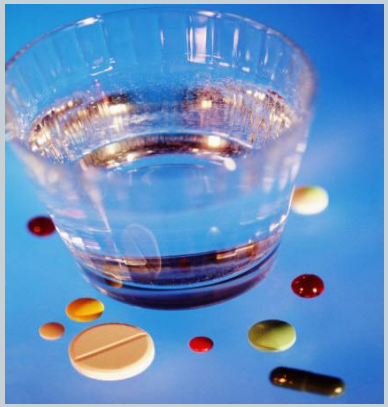
PHARMACOLOGY

In Nursing Practice



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TERMS

- Drug
- Pharmacology
- Clinical Pharmacology
- Therapeutics/Pharmacotherapeutics

IDEAL DRUG PROPERTIES

Three most important:

- Effectiveness
- Safety
- Selectivity

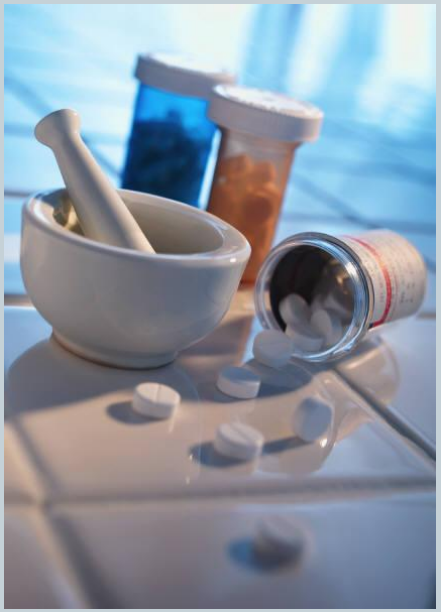
IDEAL DRUG PROPERTIES

Other important properties:

- Reversible action
- Ease of Administration
- Predictability
- Freedom from drug interactions
- Low cost
- Generic Name ease

THERAPEUTIC OBJECTIVE

- Maximum Benefit
- Minimum Harm



INTENSITY OF DRUG RESPONSES

- Administration
- Pharmacokinetics
- Pharmacodynamics
- Individual variations

PHARMACOKINETICS

- Body's impact on the drug. How much of the dose gets to the site of action.
  - Absorption
  - Distribution
  - Metabolism
  - Excretion

PHARMACODYNAMICS

- Impact of drug on the body
  - At site of action
  - Influenced by patient's functional state

INDIVIDUAL VARIATION

- Sources of Individual Variation Include
  - Age
  - Gender
  - Weight
  - Genetic Factors

ADMINISTRATION

- Right Patient
- Right Medication
- Right Dosage
- Right Route
- Right Time
- Right Documentation

NURSING RESPONSIBILITIES

- The nurse must know:
  - Appropriate medications
  - Contraindications
  - Consequences of interactions
- The nurse is the patient's advocate

PREADMINISTRATION ASSESSMENT

- Collect baseline data
  - Blood Pressure
  - Blood Sugar
- Identify High-Risk Patients
  - Allergies
  - Pregnancy

DOSAGE & ADMINISTRATION

- More than one indication
- More than one route
- Read Order Carefully
- Verify Identity of the patient
- Verify Calculations
- Understand the reason for the drug's use

CAPACITY FOR SELF-CARE

- Visual acuity
- Manual dexterity
- Intellectual ability
- Memory
- Finances
- Cultural attitudes

EVALUATE THERAPEUTIC EFFECTS

- Assess and record patient response to drug
- Promote patient's adherence to medication regime
- Utilize non-drug measures to enhance drug's effect

ANALYZE DRUG THERAPY

- Appropriateness
  - PRN decisions
  - Review MD order
- Adverse Effects
  - S/S to watch for & when
  - Interventions that help

