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

Therapeutic or Toxic Range

- Often obtained as a result of clinical trials
- Must be taken in clinical context: is patient getting better?

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

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:**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Result</th>
</tr>
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<tbody>
<tr>
<td>OPIATES</td>
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</tr>
<tr>
<td>METHADONE</td>
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</tr>
<tr>
<td>BENZODIAZEPINES</td>
<td>NEGATIVE</td>
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<tr>
<td>COCAINE</td>
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<tr>
<td>BARBITURATES</td>
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</tr>
<tr>
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<tr>
<td>CREATININE</td>
<td>&lt;10 MG/ DL</td>
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