two most renowned characters are the Belgian detective Hercule Poirot and the elderly lady amateur detective Miss Marple. Christie worked for a long time as a pharmacist at the University College Hospital in London, where she encountered numerous drugs, chemicals and poisons on a daily basis. This served as a source of ideas for many of her stories. In her works, she used numerous chemicals, naturally occurring compounds and even bacteria as poisons: phosphorus, barbital, cyanide, arsenic, digoxin, *Bacillus anthracis*, atropine, physostigmine, coniine, aconitine, nicotine, laudanum, codeine, morphine, ricin, strychnine, thallium and taxine. This paper provides an overview of all the poisons she utilized, including their properties and lethal doses. Agatha Christie employed her pharmaceutical knowledge to add depth and authenticity to her crime stories. Pharmaceutical themes add to the complexity of her plots, helping readers immerse themselves in a world of intrigue and suspense.

Key words: Agatha Christie, poison, pharmacy, arsenic, ricin, strychnine.

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GIVE ME A DECENT BOTTLE OF POISON AND I'LL CONSTRUCT THE PERFECT CRIME!

These are the alleged words of Agatha Christie (Figure 1), a British writer, the most famous author of crime novels in the history of literature. Few today have not heard of this name, read or watched one of her works on television and quickly become hooked on a strong influx of dopamine in the closing moments in which the killer's name is revealed. It was the same in my case. As a boy, I followed the detective Poirot's events and the effects of his gray cells with my father. By then it was already too late and I had fully dived into this world of intrigue and criminology. Upon researching the details of her life, I learned that Christie served as a nurse in World War I and then, in 1917, passed the pharmacy trainee exam (1). She worked for a long time as a pharmacist at the University College Hospital in London. Such a work environment served as an inexhaustible source of compounds that she significantly used in her works. The poisons she utilized were diverse, with different sources and effects, and here they are gathered in one paper.

Figure 1. Agatha Christie; Source: (2)

PHOSPHORUS

One of the unusual ways Christie decided to kill a character in the timeless work *Dumb Witness* was a phosphorus murder. By flipping through the pages of this exciting novel, the reader gradually discovers an increasing number of details about the carefully planned murder of the main protagonist – the rich Emily Arundell. One of the main clues was the appearance of a green aura around the unfortunate woman at the time of her death. This led Christie's famous Belgian detective Hercule Poirot to the conclusion that she was actually poisoned with phosphorus, in such a way that the poisoning was done gradually, day by day, until it was fatal. True, at the first discovery of phosphorus, it was observed that it can fluoresce green, that is, when exposed to oxygen, it gives off a green reflection, which led the author to such a conclusion (3). Phosphorus is a chemical element that has the symbol P and atomic number 15. It is a vital element for life because it is a key component of nucleic acids, energy compounds and phospholipids, which make up cell membranes. Most often it exists in two different allotropic forms – white and red phosphorus, although there are additional ones (black, purple and others). White phosphorus is toxic and flammable, while red phosphorus is used in industrial applications (4). The medial lethal dose (LD50) of white phosphorus is 3.03 mg/kg body weight (5).

The ingestion of such elemental white phosphorus will usually result in severe vomiting that shows luminescence as well as diarrhea. People who are poisoned with phosphorus may also have halitosis reminiscent of garlic. In higher doses, phosphorus poisoning leads to more severe clinical manifestations such as rhythm disturbances, hypotension and death. In addition to the oral route, phosphorus can also produce burns when in contact with the skin within minutes of exposure. The appearance of jaw necrosis caused by phosphorus is known; such a disease was often seen in workers in the match industry who inhaled poisonous fumes of white phosphorus unprotected (6).

Phosphorus poisoning is not uncommon in developing countries. Phosphorus is widely used as a rodenticide, so poisoning in children is common, but so are suicide attempts. It is estimated that 87% of people who are poisoned with white phosphorus develop certain liver pathologies, and up to 27% of those exposed die due to liver failure (7).

BARBITAL

Barbital is a sedative and hypnotic drug from the barbiturate class. Barbiturates were often used to treat insomnia, anxiety and epilepsy before they were replaced by more modern and safer drugs. Barbitals act on the central nervous system, slowing brain activity and causing a feeling of calm and relaxation. Barbital was the first commercially available barbiturate and became popular as a cure for insomnia in the first half of the 20th century (8). At that time, it was known by the trademarked name Veronal. However, over time, many serious side effects and risks associated with long-term use of barbital have been discovered. The side effects include addiction, tolerance (reducing the effectiveness of the drug over time), drowsiness during the day, reduced coordination, dizziness, decreased breathing and heart depression.

