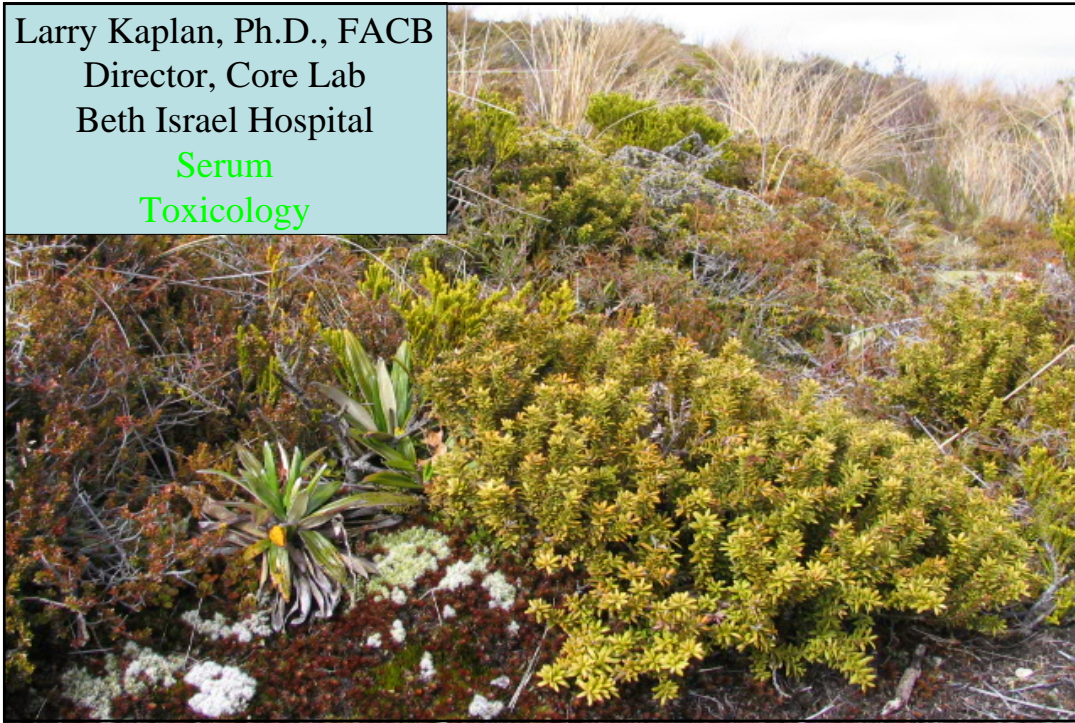


Larry Kaplan, Ph.D., FACB  
Director, Core Lab  
Beth Israel Hospital  
Serum  
Toxicology



## 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

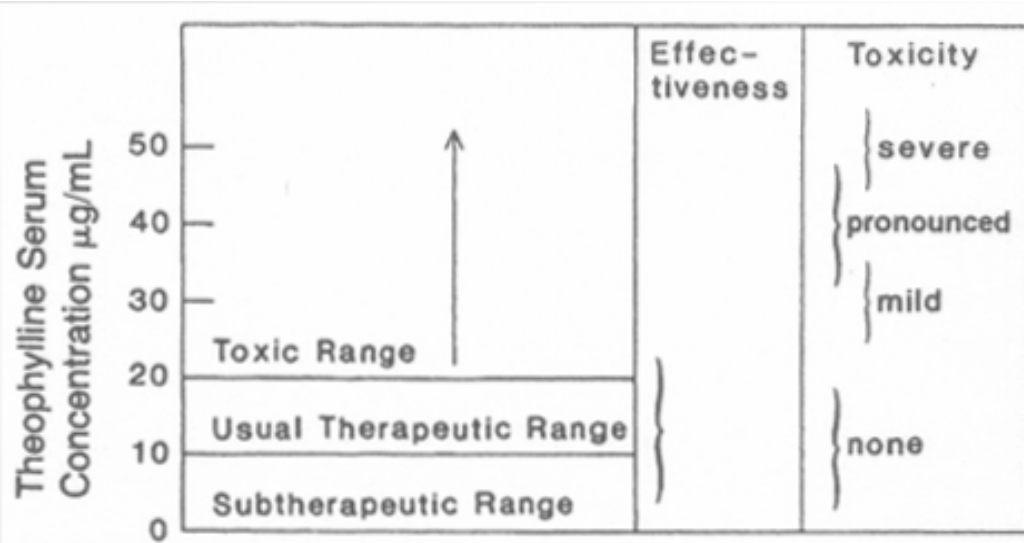
LD<sub>50</sub> OF A TOXIN IS DEFINED AS A  
*POPULATION*-BASED CONCEPT THAT  
WILL VARY WITH

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

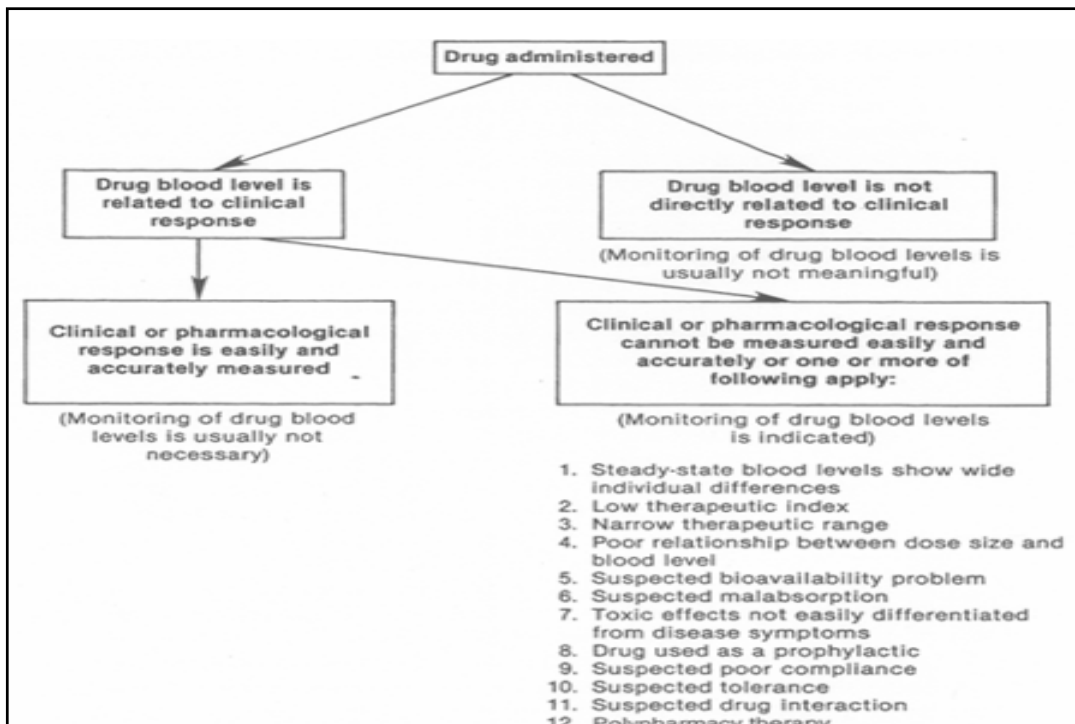
## Therapeutic or Toxic Range

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

## Theophylline Effectiveness vs Toxicity



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**

**Laboratory Support  
Serum  
Toxicology**



**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 |

Laboratory Support  
For Serum  
Toxicology

