FORENSIC TOXICOLOGY

One Day Symposium
A Summary
Royal College of Pathologists
Introduction

• APTs Katie Tomkins and David Shepherd attended the Royal College of Pathologists study day on Forensic Toxicology.
• This report is a summary of information given that is useful for APTs.
Toxicology - History

• A major pioneer in the history of Forensic medicine and toxicology.
• Retired as a professor of Chemistry at Guy’s in 1870.
• Chair of Medical Jurisprudence in 1878
• Developed analytical chemistry applied to biological specimens.
Sample Collection at “Autopsy”

• “Take the right samples, from the right place and the right body, put them in the right tubes label them properly and send them to the right laboratory”.
Sample Collection at “Autopsy”

Routine Samples

• Blood
• Urine
• Vitreous Humour
• Gastric Contents
Blood

• The sample should always be distal, 1st choice should be Venous Femoral Blood but when absent, Venous Brachial Blood will suffice

• This sample should ALWAYS be taken first to prevent any cross contamination

• A sample of blood should be preserved in no less than 1% Fluoride Oxilllate
Blood

• The remainder of the sample should be placed in a plain, sterile/clean, universal container, filled to the top when possible.
• A percentage of the sample may need to be “spun down” to serum for certain laboratory tests.
Urine

• This sample should be collected after the blood sample.
• Use a syringe to collect and transfer the sample.
• Place half the sample in a plain, sterile/clean universal container.
• The other half into Fluoride Oscillate.
Vitreous Humour

• This sample should be collected using a needle and syringe.
• Place the sample in a plain, sterile/clean, universal container.
• This sample is least affected by post-mortem redistribution.
Gastric Content

- Collect this sample in a clean measuring jug and record the volume
- The whole sample does not need to be sent
- State the volume of the sample on the tox form
Label Samples

- Name
- Date of Birth
- I.D Number (PM, NHS, HOSP)
- Sample
- Date and Time of Specimen collection
Tox Form

In addition this should contain;

• Pathologist name and contact details
• Coroner to be billed
• Site of collection
• Circumstances surrounding death and medical/illicit drug history
• If new info comes to light, pass this info onto the lab as soon as possible
Other Samples

• These samples can be sent in addition to the routine samples or when the routine samples are absent.
  • Hair
  • CSF
  • Bile
  • Liver
  • Nails
Hair

• This sample should be taken before any evisceration takes place, to avoid contamination with body fluids.
• Cut the hair close to the root, about a pencil thick amount is needed and tie it.
• Place on plain aluminium foil
• Make a note of the proximal end and mark the foil.
CSF

- Use a needle and syringe. Insert needle approx 2.5 cm below the external occipital protuberance.
- Insert the needle in the direction of the nose.
- When resistance reduces, draw on the syringe.
- This MUST be done before the brain is removed.
Bile and Liver

- Often the only samples available in decomposed bodies.
- These are however more prone to post mortem drug redistribution.
- Drug Metabolites can still be detected after embalming.
Nails

- Always check with the lab before sending nail samples.
- This area is not greatly researched and not all labs have the facilities.
Pharmacology of Drug Abuse

• The Most important drugs of abuse are LEGAL!
• Alcohol and Tobacco
• The most important illegal drugs of abuse are
  • Opioid agonists
  • Indirect sympathominetics
  • GABA agonists
Opioids

- Opium, Heroin and Methedone
- Activate the \( \mu \)-receptors to cause
- Analgesia, euphoria and dysphoria
- Respiratory depression
- Miosis (restriction of the pupils)
Indirect sympathomimetics

- Cocaine, amphetamines and ecstasy
- Increase the activity of monoamines eg Adrenaline $\alpha$-receptors and $\beta$-receptors;
  - Hypertension
  - Tachycardia
  - Mydriasis (abnormal dilation of the pupil)
  - Excitement and hyperthermia
GABA agonists

- Inhibits functions of the central nervous system
  Examples: Ethenol, benzodiazepines, barbiturates, GHB/GBL
- Modesty; Lose Inhibitions
- Memory Loss
- Co-ordination
- Coma
- Breathing and Circulation depressed
Problems of Post-Mortem Redistribution

• In general the purpose of a post-mortem analysis for drugs is to determine as accurately as possible the concentration of the drugs that exist in the blood at the time of death.

• Invariably the blood sample obtained at autopsy is taken many hours or days after death.
Problems of Post-Mortem Redistribution

• During this time interval between death and blood sampling, drug concentrations in blood and other bio fluids and tissues may change significantly.

• This is true for most, but not all, drugs.
Problems of Post-Mortem Redistribution

- Femoral venous blood is least affected by redistribution artefact and is the blood sample of choice for post mortem toxicological analysis.

- Post Mortem diffusion of drugs and alcohol from the stomach contents increases drug concentrations in the torso blood and adjacent liver.
Summary

• “Take the right samples, from the right place and the right body, put them in the right tubes label them properly and send them to the right laboratory”.

• The accuracy of the analysis is directly relative to the quality of the samples sent.
References

• Professor ARW Forrest – F.Tox

• Dr R Ferner – Pharmacology

• Professor D Pounder
Authors

• Katie Tomkins
  Hornsey Public Mortuary

• David Shepherd
  Westminster Public Mortuary