

# Role and practice of a forensic toxicologist criminology essay



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The word “ Toxic” creates a negative reflection in our brain. It defines poison or toxin which in a layman’s view is either dangerous or sometimes fatal.

Toxicology is a branch of science which deals with poison, more specifically physical and chemical properties of them. For border definition, toxicology can be defined as “ The study of detection occurrence, properties, effects and regulations of toxic substances” (Ernest Hodgson 2004) It has been two decades since this branch of science has taken birth in our society and since then it has proved its existence in this contemporary world. Due to the endless and vast field of science, toxicology has been divided into sub groups for the betterment of society, out of which one is Forensic Toxicology. Today we can see that there are many chemicals that is been used for our benefit but each coin has the other side, they show some harmful effects on our living system. As it is said that the more complex we make ourselves the more fragile we become. Toxicology mainly deals with the combined attire of biochemistry, immunology, pathology and other branches of science (J. G. Vos, 2007) It deals how to minimize or avoid the harmful effect of a particular substance or chemical.

#### Role and Practice of Forensic Toxicologists:

Forensic Toxicology plays a vital role to adhesive the victim’s deaths to drug use, detection of foreign chemicals or toxins in human body, cause of death and “ driving under the influence” (Slade M, Daniel LJ, Heisler CJ. 1991) They can be identified through several bodily fluids or by studying the sample of hairs etc. The role of Forensic Toxicologist is to monitor the impact of toxic substance and identify the foreign chemicals in the body and their concentration. The primary and the foremost concern of Forensic

Toxicologists should not be the legal outcome of the investigation but rather technology and techniques for obtaining and interpreting the results. (British Toxicological Society).

Forensic toxicologists have a huge responsible career as he/she has to quantify, analyze toxic substance in biological way. There are various analytical ways e. g. immunoassays to identify drugs, chromatographic techniques, spectrometric assays these procedure can be applied to measure very small amount of drugs often present in biological samples. Forensic Toxicologists should have a sound knowledge of various fields of science e. g. Drug Metabolism, Pharmacogenomics, Pharmacokinetics, ADMET parameters (Rook et al, 2006). If we look into a drug facilitated victims of these crime we can observe that the victims were reported to be either robbed or assaulted while incapacitated by a drug. Mostly it have been seen that in, these cases there has been an involvement of a strong central nervous system depressant drugs, which have the capability of preventing individuals from consenting to the action of the perpetrator or fighting off their attackers. For all intents and purposes, the drug acts as the offender's weapon, therefore many jurisdictions require analytical proof of its presence, which helps substantiate the alleged victim's claim.( Shbair MKS, Lhermitte M 2010). We can find many court cases which had been solved with the help of Toxicologists The routes of metabolism or biotransformation of a drug can change with respect to time, but the pathways of oxidation, reduction, and hydrolysis should be well understood so as to determine the route of the metabolism of a drug. (Michael Scott-Ham, Fiona C. 2005) If we see the pharmacological aspect of Heroine we can find out that when the drug is

taken orally dactyl morphine undergoes extensive first pass metabolism via deacetylation making it a prodrug for systemic delivery of morphine whereas If morphine is taken intravenously it however avoids the first pass phase and very rapidly it crosses the blood brain barrier due to the presence of acetyl3-monoacetyl morphine and active 6-monoacetylmorphine and then to morphine which binds to  $\frac{1}{4}$  opioid receptors, resulting in drugs euphoric analgesics which acts as the pain killer in the body.(Ghuman, Preet etal 2003) By the above pharmacological aspect we come to a conclusion that the work of toxicologists in court cases is an extremely tough job as to prove with a proper concept describing all the required parameters.

### Introduction to Clinical Toxicology

The discipline of toxicology that deals with the toxic effects of agents whose intent is to treat, modify or prevent the diseased states. Dose plays an important role when we talk about toxicity. Understanding the dosage and toxicity is essential. A lack of understanding of these principles may lead to improper labeling of a toxic substance which could be useful in a particular dosage. It can be said that there is a very fine line between the correct dose and the lethal side. So it should be treated as important criteria to calculate the dosage of a particular drug. Forensic Pathology deals with the investigation of deaths where there is a medical complication to the subject e. g. suicide, murder, homicide, rape etc. They work with police hand to hand for the case. Forensic Pathology is not within the health service. They mainly work with police and toxicologists along with the crime scene investigation team for the betterment of the case.

Determining how someone died?

Determining why someone died?