Abuse or excessive use of barbiturates can create serious health problems, including overdose, which can be fatal. Such an overdose was fatal for Roger Ackroyd, another fictional character from the pen of Agatha Christie. Specifically, barbiturates cause depression of the central nervous system by increasing the opening of the chloride channel at the γ-aminobutyric complex. Barbiturates also block the excitatory neurotransmitter glutamate. This combined action leads to the inhibition of cardiorespiratory centers and autonomic nuclei of the hypothalamus, resulting in hypotension, hypothermia and respiratory arrest. The LD50 was determined in mice and is 800 mg/kg body weight (9). There is no direct antidote. Today, barbital is rarely used for medical purposes, mainly due to the serious side effects and risks associated with its usage. Instead, modern therapies for insomnia, anxiety and similar conditions include over-the-counter medications, cognitive-behavioral techniques and conversation therapy, as well as other approaches.

CYANIDE

Cyanide is considered a king among poisons. Its great popularity is evident in Márquez's novel *Love in the Time of Cholera*: "It was inevitable: the smell of bitter almonds always reminded him of the fate of unrequited love." In layman's terms, it can be intuited that the smell of cyanide resembles almonds. However, the smell of cyanide is somewhat reminiscent of sliced bitter almonds (a special species) containing 42 times more cyanide compared to sweet almonds (10). Cyanide most often occurs in the form of potassium salt of hydrocyanic acid (potassium cyanide).

The main effect of cyanide is the inhibition of oxidative phosphorylation, a process in which oxygen is utilized to produce essential sources of cellular energy in the form of adenosine triphosphate. This is achieved by binding to the enzyme cytochrome C oxidase and blocking the mitochondrial transport chain. After that, cellular hypoxia occurs, which leads to metabolic acidosis. The tissue uses up all oxygen and the failure of vital functions follows. Death, in fact, transpires by chemical suffocation (11). The LD50 dose is 7.49 mg/kg body weight (12). Cyanide was fatal for a number of real but also fictional characters in literary works and films. It was employed in Christie's works as well (*Sparkling Cyanide*, *Curtain*, *Halloween Party*, etc.). Christie poisoned her characters either in the form of potassium cyanide or with so-called Prussian acid (hydrocyanic acid).

ARSENIC

If cyanide is a king among poisons, arsenic is certainly a prince. This chemical element is known for its high toxicity. It occurs in nature and can be found in various compounds. The toxicity of arsenic stems from its ability to interfere with various biochemical processes in the body. Arsenic can be present in a variety of forms, including inorganic and organic compounds, each of which has its own specific toxicity. Arsenic is a common poison in a

number of literary works by the English writer (*Murder is Easy*, *Evil under the Sun*, etc.). Due to its effectiveness and popularity, arsenic was favored as a poison from Roman times to the mid-19th century due to its lack of color, smell and taste. Arsenic poisoning was such a widespread concern that the Roman consul Lucius Cornelius Sulla issued the *Lex Cornelia* in 82 BC banning arsenic poisoning (13).

Arsenic interferes with the normal cell cycle by allosteric inhibition of the essential metabolic enzyme complex pyruvate dehydrogenase, which catalyzes the oxidation of pyruvate into acetyl coenzyme A (acetyl-CoA) by NAD+. With enzyme inhibition, the cell's energy system is disrupted, resulting in cellular apoptosis (14). Exposure to and arsenic poisoning can be chronic and acute, and the LD50 dose is 15 mg/kg body weight (15). Acute arsenic poisoning causes nausea, vomiting, diarrhea, abdominal pain, loss of consciousness and convulsions. In higher doses, it leads to death. Long-term exposure to low arsenic levels can produce chronic health problems, including cancer (especially of the skin, lungs and bladder), as well as heart disease, diabetes, damage to the nervous system and skin lesions.

DIGOXIN

The thimble owes its name to the shape of a flower (*Digitalis purpurea*) that has a similar shape to a device that is placed on the tip of the finger when sewing. It belongs to the plantain family (Plantaginaceae), and is known for its healing properties and compounds that have cardiological effects. These are glycosides of digitalis, a group of natural compounds that help increase the strength and efficiency of heart contractions, but they can also be extremely dangerous if used uncontrollably or excessively. These compounds affect the ionization and transport of ions through the cell membranes of heart cells. The most famous representative of this group is digoxin, which is utilized in the treatment of mild to moderate heart failure and to control the rate of ventricular response in chronic atrial fibrillation (16). Digitalis poisoning actually occurs as an action of digoxin and digitoxin.

