

LLSA review

Post-mortem toxicology: what the
dead can and cannot tell us.

Leikin JB, Watson, WA.

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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
- Phenezine
- 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 → serum
- Post-mortem → whole blood
- 12-18% (p/b) difference for ethanol values
- 1.6 factor for cannabinoid samples



Volume of distribution

- Drugs with high V_d 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?

