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Review

Physico-chemical reaction of the poisons in shakespeare's tragedies

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This paper provides the analysis of the definition of toxins from a medical aspect, as unpoisonous substance given in one dose and as a poisonous substance given in another dose. The aim of this paper is to, from physico-chemical aspect, make connection between toxins from medical aspect considered as a drug and Shakespeare's plays. The Chinese Doctors appear to have safely and successfully treated patients with cancer of the blood and bone marrow with a combination of arsenic and vitamin A, according to long-term study published in Hong Kong. With the same one with which the Friar poisoned the King Dona and then himself. So arsenic could be a poison and a remedy. In 18th century already arsenic compunds were used as a medicine. In 2000, American Ministry of Health approved the use of arsenic for treatment of the patients with cancer of the blood and bone marrow. Consideration of the toxins from the aspect of their toxic and curative properties is a very common multidisciplinary approach to the problem as an indissoluble link between the sciences.

Key words: Poison, doze, Shakespeare, arsenic, drug.

INTRODUCTION

A completely precise definition of a toxin cannot be given. The same substance could be harmless (even healthy) given in one dose or in one way, while it could be toxic if given in another dose or applied in another way. So injecting destilled water into a vein causes death due to red cells osmotic hydrolysis. Ethanol, which is poisonous itself, is being used as an antidote with methanol poisoning while athropine which is poisonous too is being used as antidote with nerve gases poisoning. For persons with lack of certain enzymes even food could be toxic (milk, proteins).

According to Bernard (2004) the toxins are substances of such physical and chemical nature, which once they enter the blood or human body and remain there, produce temporary or acute effects and under certain conditions even death. In order to avoid a general definition of poisons, toxic and fatal doze for each chemical compound is defined nowadays.

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LOOKING AT TOXIN OR POSION FROM SHAKESPEARE'S PERSPECTIVE

The toxins could be classified in accordance with their chemical nature, origin, physiological effect and abstracting methods. According to the chemical nature, the toxin could be: acid, base, metal, metalloid, alkaloid, synthetic organic poison. According to the origin, the toxins could be plant, animal and mineral while according to the physiological effects they could be nerve, blood, corrosive, etc. According to the abstracting methods, the most often used clasification of toxins in practice is: gases, volatile toxins, mineral toxins, herbal and synthetic toxins.

In order to neutralise the effect of a toxin which is still present in the body, antidotes are given. Antidotes could be physiological and chemical. The latter acts on the toxic molecule, neutralize it (magnesium-oxide with acide poisoning) burning its absorption (tannins create non solute complexes with the alkaloids).

By studing toxins from the physico -chemical and medical aspect the connection is made between Shakespeare's

Figure 1. Mandrake (Mandragora) an excitant, medicine and poison.

heros in his plays.

Shakespeare's characters often used poison to eliminate their opponents or for committing suicides. Although Shakespeare was not an expert in toxicology, Professor Shimon A. Djarmanti was very much interested in Shakespeare's palette of toxins (from chemical aspect), in his book ''Poisonous Shakespeare''. Reconstruction of the events in Romeo and Juliet play was especially exciting.

Based on the available facts Romeo died from potassium -cyanide, while Juliet used Mandrake juice as an opiate. (quote:-Jago:,,not poppy nor mandragora, not all the drowsy drugs of the world, shall ever bring you that sweet dream that you had yesterday, the act three, the scene three -Othello).Figure 1

The cause of sleep could be a favourite Shakespeare's mandrake plant which extract along with opium was used in in the Middle Ages as opiate, placing the sponge sodden with these drugs over the patients faces» (Shimon, 2006; Djarmanti, Poison Shakespeare's).

Hamlet's favourite lullaby was the henbane juice. Figure 2.

Friar Lawrence in one part says:

„Within the infant rind of this small flower Poison hath residence and medicine power; For this, being smelt, with that part cheers each part; Being tasted, slays all senses with the heart".

The Friar poisoned the King with arsenic (and died himself from it), while Cleopatra died from an asp poisonous bite (Egyptian cobra). A snake uses the venom in its food digesting process and therefore the venom of a hungry

Figure 2. Henbane (Bunika)

snake is more dangerous than the venom of a snake that has recently fed.

From the physico-chemist prospective potassium-cyanide (RTECS TS8750000, molecular formula KCN, molar mass of 65.12 g/mol and melting point of 634°C) can be characterized as a very strong poison that dissolves in methanol and other organic solvents. Minimum toxicity with food poisoning is estimated at about 3 mg/kg of the body mass, that is for a man of an everage weight of 70 kg aproximately 0.25 g, if a bigger amount is taken

Figure 3. Arsenic

a person dies in several minutes.

Anyone who is fed up with their life falls dead once he swallowed it and his body suddenly drops a breath as the gunpowder surges from a fatal cannon's womb. (It is believed that Adolf Hitler was poisoned by this compound in 1945).

Beside this, potassium-cyanide is used in silver and gold metallurgy and many chemical synthesis.

Active coal is most often used to neutralize poisoning with potassium -cyanide. The Chinese Doctors appear to have safely and successfully treated patients with cancer of the blood and bone marrow with a combination of arsenic and vitamin A, according to long-term study published in Hong Kong. With the same one with which the Friar poisoned the King Dona and then himself. So arsenic could be a poison and a remedy. Figure 3

In 18th century already arsenic compunds were used as a medicine.In 2000, American Ministry of Health approved the use of arsenic for treatment of the patients with cancer of the blood and bone marrow.

In antient China bitter almond, which has some substances (for example cyanide), was used for the treatment of cancer over 3000 years ago. That horrible poison cyanide could be found in the apple seeds, plums, lemon cherry, apricot pits, etc.

