PRINCIPLES OF FORENSIC TOXICOLOGY

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POSTMORTEM TOXICOLOGY

- Postmortem toxicology is used to determine whether alcohol, drugs or other poisons may have caused or contributed to the death of a person.

CASEINVESTIGATION

- Often the investigating officer will not know whether or not any offence has been committed until the results of the forensic toxicological analyses are available,
- details of the circumstances that lead to the conclusion that a criminal action might have taken place must be supplied to the toxicologist so that the analyses can be planned.

CASEINVESTIGATION cont…

- every case submitted must be accompanied by a form.The information will assist the toxicologist to use the most directly useful methods of analysis, and to interpret the results in the context of the case at a later stage.

FORENSIC SCIENCE

- Forensic Science has been considered as Science applicable to legal affairs.
- It has been classified as a forum pertaining or applicable to legal proceedings.
- Forensic investigations are among the most powerful tools of assistance to criminal investigations in provision of circumstantial evidence in criminal offences all over the World.

FORENSIC SCIENCE cont..

- There are several branches of forensic science,
- These include Forensic Medicine, Forensic Biology, Forensic Pathology, Forensic Toxicology, and Forensic Chemistry.
- Each branch specialized in a particular field of legal application of Forensic Science.

FORENSIC TOXICOLOGY

- **Forensic Toxicology covers any application of the science and study of poisons to the elucidation (*clarification*) of questions that occur in judicial proceedings.**
- **The subject is usually associated with work for the police, the coroner and the criminal law courts.**

FORENSIC TOXICOLOGY cont…

- **Accidental self–poisoning and attempted suicide cases are generally the responsibility of the clinical toxicologist or the hospital biochemist, who work in conjunction with a poison control centre.**
- **A small proportion of these cases is referred to the forensic toxicologist, either because of an allegation of malicious poisoning, or because the patient dies and a coroner's inquest is ordered.**

FORENSIC TOXICOLOGY cont…

- The forensic toxicologist is expected to detect and identify poisons
- ‘poison’ is defined as a chemical substance harmful to living organisms,
- Chemical analyses are used to detect the presence of the poison, measure its concentration and relate this to its known toxicity.

FORENSIC TOXICOLOGY cont…

- If the poison is not specified by name, the request to ‘test for poisons’ is a major problem for the chemist, because no single chemical method of analysis is able to detect all the various poisons
- The forensic toxicologist has scarcely any control over the sampling time or the selection of material for analysis, and no certain knowledge that a poison is present

CLASSIFICATION OF POISONS.

- for analytical purposes it is more useful to classify poisons according to the method used for extraction.
- Five major groups are usually considered:

CLASSIFICATION OF POISONS cont…

- Gaseous and volatile substances isolated by diffusion or distillation.
- Organic non–volatile substances isolated by solvent extraction (drugs and pesticides).
- Metallic poisons isolated by ashing, by wet oxidation of the organic matter or by enzymic hydrolysis of the tissue.
- Toxic anions isolated by dialysis.

CASE INVESTIGATION

- Most cases that enter a forensic toxicology laboratory start with the suspicion that a drug or poison is present.
- A fatality might be an accident, suicide or murder, but a toxicological examination must be carried out to assist the investigating officer to decide which of these it might be.

CASE INVESTIGATION cont….

- Often the investigating officer will not know whether or not any offence has been committed until the results of the forensic toxicological analyses are available,
- Thus, details of the circumstances that lead to the conclusion that a criminal action might have taken place must be supplied to the toxicologist so that the analyses can be planned.

CASE INVESTIGATION cont….

- Therefore, every case submitted must be accompanied by a form.
- The information will assist the toxicologist to use the most directly useful methods of analysis, and to interpret the results in the context of the case at a later stage.

SAMPLES

- It is essential that the appropriate samples be collected as soon as possible, correctly and informatively labelled and stored appropriately.
- Their acquisition, storage and transportation to the laboratory should be documented adequately (with timings where appropriate) to ensure a safe chain of custody.

CONTAINERS

- The containers used for the samples may vary depending on the analysis to be performed, and it is vital that the correct types are used.

GENERAL METHODOLOGY

- The presence of a poison must be proved in the blood and organs before it can be considered as a cause of death'.
- There are four stages in any toxicological examination:

-**Detection**: to detect any drugs or poisons in the samples submitted by means of screening procedures.