The narrow therapeutic width of these compounds requires special caution when using them. An excessive amount was fatal for several characters in Agatha Christie's literary works (*Appointment with Death*, *Crooked House*, etc.). Digoxin inhibits the cardiac Na/K pump, which causes an increment in intracellular sodium and a decrease in intracellular potassium. Reducing potassium is what leads to hyperkalemia in patients with an overdose of digoxin. A rise in intracellular sodium results in an expansion in sodium secretion through the Na/Ca pump, which in turn raises intracellular calcium levels. Enlarged intracellular calcium increases inotropia, which often elicits a reflex increase in vagal tone. For patients with atrial fibrillation, an increased vagal tone will reduce the rate of conduction through the atrioventricular node, thereby slowing down the ventricular number. Death occurs due to heart failure. The least reported toxic dose was 75 µg/kg body weight (17).

BACILLUS ANTHRACIS

It is unusual to encounter a bacterium among selected poisons, but Agatha Christie's mind was a creative garden hiding a new secret in every corner. *Bacillus anthracis* is a gram-positive, rod-like bacterium that causes anthrax, a serious infectious disease that can affect humans and domestic animals. This bacterium is known for its ability to form spores, which are durable and allow survival in adverse conditions such as the soil and bodies of deceased animals.

Anthrax infections can occur in three forms, depending on the method of exposure: skin, inhalation and gastrointestinal. Cutaneous anthrax is the most common one in humans and is characterized by the formation of a painful red lesion that can develop into a wound with a scab. Inhaled anthrax develops in the case of slow inhalation, and the symptoms may resemble the flu, but over time they worsen and can lead to serious respiratory problems (18).

Gastrointestinal anthrax results in symptoms such as abdominal pain, diarrhea and vomiting, and is usually due to consuming contaminated food.

Bacillus anthracis also has significant potential as a biological weapon due to its resistance to extreme conditions and the ability to create issues. This makes it potentially deadly for mass infections. Throughout history, this organism has been associated with naturally occurring epidemics, especially among livestock. Today, ways to identify, treat and prevent infections in both the natural environment and as a potential bioterrorism threat are being explored and developed. Agatha Christie decided to use this imaginative way to kill Charles Craddock in her novel *Cards on the Table*.

ATROPINE

Deadly nightshade (*Atropa belladonna*) is probably one of the most famous plants used in pharmacy and medicine. It is known for its alkaloid atropine. In antiquity, people utilized this plant for various purposes. In Ayurveda it is employed to treat a variety of conditions, including indigestion, rheumatism and cramps. The plant also had its place in art and cultural history. In the Renaissance, women dripped the extract of the plant into the eyes to dilate the pupils and achieve the effect of larger and brighter eyes (the action of atropine), which led to the name of this plant (Italian *bella donna*, beautiful woman). This was a popular aesthetic ideal of the time, although such a use was extremely dangerous to health.

Atropine is generally available today as a sulphate salt and can be administered intravenously, subcutaneously, intramuscularly, endotracheally and ophthalmologically. Oral atropine is only available in combined products. Atropine is a competitive, reversible muscarinic receptor antagonist that blocks the effects of acetylcholine and other choline esters (19).

Like almost everything in pharmacy, a drug very quickly becomes a poison. Such is the case with atropine. The LD50 dose by oral administration is 500 mg/kg body weight (20). Pilocarpine or physostigmine can be used as an antidote. Christie utilized atropine in several of her works ("The Thumb Mark of St. Peter," *A Caribbean Mystery* and other stories).

PHYSOSTIGMINE

Physostigmine is an organic compound belonging to the group of carbamate inhibitors of acetylcholinesterase. This compound plays an important role in medicine as a reversible inhibitor of the enzyme acetylcholinesterase and is used to treat poisoning with poisons that block this enzyme. Physostigmine also has a history of application in ophthalmology and brain research. The mechanism of action of physostigmine is based on the inhibition of the enzyme acetylcholinesterase, which normally breaks down acetylcholine, a neurotransmitter responsible for the transmission of signals between nerve cells and muscles. This inhibition results in an increased concentration of acetylcholine in the synaptic gap, which enhances nerve impulses and increases the action of acetylcholine on receptor cells. It appears in the works *Curtain* and *Crooked House*. The LD50 is 3 mg/kg body weight. Death due to overdose occurs as a result of cardiac arrest and paralysis of the heart (21). Symptoms of poisoning may include dry mouth, blurred vision, nausea, vomiting and convulsions, in addition to other symptoms associated with enlarged concentrations of acetylcholine.