ANALYZE DRUG THERAPY

- Reduce drug interactions
  - Knowledge
- Toxicity
  - Know S/S of toxicity

PATIENT EDUCATION

- Drug name/size schedule
- Route –how to take
- Major drug & food related interactions
- S/S adverse effects
  - What to do
- Who and when to call with problems

Drug Regulation

- Federal Pure Food and Drug Act of 1906
- Food Drug and Cosmetic Act 1938
- 1962 Amendment to the Food Drug/Cosmetic Act
- Controlled substance Act 1970
- 1992 Accelerated approval laws (cancer and AIDS)

New Drug Development

- Controlled Trials
- Clinical Testing
- Exercising discretion regarding new drugs
- Benefits vs. Risks

Drug Names

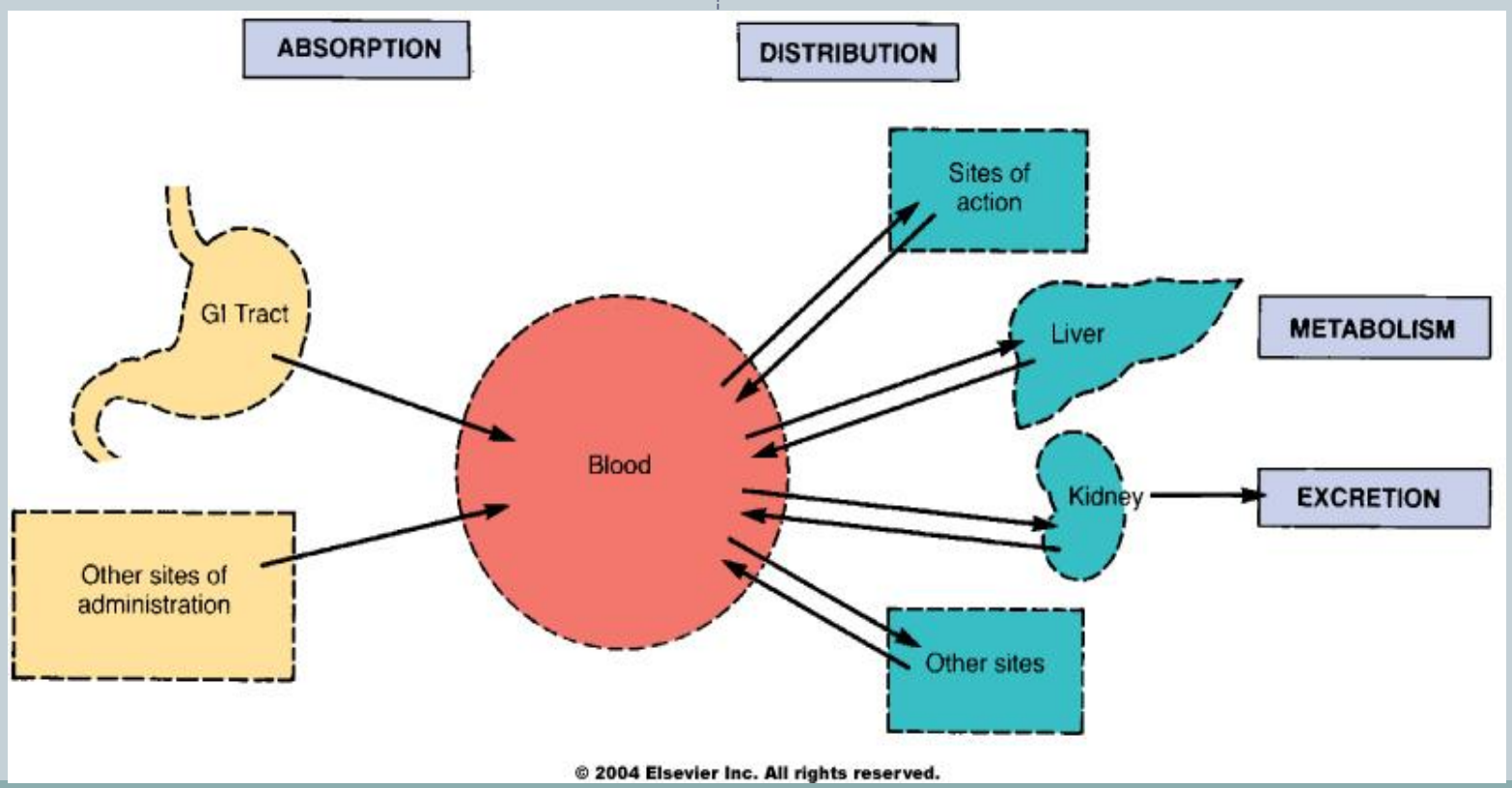
- Chemical Name — N-acetyl-para-aminophenol
- Generic Name — Acetaminophen
- Trade Name — Tylenol

