LLSA review
Post-mortem toxicology: what the dead can and cannot tell us.
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Content Area 5.0  Analytical and Forensic Toxicology

- **5 Key Concepts:**
  - Evaluation of postmortem laboratory analysis of drugs needs to be performed in a systematic manner.
  - Interpretation is IDEALLY based on data demonstrating a consistent relationship between the drug concentration at a specific site at the time of death and the concentration measured in a postmortem sample.
  - Whole blood is the primary matrix utilized for autopsy analysis and serum for clinical analysis; variations in values can therefore occur for different chemicals/drugs.
  - Drug’s postmortem stability and potential for redistribution must be considered and be part of interpretation.
  - The autopsy drug concentration may not always be able to be interpreted or extrapolated to the antemortem state.
Current state

- Measure post-mortem levels
- Compare to established therapeutic/toxic concentration ranges
- Assume concentrations don’t change after death

This concept INCORRECT
Post-mortem changes must be considered for all but few drugs

- Alcohols*
- Carbon monoxide
- Carbamazepine
- Chlordiazepoxide
- Diflunisal
- Ephedrine
- Hydrocodone
- Hydroxyzine
- Lorazepam
- Lamotrigine
- Mirtazapine
- Nitrazepam
- Phenelzine
- Pheniramine
- Phenobarbital
- Primidone
- Procyclidine
- Quinine/quinidine
- Theophylline
- Zopiclone
Redistribution occurs rapidly

- Thiopental and pentobarbital with significant increases first 4 hours post-mortem
- Morphine significant post-mortem increases within first few minutes
Ongoing absorption/redistribution

- Ethanol in stomach can contaminate pericardial blood.
  - Need 400 ml or 10% ethanol for this to occur

- Femoral vein sample under these conditions does not occur.
Cardiac/peripheral (C/P) blood ratios

- High C/P ratios have greater potential for redistribution
- Cardiac/pericardial samples are high
- Need peripheral samples
- Table 2.
Basic drugs bind to myocardium → card.blood

- TCAs
- Cardiac glycosides
- Local anesthetics
- Opioids

May result in increased heart blood concentrations
Serum vs whole blood

- Clinical $\rightarrow$ serum
- Post-mortem $\rightarrow$ whole blood

- 12-18% (p/b) difference for ethanol values
- 1.6 factor for cannabinoid samples
Volume of distribution

- Drugs with high Vd are candidates for redistribution from tissue to vascular space
See Tables!

- Table 1: drugs in which redistribution does NOT occur.
- Table 2: partial list in which post-mortem transformation/redistribution occurs
- Table 3: Recommended tissue sites to determine acute fatal poisoning
- Table 4: drugs which concentrate in bile
- Table 5: postmortem blood antidepressant/antipsychotic levels → death
- Table 6: urinary LDH/lactic acid and protein result in false positive immunoassay
- Table 7: Postmortem toxidromes
- Table 8: drug issues with embalming
Key concepts

1. Where were samples collected from?
2. Is there post-mortem redistribution?
3. Concentration-toxicity relationship?
4. Clinical information to correlate with concentrations?
5. Was concentration clinically sufficient to cause or be involved in death?
Key Concepts

6. Post-mortem toxidrome?
7. Was body embalmed?
8. Does analyte require special storage conditions?
9. Do pills found in gastric contents actually contain active drug?