Reasons for Serum Drug Measurement

1. Monitoring therapeutic levels of a drug
2. Possible toxicity of a therapeutic drug
   – Requires quantitative levels
3. Presence of a toxic substance
   – Typically requires only a qualitative result
CONCEPT OF THERAPEUTIC vs TOXIC RESPONSE: POPULATION DEFINITION

LD$_{50}$ of a toxin is defined as a population-based concept that will vary with:

• GENDER, AGE,
• RACE,
• GENERAL HEALTH, AND
• GENETIC FACTORS

Therapeutic or Toxic Range

• Often obtained as a result of clinical trials
• Must be taken in clinical context: is patient getting better?
When is measurement of serum drug appropriate?
Clinical Settings for TDM (1)

- Suspected overdose
- Lack of therapeutic effect
- Compliance
- Possible toxicity
- Drug interaction
- Prophylactic drug
- Dose prediction: use current level to adjust next dose
Clinical Settings for TDM (2)

- Disease state that alters pharmacokinetics
- Optimization in critically ill patient
- Unknown medication level
- Leucovorin rescue

Optimal Sampling Time

- For dosage at half life, usually oral medications
- Optimal sampling is after 5 half lives
- Intravenous infusion at constant rate the same e.g. after 5 half lives
Critical Values

- Unusually high or toxic values
- High trough values
- Low values (near 0)
  - Non-compliance
  - Wrong patient
  - Incorrect order, patient not on drug

TOXINS ENCOUNTERED IN CLINICAL SITUATIONS

- SUICIDE
- MURDER
- ACCIDENTAL OVERDOSES OF A SUBSTANCE or THERAPEUTIC DRUG (legal drug)
- ABUSED DRUGS, LEGAL AND ILLEGAL
USE OF SPECIFIC DRUG ANALYSES FOR TOXINS IN BLOOD/SERUM

- SERUM SALICYLATE, ETHANOL, ACETAMINOPHEN; correlation between [blood] and status
- Certain, limited, therapeutic drugs
- THE RESULTS OF THESE ANALYSES WILL OFTEN AFFECT TREATMENT
- BLOOD ANALYSES NEVER REQUIRE CONFIRMATION, VERY RAPID TURN-AROUND
- In-lab TAT <30 min.
SAMPLES FOR DRUG SCREENING

• SERUM- usually overdose situations for which there is good correlation between concentration and clinical status

• URINE- usually for drugs of abuse; only POS/NEG.-serum analyses is NOT necessary

Request for Quest send-out; questions

• What is the drug?
• Why is serum level needed:
  – compliance?
  – Toxicity?
  – Therapeutic levels?
• Does Quest have toxic or therapeutic ranges?
• Pain management often requires levels for toxicity issues
For qualitative results, compliance, a urine sample is sufficient to indicate presence:

- **OPIATES**: NEGATIVE
- **METHADONE**: POSITIVE
- **BENZODIAZEPINES**: NEGATIVE
- **COCAINE**: NEGATIVE
- **BARBITURATES**: NEGATIVE
- **ALCOHOL**: NEGATIVE
- **CREATININE**: <10 MG/DL