Over The Counter Drugs

- The average home medicine cabinet contains 24 OTC preparations
- Americans spend 20 billion dollars annually on OTC preparations

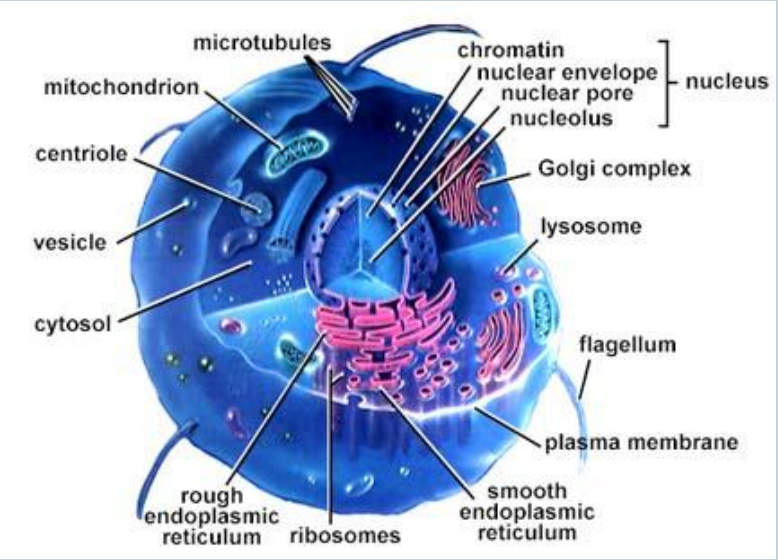
PHARMACOKINETICS

- Absorption
- Distribution
- Metabolism
- Excretion



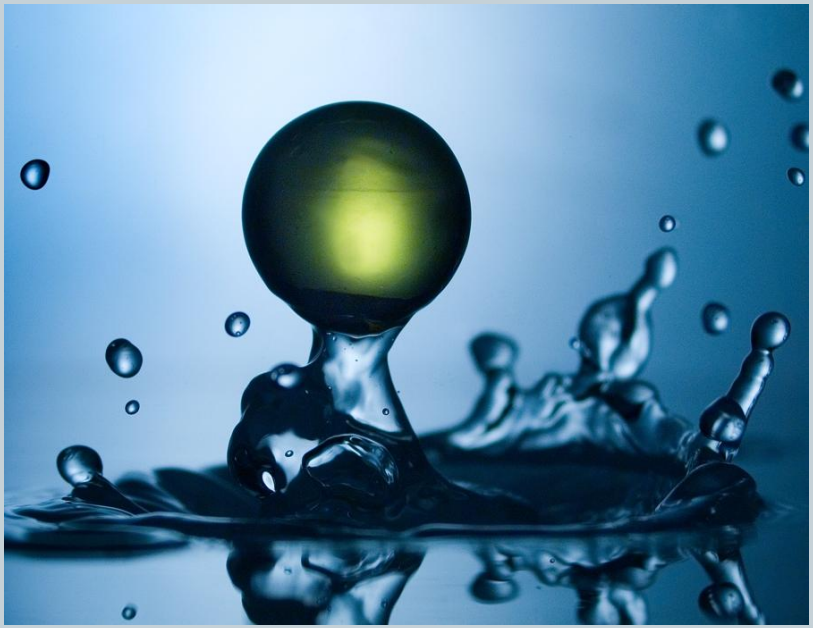
CROSSING THE MEMBRANE

- Drug movement occurs in all four steps of pharmacokinetics
  - Channels and Pores
  - Transport Systems
  - Direct Penetration