GENERAL METHODOLOGY cont..

- **Identification:** to identify conclusively any drugs, metabolites or poisons present by means of specific relevant physicochemical tests.
- **Quantification:** – to quantify accurately those drugs, metabolites or poisons present.

GENERAL METHODOLOGY cont..

- **Interpretation:** to interpret the analytical findings in (2) and (3) in the context of the case, the information given and the questions asked by the investigating officer.

ANALYTICAL PROBING

- ***Medicaments and other materials near the body***
- Empty, or nearly empty, tablet containers found by a body with tablets strewn close by can provide a valuable first clue as to what to look for, particularly if accompanied by a suicide note.

ANALYTICAL PROBING cont..

- Other materials may include containers of household or industrial products (e.g. cleaning agents, disinfectants, gas–lighter refills, pesticides, etc.) and syringes.
- Their chemical content is usually obvious from the container labels and in situations where a syringe is found it makes sense to analyse any residual content.

ANALYTICAL PROBING cont..

- ***Food or drink residues near the body***

The priority given to this aspect depends on the case history, but a rapid initial examination at an early stage is often useful

ANALYTICAL PROBING cont..

- **Body fluids**

  A number of preliminary tests should be carried out to confirm or exclude the most common toxic agents in the following body fluids.

ANALYTICAL PROBING cont..

These body fluids include;

- ***Urine***
- ***Stomach contents***
- ***Blood***

Guides to the collection of Physical Evidence

Specimen	Evidence	Identification	Wrapping and packing	Remarks
Blood : Liquid for toxicological use	2-5 ml of blood and preservative mixture	Label ,stopper and seal. Investigator initials	Use universal sterile bottle	Preservative desired. Refrigerate. Can freeze.
Drugs 1. Liquids	All	Label and seal. Investigator initials	Make sure container does not leak. Seal.	
2. Powders, pills and solids (found in paper bags)	All to 30 gm	Label and seal. Investigator initials	Seal with tape to prevent any loss	Place them in plastic bags to prevent any loss.

Guides to the collection of Physical Evidence, cont.

Specimen	Evidence (Amount)	Identification	Wrapping and packing	Remarks
Urine	20-50 ml of urine	Label , stopper and seal. Investigator initials	Use sterile bottle. Seal tight with lid.	Preservative not desired. Refrigerate.
Liver	Half the liver, 800 gm	Label , stopper and seal. Investigator initials	Use wide mouthed sterile glass bottle. Seal tight with lid	Preservative desired. Refrigerate.
Kidney	One kidney	Label , stopper and seal. Investigator initials	Use wide mouthed sterile glass bottle. Seal tight with lid	Preservative desired. Refrigerate.

Guides to the collection of Physical Evidence, cont.

Specimen	Evidence (Amount)	Identification	Wrapping and packing	Remarks
Entire stomach and its contents	Entire stomach and its contents lingered at both ends.	Label , stopper and seal. Investigator initials	Use wide mouthed sterile glass bottle. Seal tight with lid	Preservative desired. Refrigerate.
Portion of small intestine	Portion of small intestine lingered at both ends.	Label , stopper and seal. Investigator initials	Use wide mouthed sterile glass bottle. Seal tight with lid.	Preservative desired. Refrigerate.

Guides to the collection of Physical Evidence, cont.

Specimen	Evidence (Amount)	Identification	Wrapping and packing	Remarks
Stomach aspirates	All Stomach aspirates	Label , stopper and seal. Investigator initials	Use wide mouthed sterile glass bottle. Seal tight with lid.	Preservative desired. Refrigerate.
Food remains and poisoned food	Send adequate Food remains and poisoned food	Label and seal. Investigator initials	Pack in clean strong brown papers.	Preservative not desired. Refrigerate.

Guides to the collection of Physical Evidence, cont.

Specimen	Evidence (Amount)	Identification	Wrapping and packing	Remarks
Poisons	Send adequate amount of poison	Label and seal. Investigator initials	Pack in clean strong brown papers.	
Contaminated utensils	All	Label and seal. Investigator initials	Pack in clean strong brown papers.	
Traditional/ native medicine	Send adequate plant parts i.e. root, leaves, flowers, etc.	Label and seal. Investigator initials	Label and seal. Investigator initials	Use air drying for preservation.

END

- **THANK YOU FOR YOUR ATTENTION**