Chapter 6

Pharmacodynamics

Know Principles of Pharmacodynamics and Clinical Practice

- Helps to predict if drug will produce change
- Will ensure that drug will provide safe, effective treatment

Frequency-Distribution Curve

- Graphical representation of number of clients responding to drugs at different doses
- Peak of curve indicates largest number of clients responding to drug

Median Effective Dose (ED\textsubscript{50})

- Middle of frequency-distribution curve
- Dose that produces therapeutic response in 50% of a group
- Sometimes called “average” or “standard” dose
- Many clients require more or less

Skill of Nurse Critical in Determining if Average Dose Is Effective

- Client observation
- Taking of vital signs
- Monitoring lab data
Median Lethal Dose ($LD_{50}$)

- Used to assess safety of a drug
- Shown on frequency-distribution curves
- Determined in preclinical trials
- Is lethal dose in 50% of group of animals
- Cannot be experimentally determined in humans

Median Toxicity Dose ($TD_{50}$)

- Dose that will produce given toxicity in 50% of group of clients
- Value may be extrapolated from
  - Animal data or
  - Adverse effects in client clinical trials

Therapeutic Index

- Measure of a drug’s safety margin
- The higher the value, the safer the drug

Calculating Therapeutic Index

Therapeutic index = \[ \frac{\text{Median lethal dose} \ LD_{50}}{\text{Median effective dose} \ ED_{50}} \]

Example of Therapeutic Index

- Therapeutic index of 4: need error four times dose to be lethal
Three Phases of Graded Dose-Response Curve

- Phase 1: occurs at lowest dose
  - Few target cells affected by drug
- Phase 2: linear relationship
  - Most desirable range
  - Linear relationship between amount of drug administered and degree of client response

Three Phases of Graded Dose-Response Curve

- Phase 3: plateau reached
  - Increasing dose has no therapeutic effect
  - Increased dose may produce adverse effects

Two Ways to Compare Medications

- Potency
- Efficacy

Potency

- Lower dosage with therapeutic effect
Efficacy

- Magnitude of maximal response

Drugs That Act as Agonists

- Bind to receptor
- Produce same response as endogenous chemical
- Sometimes produce greater maximal response

Drugs That Act as Partial Antagonists

- Bind to receptor
- Produce weaker response than agonist

Drugs That Act as Antagonists

- Occupy receptor
- Prevent endogenous chemical from acting
- Compete with agonist for receptor
- Inhibit effects of agonist by changing pharmacokinetic factors

Receptor Is Macromolecule

- Binds with endogenous molecules – Hormones, neurotransmitters, growth factors
- Most drug receptors are proteins.
- Associated with plasma membrane or intracellular molecules

Drug Attaches to Receptor

- Like key to lock
- Triggers second messenger events
- Initiates drug action
- Can stimulate or inhibit normal activity
In the Future: Customized Drug Therapy

- DNA test before receiving drug
- Prevention of idiosyncratic responses