FACTORS AFFECTING ABSORPTION

- Rate of dissolution
- Surface area
- Blood flow
- Lipid solubility
- pH partitioning



ROUTES OF ADMINISTRATION

- Enteral
  - Via gastrointestinal tract
- Parenteral
  - Outside the GI tract
    - Inhalation, transdermal, transmucosal, injection, etc.

Routes of Administration

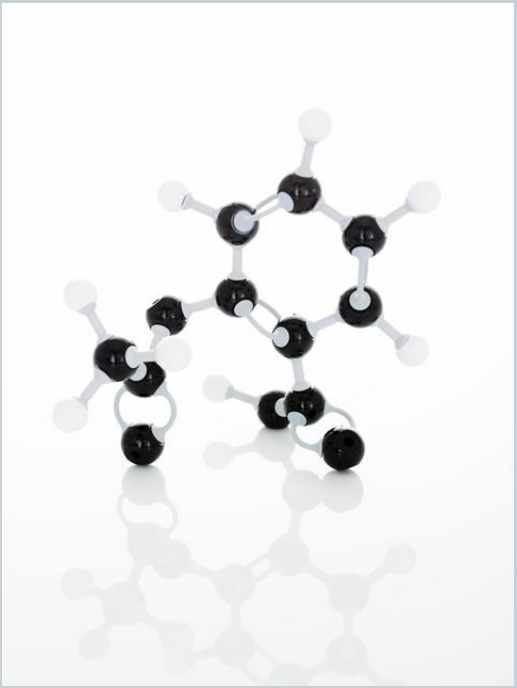
- Intravenous
- Intramuscular
- Subcutaneous
- Oral
- Rectal

DISTRIBUTION

- Blood flow to tissue
- Leaving the vascular system
  - Blood brain barrier
  - Placental drug transfer
- Entering the cells

DRUG METABOLISM

- Biotransformation
  - Enzymatic alteration of drug structure
- Liver
  - Primary site

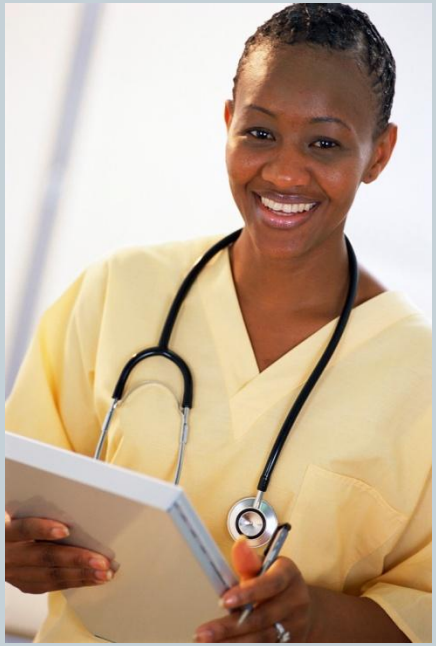


THERAPEUTIC EFFECTS OF METABOLISM

- Accelerated renal excretion (most important)
  - Decreasing lipid solubility
- Inactivates drugs
- Increases therapeutic action
- Activates prodrugs
- Increases or decreases toxicity

SPECIAL CONSIDERATIONS

- Individual Factors
  - Age, Body Mass, Gender, Genetics, Environment, Fluids
- First-pass effect
- Nutritional status
- Competition between drugs