The above two questions acts as the main frame for the forensic toxicologists. (Helen Whitewell 2006)

### Toxicological Research

Clinical Toxicologists deals with the mechanism and the pathways of several drugs and that to with the human body. They concentrate on techniques to deal with victims who are fighting with their life due to poison or some other lethal toxins in their body. The main aim of research toxicologists is to work with the laboratory techniques which can lead to combine the results of crime investigators. One of the techniques is HPLC It is a technique which separates a mixture of compounds and can be used analytically to identify, quantify the mixture of the compound. If a person has to analyze caffeine in a sample of blood, he can use a chromatographic separation technique by which caffeine can be separated from the mixture of compounds. It can also determine the graph which helps toxicologists to determine the amount of toxic substance present in the sample. There are many such techniques through which Toxicologists working in the research settings helps for the detection of crime and analysis. (Dept. of Chemistry, The Uni. Of Adelaide)

Advancement in the latest molecular techniques used in toxicology has grabbed our mind with immense information. It deals from the global structure to function of toxicant responsive genes. With the advancement of science it has been possible to access the functional activity of genes and the proteins involved in the toxicological pathways, which was way beyond <https://assignbuster.com/role-and-practice-of-a-forensic-toxicologist-criminology-essay/>

imagination with the conventional methods. “ Toxicogenomics” is the latest field on which Clinical Toxicologists are working these days. (Hamadeh et al 2002) The completion of Human Genome Project has played the key role in this field. It comprises of genomic scale m-RNA expression profiling. The role of bioinformatics play a major role in dealing with protein profiling and genetic susceptibility of an individual population. Toxicogenomics is dominating this century by taking advantage over traditional toxicology testing biochemical and molecular estimations. (S. Patel et al. 2005) The use of toxicogenomic and toxicoproteomic approaches to biomarker discovery is being widely used in both environmental and clinical exposure scenarios. In the past few years, researchers have successfully employed proteomic approaches in the development of diagnostic biomarkers. (Abby D. Benninghoff, 2007). If we have a look on systems biology approach towards toxicology we can find many prominent features included in these recent times. Systems biology/toxicology involves the iterative and integrative study of perturbations by chemicals and other stressors of gene and protein expression that are linked firmly to toxicological outcome. (Slikker W Jr et al., 2007) Systems biology deals with the systems level approach and helps in treating with the help of networking parameters. The role of bioinformatics has greatly helped toxicologists in their research, RNA and protein expression profiling has revolution the dogma of modern science. The role of HPLC and mass spectroscopy has greatly helped toxicologists working in the clinical based set up to determine the level of toxins in the stream.(Mark and Tim, 2001) These days the most emerging trend is the study of toxicology in Genomic data which is available in a large scale which is required to be stored safely. For this advancement there are many databases which help to <https://assignbuster.com/role-and-practice-of-a-forensic-toxicologist-criminology-essay/>

maintain a library of Genomic data with all the required information. To the modern world of science not only in vivo, invitro techniques but Insilco techniques had also been discovered. Micro Array analysis helps a toxicologist by giving up regulated and downregulated data through which we can proceed with the clinical research on toxins present. There are many types of software that help predictive toxicologists for their research. E. g. QSAR (Quantitative Structure Activity Relationship)

#### Conclusion:

As we can find that the difference between role and practice of forensic toxicologists as compared to the toxicologists working in the clinical research does not vary to a greater extent. In recent years, forensic toxicology has benefited from advances in broader areas of science and technology. However, the demand for toxicological examinations has continued to grow. Computational toxicology may help to significantly reduce drug development costs Structural integrity of protein interaction systems correlates with their functional integrity Contribution to network structural integrity of host proteins affected by a drug compound indicates the toxicity of the drug compound.(Peter Andras, 2008). A clinical toxicologist is mainly required to identify the drug as soon as possible where as a forensic toxicologist is required to identify and quantify any drug that may be the cause for death, or a reason for an individual's un natural behaviour. In case of a clinical toxicologist the analysis is limited by the time constraints, which is set by the court of law. (Alan Langford, et al, Practical skills in forensic science, 2005, pg; 363). There are certain things that have to be served by the clinical toxicologist in their laboratories such as diagnosis and treatment of toxicoses <https://assignbuster.com/role-and-practice-of-a-forensic-toxicologist-criminology-essay/>

and monitoring of treatment effectiveness. They should also identify the nature of exposure of the toxic substance and should also quantify the toxicant. In case of a forensic toxicologist, they should quantitatively and qualitatively analyse the drugs or poisons in the biological specimen detected at autopsy. Forensic toxicologist mainly interpret the results regarding the physiological effect of chemicals detected on the deceased at the time of death and also they should establish the cause of death with combined efforts with the pathologists.

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