

Historical aspects of toxicology

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ABSTRACT

Poisoning and knowledge of poisons have long been known to humans. Toxicology is a branch of science that deals with toxins, poisons, their effects and treatment. Toxicological screening is very important for the development of new drugs and for the extension of the therapeutic potential of existing molecules.

Keywords: Toxicology, Historical aspects

INTRODUCTION:

The word “toxicology” is derived from the Greek word “toxicon” which means “poison” and logos means to study. It also includes study of special effects of

toxicants developmental toxicity, teratogenicity, carcinogenicity, mutagenesis, immune-toxicity, neurotoxicity, endocrine disruption, etc. Adverse effects may occur in many forms, ranging from immediate death to subtle changes not realized until months or years later.

Toxicology is the science dealing with properties, actions, toxicity, fatal dose, detection of, interpretation of the result of toxicological analysis and treatment of poisons .In other words- “It is the study of the adverse physicochemical effects of chemical, physical or biological agents on living organisms and the ecosystem, including the prevention and amelioration of such adverse effects.”

At the beginning, toxicology was the science of poisons. Many civilizations actually have used these poisons, this knowledge, ancient Greeks, Romans, to shape their society. A lot of kings, emperors have been killed with poisons. The father of modern toxicology, Paracelsus, articulated the famous saying, “It’s the dose that makes the poison.” He believed that every substance actually is a poison and for every substance you can identify a dose which is harmful and a dose which is therapeutic or not harmful.

Poison is derived from Latin “potus,” a drink that could harm or kill. Poison is a substance (solid, liquid or gas), which if introduced in the living body, or brought into contact with any part thereof, will produce ill health or death, by its constitutional or local effects or both.

Historical review of toxicology:

History is nothing but chronologically arranged the record of past events.

Prehistorically phase

Dioscorides, a Greek physician in the court of the Roman emperor Nero, made the first attempt to classify plants according to their toxic and therapeutic effect. **Poisonous plants and animals were recognized and their extracts used for hunting or in warfare.**

Ibn Wahshiyya wrote the *Book on Poisons* in the 9th or 10th century. This was followed up in 1360 by *Khagendra Mani Darpana*.

1500 BC

Written records indicate that hemlock, opium, arrow poisons, and certain metals were used to poison enemies or for state executions.

Renaissance and Age of Enlightenment

Certain fundamental toxicology concepts began to take shape. Noteworthy studies include those by Paracelsus in the 16th century and *Orfila* in the 19th century. Mathieu Orfila is considered the modern father of toxicology, having given the subject its first formal treatment in 1813 in his *Traité des poisons*, also called *Toxicologie générale*.

In 15th Century in Italy, Cesar and *Lucrezia Borgia* assassinated many of their political rivals by poisoning with arsenic, copper and phosphorus.

Socrates was forced to drink Hemlock for corrupting the youth of Athens.

Cleopatra committed suicide through the bite of an asp; a poisonous snake .

Paracelsus (16th Century)

The ophrastus *Phillipus Auroleus Bombastus von Hohenheim* (1493–1541) (also referred to as Paracelsus, from his

belief that his studies were above or beyond the work of *Celsus* – a Roman physician from the first century) is also considered "the father" of toxicology. He is credited with the classic toxicology maxim, "*Alle Dinge sind Gift und nichts ist ohne Gift; allein die Dosis macht, dass ein Ding kein Gift ist.*" which translates as, "All things are poisonous and nothing is without poison; only the dose makes a thing not poisonous." This is often condensed to: "The dose makes the poison" or in Latin "Sola dosis facit venenum. He determined that specific chemicals were actually responsible for the toxicity of a plant or animal poison. Also he documented that the body's response to those chemicals depended on the dose received. All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy." Paracelsus Studies revealed that small doses of a substance might be harmless or beneficial, whereas larger doses could be toxic. This is now known as the **dose-response relationship**, a major concept in toxicology."

As Paracelsus proposed centuries ago, dose differentiates whether a substance will be a remedy or a poison. A xenobiotic in small amounts may be

nontoxic and even beneficial, but when the dose is increased, toxic and lethal effects may result.

In 1850, Jean Stas became the first person to successfully isolate plant poisons from human tissue. This allowed him to identify the use of nicotine as a poison in the Bocarmé murder case, providing the evidence needed to convict the Belgian Count Hippolyte Visart de Bocarmé of killing his brother-in-law. Lead caused poisoning in hundreds of thousands from the time of Roman era till **17th and 18th century** as it was used in pottery, cosmetics, and paints and in automobile fuels.

Modern History

- *Orfila, the founder of toxicology (19th Century)*

A Spanish physician, *Orfila* is often referred to as the **founder of toxicology**. *Orfila* was the first to describe a systematic correlation between the chemical and biological properties of poisons of the time. *Orfila* demonstrated the effects of poisons on specific organs by analyzing autopsy materials for poisons and tissue damage associated with them.

- Chemical toxicities has caused disasters too, like in Bhopal, India in 1984 where release of methyl isocyanate killed many thousands

- **20th and 21st Centuries**

Marked by great advancements in the level of understanding of toxicology. DNA and various *biochemicals* that maintain body functions have been discovered.

Our level of knowledge of toxic effects on organs and cells has expanded to the molecular level.

Virtually all toxic effects are recognized as being caused by changes in specific cellular molecules and *biochemicals*.

Mustard Gas and other poisonous gases were used in many wars started from WW-I in 1914 by Germans. Newer versions are Neurotoxins, *Sarin*, *Tabun* and *VX*.

CONCLUSION

- Toxicology is probably as old as mankind.
- *Toxicology uses the power of science to predict what, and how chemicals may cause harm and then shares that information to protect public health.*

- People were more and more exposed to different chemicals and so the knowledge of the toxicological properties of these chemicals was extremely important in order to protect public health.

- So, toxicology evolved from the science of poisons to the science of safety and that's an evolution which has continued today.

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