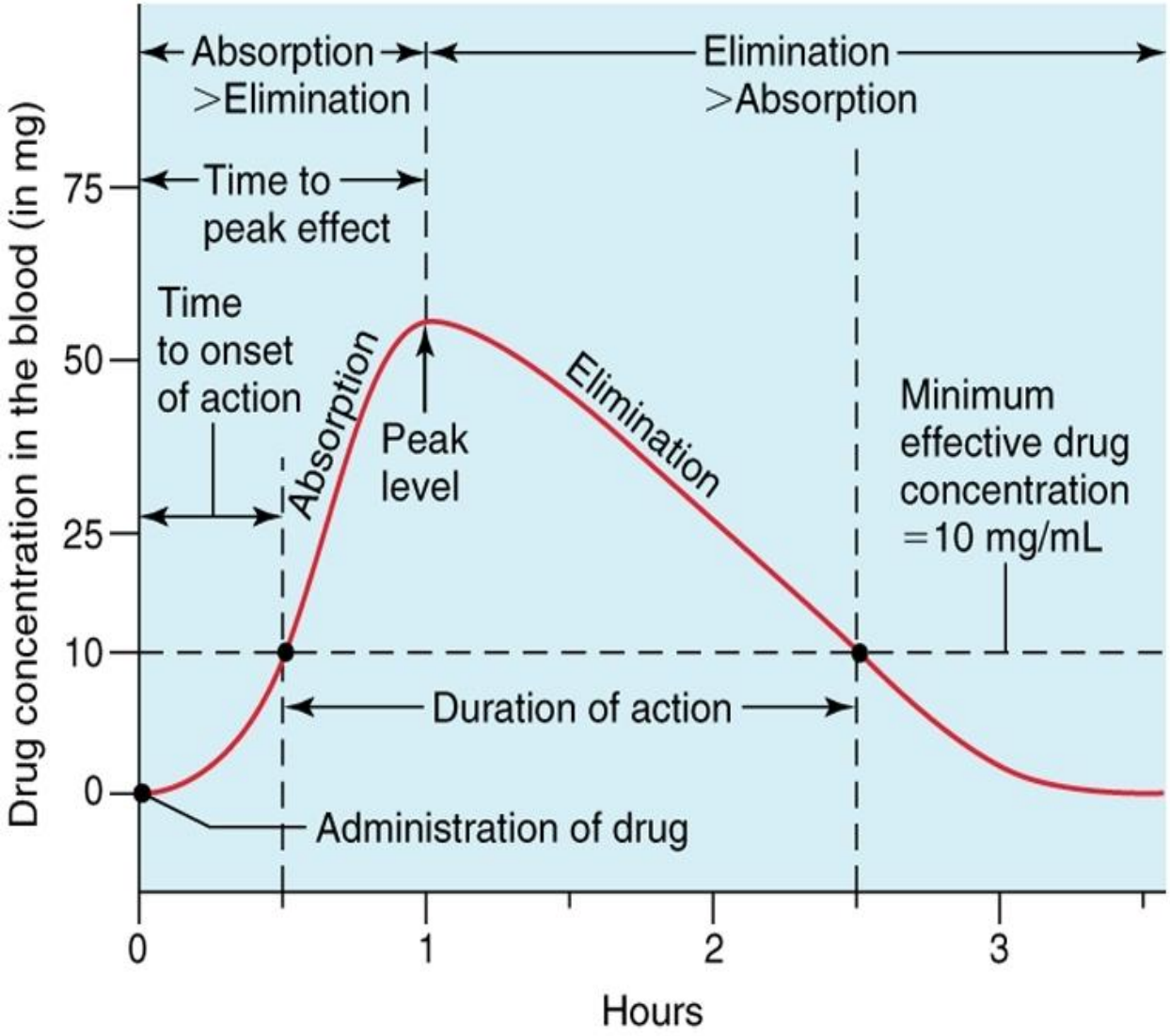
EXCRETION OF DRUGS

- Drug excretion is defined as the removal of drugs from the body
  - Urine
  - Bile
  - Sweat
  - Saliva
  - Breast milk
  - Expired air