CONIINE

Coniine is a natural alkaloid found in the hemlock plant (*Conium maculatum*). This compound is known for its extremely toxic nature and has a significant history as a poison, but it has also played a role in the development of medicine and philosophy. Coniine acts as a paralytic poison that affects the nervous system, making it dangerous for humans and animals. Christie employed it in her work *Five Little Pigs*. In pharmaceutical terms, coniine acts

as an antagonist of acetylcholine, a neurotransmitter that transmits signals between nerve cells and muscles. It works by blocking acetylcholine receptors, interfering with the normal transmission of signals and causing gradual weakening of the muscles. Coniine poisoning can result in progressive muscle paralysis, including respiratory muscles, which can lead to death. Hemlock is known as the plant by which Socrates took his own life. At that time, this plant was known as one of the ingredients of the cup of death, a potion used to commit suicide (22). Today, coniine is utilized in laboratory settings to study neurotransmitter systems and other biological processes. The LD50 is 100 mg/kg body weight (23). Death occurs due to failure of the respiratory muscles. Given its danger, coniine is not only a poison, but also an object of scientific interest. Its structure and mechanism of action provide insight into the complex interactions between chemical compounds and biological systems.

ACONITINE

Aconitine is a powerful natural alkaloid present in various plants, primarily in the family of the blue hedgehog plant (*Aconitum napellus*). This compound is extremely toxic and known for its deadly effects on the human body. Historically, aconitine has been associated with witchcraft and poisonous beverages. Plants containing aconitine have often been used in traditional medicine and in tribal rituals, although they have also been a source of serious toxic reactions. Aconitine acts as a strong stimulator of ionotropic sodium receptors in nerve cells, which causes the rapid and excessive depolarization of neurons. This reaction results in the dysfunction of nerve signals and severe paralysis of muscles, including the muscles of the respiratory system, which can lead to death. The chemical structure of aconitine makes it very toxic, and a sufficiently small amount of this compound can create serious health complications.

Aconitine poisoning leads to the rapid onset of symptoms, including nausea, vomiting, abdominal pain and diarrhea. These symptoms quickly progress toward more serious consequences, such as heart rhythm disorders and decreased circulation, as well as the weakening of muscles and convulsions before death. Such a fate befell the characters in the works *4.50 from Paddington* and *The Hand Faster than the Eye*. Although aconitine is extremely toxic (the LD50 is 1 mg/kg body weight), it has also been the subject of research (24). Some laboratory experiments have used aconitine to investigate nerve channels and interactions, which contributed to the understanding of complex processes in the nervous system. However, due to its exceptional toxicity, such studies are carried out with extreme caution and strictly controlled conditions.

NICOTINE

It may seem somewhat confusing, but it is quite clear that although nicotine is primarily associated with smoking and cigarettes, its toxicity has long been established. By smoking a person cannot reach lethal doses of nicotine in the body, but by oral administration it is certainly possible to achieve such an effect. Nicotine is an alkaloid from plants within the Solanaceae family and is most often associated with the tobacco plant. This natural compound has a complex effect on the body and is widely known for its presence in cigarettes and as an addictive substance. However, nicotine has deeper biochemical and physiological effects that deserve attention. Nicotine acts as an agonist of nicotinic acetylcholine receptors in the central nervous system and peripheral nerve cells. These receptors normally respond to acetylcholine, a neurotransmitter that transmits signals between nerve cells. By interacting with these receptors, nicotine causes the release of various neurotransmitters, including dopamine. This process leads to a feeling of euphoria, improved concentration and alertness. Nicotine can result in a wide range of physiological effects. It increases heart

rhythm and blood pressure as well as breathing rate and stimulates the release of adrenaline. These effects can raise the risk of heart problems and the load on the cardiovascular system.

In light of the emergence of new e-cigarettes and liquid cigarettes, increasing numbers of nicotine poisonings are occurring. In the time of Agatha Christie, such poisonings were not often reported, because it was difficult to attain a large amount of such an isolated compound. Nevertheless, she took the opportunity to include it as one of the poisons in her work *Three Act Tragedy*.