Hamlet made a drink from a grayish-green plant which can reach a height of one up to five meters, with the leaves from10 up to 30 cm and the fruit being oblong spindle-shaped funnels of thimble size. It is very poisonous and is called henbane (*Hyoscyamus niger*). It is a plant of a strong odor which mainly grows near the settlements, with glandular hairs upon the midrib and the lid full of seeds. All parts of the plant are poisonous.

Juliet used a mandragora juice to go insane. That plant (its root has a form similar to human figure) plays a significant role in superstition,first of all for the hallucinate effect and then for weird (humanoid) form. Due to that strange resemblance it is beleived that mandragora has weird properties of the human body and spirit although the presence of psyho-active substances has been proved by the analysis. In Egypt the mandragora vas highly appreciated by pharaohs. Their clothing was often decorated with motives of this herb and in the wreth found with Tut- Auch-Amon there were several gimped haulms of mandragore.

In the process against Joan of Arc one of the charges was for possesion of madragora. The were some stories about this already in a Roman period, when psyho-active herbs started playing an important role in magic. Flavius Josephus relates: «...that in a valley near the Dead Sea there grows a wonderful plant which at night emits a gloving light and is hiding from people. It could be seen if poured with urine or menstrual blood. Direct contact with the plant is dangerous and therefore to get it out of the ground it should be tied to a dog and then the dogs dies.» It was beleived that the plant utters a shriek when pulled

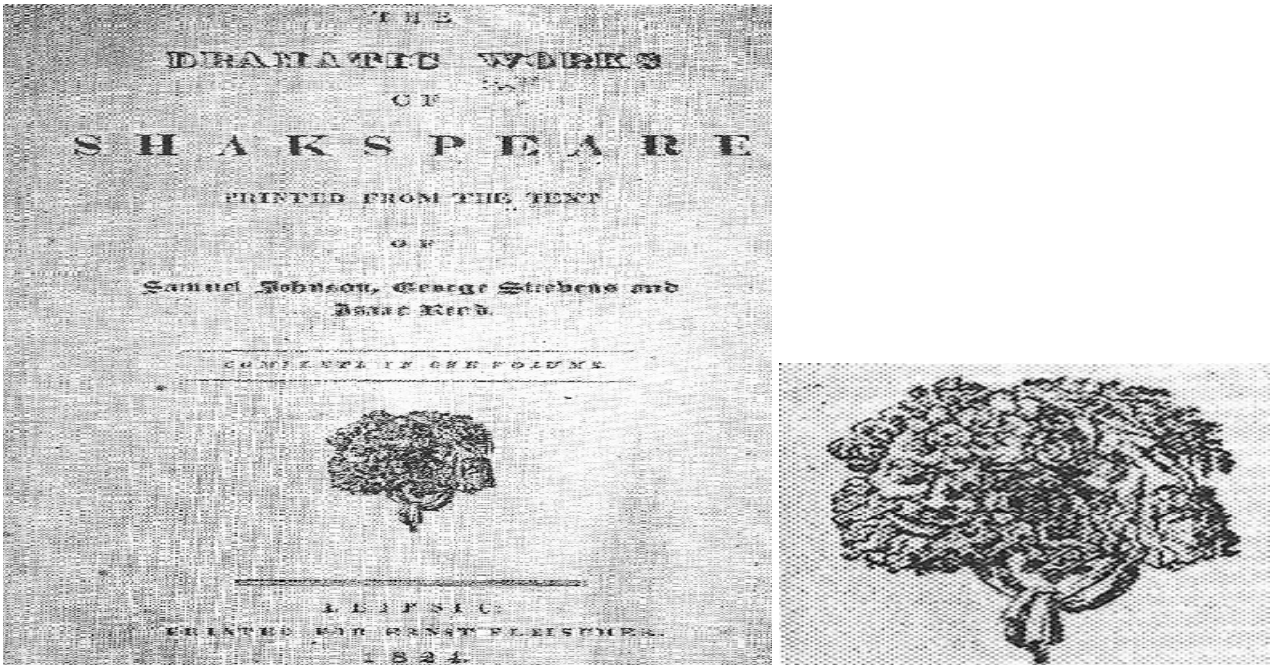

Figure 4: The dramatic work of Shakespeare.

from a ground and whoever heard it would die. In the dark Middle Ages it was also beleived that the plantcould grow under the gallows where urine and sperm of the persons hanging drop. Therefore Germans call this plant «Little Gallows Man».

In 1526, English botanist Turner, opposed the folklore and superstition related to the stories about digging out mandrake and he emphasized its healthy effects. The cream produced out of the the root of this plant is said to be efficacious in chronic rheumatism.

For magical experiments half teaspoon or even less than that of the crushed root mixed with a fruit juice was purported to have caused hallucinations followed by a death-like trance and sleep. The fruits of the plant (cherries) are not good for eating, as they are very poisonous although around the Mediterranean region people say they are not poisonous and even homemade specialities are made out of them.

CONCLUSION

Shakesepare's works contibuted a lot to spreading of general and health culture worldwide. Very early the world learnt the wisdom from Shakespeare's plays. The state of Montenegro confirms that as well. In the library of Peter I , thatis Njegos's library there are Shakespeare's plays, prined in English in Lajpcig in 1824.

If Shakespeare could arise in 21st century he might have written a drama with the main characters being: literature, chemistry, history, biology, medicine, psychology ...with a happy end, in which all acharcters continue to live in a happy and spiritly reach multidisciplinary family, which in practices makes a stabile and good quality educational process. That would be his mesage and mine as well! Figure 4

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