The LD50 of nicotine has been the subject of numerous studies. It has been found that in humans this dose is approximately 13 mg/kg body weight, and in children it can be as high as 0.1 mg/kg body weight (25). An overdose will lead to nausea, vomiting, diarrhea, hypersalivation, abdominal pain, tachycardia, hypertension, tachypnoea, sweating and similar symptoms. Death can occur due to serious complications including cardiac arrhythmia, respiratory arrest and heart failure. The combination of an increased heart load with respiratory problems and changes in circulation can cause a complete disruption of the normal function of the body. In some cases, death can happen suddenly, while in others it can be gradual, as a result of the accumulation of various serious complications.

OPIATES

Opiates are a common name for alkaloids derived from opium, a naturally occurring juice extracted from several types of poppies, most notably *Papaver somniferum*. Opiates have a strong analgesic effect, but they can also cause feelings of euphoria and be addictive. In a broader sense, the term "opiates" is often used to refer to both synthetic and semi-synthetic opium derivatives, such as morphine, codeine, heroin and many other similar compounds. Christie was very fond of opiates in her works. She utilized codeine, morphine and laudanum (an opium tincture containing approximately 10% chopped powder in ethanol) in *Hickory Dickory Dock*, *A Murder Is Announced*, *Sad Cypress*, *The Big Four* and many others. These poisons were extremely effective. The LD50 for codeine is 427 mg/kg body weight, and for morphine it is as much as 0.78 µg/kg body weight (26). Laudanum (Figure 2) has long been withdrawn from sale and is not found on the free market today. Historically, it was a popular remedy to relieve pain, insomnia and other ailments. However, laudanum also had a high potential for addiction and toxicity. Prolonged use of laudanum could lead to serious physical and mental problems.

Figure 2. Laudanum, a tincture containing opiates; Source: (27)

All of these opiates have a common factor called central nervous system depression; in other words, they reduce the activity of the brain and spinal cord, which can generate serious breathing problems, a slow heartbeat and general impaired body function. An overdose of opiates can cause complete cessation of breathing and cardiac arrhythmia, which can result in a fatal outcome. Depending on individual factors such as body weight, opiate

tolerance and other health characteristics, the dose that can lead to death may vary.

RICIN

Ricin is a natural toxin found in the seeds of the castor plant (*Ricinus communis*). This poison is one of the deadliest known natural poisons. Ricin works by inhibiting the formation of proteins in the body, which causes serious damage to cells and organs. Although ricin is extremely poisonous, there are limited reports of its intentional abuse. Historically, ricin has been occasionally used as a poisoning agent, and its toxicity and the ease with which it can be obtained from castor seeds have raised concerns regarding potential usage for terrorist purposes. At the time of Agatha Christie, it was widely utilized, and so it can be found in her series Partners in Crime in which the detectives Tommy and Tuppence participate in the investigation of murders. The severity of the effects depends on the method of exposure to ricin. Inhaling ricin has a much more powerful effect than oral use. The inhaled LD50 ranges from 3 to 5 µg/kg while the oral LD50 is 20 mg/kg (28).

Ricin is still used as a poison to this day. One of the most famous uses of ricin for these purposes was the assassination of Georgi Markov, a Bulgarian journalist, who was killed by a bullet containing ricin. The bullet was fired from an umbrella into the back of the right thigh and led to his death (29).

STRYCHNINE

Alkaloids enjoy special attention under the pen of Agatha Christie. This should be understood in the context of a time when they were significantly more used in everyday medicine and were easily accessible. In her works *Death on the Nile* or *The Mysterious Mr. Quin*, enough strychnine was found to make it sometimes fatal. Strychnine is one of the most powerful naturally occurring poisons ever known. The minimum lethal dose for humans is only 0.5 to 1 mg/kg body weight (30). The most common natural source is the *Strychnos nux-vomica* tree, which is native to the territory of India and Sri Lanka. Strychnine has been utilized as a poison for centuries, both to kill pests and in tragic cases of human poisoning. The toxic properties of strychnine arise from its action on the nervous system. Strychnine blocks the normal functioning of inhibitory neurons in the spinal cord, leading to an excessive release of neurotransmitters like acetylcholine. This causes severe muscle spasms and convulsions, which can worsen to a fatal outcome without an intervention in time.

Symptoms of strychnine poisoning usually develop rapidly after intake and include severe muscle, jaw, neck and back spasms and muscle tension, as well as difficulty breathing, increased blood pressure, a rapid pulse, heat and sweating. In severe cases, strychnine poisoning can lead to respiratory arrest and death. Although strychnine was once used in traditional medicine and as a means of killing pests, today it is strictly regulated in most countries and is rarely utilized. In a medical context, it can be employed in highly controlled conditions to investigate and diagnose neuromuscular disorders.

THALLIUM

Thallium is a chemical element found in the periodic table of elements under ordinal number 81. It is a rare metal of silvery color, soft to the touch and very toxic to humans and other organisms. Although thallium has several industrial applications, its toxicity limits widespread use and places it in the category of high-risk substances. Thallium is known for its ability to mimic the action of alkali metals in cellular processes, which makes it toxic to living organisms. Thallium poisoning can cause a number of serious health problems, including nervous system damage, as well as heart problems, severe gastrointestinal symptoms and kidney damage, and consequently death. Such a fate befell numerous characters in the work *The Pale Horse* which had Ariadne Oliver as the main protagonist.

Thallium poisoning can occur due to exposure to the skin, the inhalation of steam or an oral route. It can be due to cumulative exposure or acute. As a result of serious damage to organs and tissues, the body becomes incapable of maintaining its basic functions. A deadly outcome develops when multiple vital organs are unable to perform their functions and the body loses its ability to sustain life.

The US Occupational Safety and Health Administration has set a legal limit for workplace thallium exposure of 0.1 mg/m2 of skin for eight working hours a day, as thallium continues to be extensively used in certain industries (31). At the degree of exposure of 15 mg/m2 thallium is already considered hazardous to health. The biggest sources of poisoning today include cement factories, coal-fired power plants, certain types of sewage and ore processing (32).

TAXINE

At the time of Agatha Christie, taxine was thought to be an individual poison isolated from ordinary yew, *Taxus baccata*. However, later electrophoresis methods established that taxines represented a group of alkaloids, two of which of the most important representatives are taxine A and taxine B. Christie utilized this poison in the novel *A Pocket Full of Rye* with Miss. Marple, a simple English woman who solves complicated crimes with insightful observations. Today it is more accurate to use the term taxine alkaloids, since we know that these are several different alkaloids. Like most of the poisons shown here, taxines have been employed since ancient times. Greek and Roman writers have recorded numerous cases of poisoning and suicide involving yew juice. The first preparation with the name taxine was made by the German pharmacist Lucas and was applied as an herbal one.

Today, the famous chemotherapeutic paclitaxel is obtained from this family of plants (*Taxus brevifolia*). Taxines block sodium and calcium channels and interfere with the transport of sodium and potassium, such as the glycoside digitalis, which can progress to a life-threatening arrhythmia. The first symptoms expected after ingestion are dizziness, mydriasis, nausea, vomiting, abdominal pain, tachycardia and convulsions, accompanied by bradycardia, paralysis, diastolic cardiac arrest and death. There are no antidotes or specific therapy (33). The LD50 dose in mice is less than 20 mg/kg body weight (34).

AMIL NITRITE

Paracelsus supposedly postulated that only the dose distinguishes between medicine and poison. Today we supplement with the time of exposure, although in its original form this comment is still very timely and accurate. What is interesting about the case of Hercule Poirot is death due to the absence of a dose. In *Curtain*, the last work in which the Belgian detective appears, Poirot ends his life by refusing to take amyl nitrite, his cure for angina pectoris. He places the drugs out of reach and the moment he feels the attack he is aware that this is his end. Without going into the details of the plot, Poirot dies, and his death is planned and controlled, with the aim of ensuring justice in the case he is investigating, as well as preventing potential future crimes. Amyl nitrite was previously widely used as a standard treatment for various heart diseases. Today, it has been replaced by better preparations, so it has almost disappeared from use. Thus, amyl nitrite is a drug and should not be seen as a poison in a colloquial sense, but it should definitely be included in this context as an honorable mention.

CONCLUSION

Poisons undoubtedly have their place in the numerous works of the queen of crime. Reading her publications makes us feel unable to separate the characters' biographical sketches from the life of this English writer. She wove herself into each and gave them a part of herself for eternity. Her experience as a nurse in World War I and later as a pharmacist in a pharmacy

provided her with an exceptional basis in knowing about and handling poisons. These science-based facts and windows into human relationships, as well as the depth of human emotions and incredible intrigue and plots, are the reason Christie is still popular today. Her stories lead readers through labyrinths of mysteries, asking questions about truth, prejudice and everything in between. Agatha Christie's true greatness is expressed in the fact that with her actions she still manages to retain the magic of the written word. Her legacy still has an incredibly powerful effect today, one similar to the poisons in her works.

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