PLASMA DRUG LEVELS

- Levels in blood correlate with therapeutic and toxic responses
  - Toxic
  - Not therapeutic
- Therapeutic Range
  - Peak Level
  - Trough Level
- Drug Half-Life

Blood Concentration



Onset of action = 30 minutes
Peak effect = 1 hour
Duration of action = 2.0 hours

PHARMACODYNAMICS

- How drugs effect the body
  - Biochemical and physiologic effects
  - Dose-response relationship
- Receptor Activation
  - Blocking
  - Enhance Receptor Activation
  - Agonist vs. Antagonist

DRUG-DRUG INTERACTIONS

- Consequences
  - Intensification or reduction of effects
- Pharmacodynamic interactions
- Clinical Significance
- Minimizing Adverse Interactions

CONSEQUENCES

Three possible outcomes

1. Intensification of effects (potentiative)
2. Reduction of effects (inhibitory)
3. New response

Pharmacodynamic Interactions

- At the same receptor
- At separate sites
- Combined toxicity

CLINICAL SIGNIFICANCE

- Average hospitalized patient takes 6-10 drugs
- Drugs with narrow therapeutic range
- Unusual symptoms
- Minimize adverse reactions

DRUG-FOOD INTERACTIONS

- Similar effect as drug interactions
- Timing of drug administration
  - At bedtime
  - In morning
  - With meals or not

DRUG-FOOD EXAMPLES

- Grapefruit juice effect
- MAOI's
  - Tryamine rich foods

ADVERSE REACTIONS

- Mild
  - Drowsiness
  - Nausea
  - Vomiting
  - Itching, rash
- Severe
  - Neutropenia
  - Respiratory depression

ADVERSE REACTIONS

- Side effect
- Toxicity
- Allergic reaction
- Physical dependence
- Carcinogenic effect
- Teratogenic effect

IDENTIFYING REACTIONS

- Did symptoms appear shortly after the drug was first used?
- Did symptoms abate when the drug was discontinued?
- Did symptoms reappear when the drug was reinstituted?
- Is the illness itself sufficient to explain the event?
- Are other drugs in the regimen sufficient to explain the event?

MINIMIZE ERRORS

- Definition of a medication error and who makes them
- Types of medication errors
- Causes of medication errors
- Ways to reduce medication errors
- Reporting

CLASSIFICATIONS

- Categorize medications
- Medications in the same classification often have similarities in the generic names
- Relate to a disease or disease process

CLASSIFICATIONS

- Anticoagulants
  - Prevent clot formation
  - Contraindications: bleeding and pregnancy/lactation
  - Precautions: bleeding
  - Interactions:
    - Drugs that cause bleeding
  - Nursing Implications
    - Watch for signs of bleeding
  - Commonly Used
    - heparin and warfarin (Coumadin)

CLASSIFICATIONS

- Antidiabetic
  - Lowers blood glucose
  - Contraindications: hypoglycemia and pregnancy
  - Precautions:
    - Factors that may alter requirements (cause hypoglycemia)
  - Interactions:
    - Drugs that may increase of decrease effects
  - Nursing Implications
    - Watch for signs of hypoglycemia
  - Commonly Used
    - Metformin and gipizide (Glucotrol)

CLASSIFICATIONS

- Antihypertensives
  - Lowers blood pressure
  - Contraindications: hypersensitivity (lowers BP)
  - Precautions:
  - Pregnancy/lactation and sudden stop may increase BP
  - Interactions:
    - Drugs that negate therapeutic effectiveness
  - Nursing Implications
    - Monitor BP

CLASSIFICATIONS

- Antihypertensives
  - Commonly used:
    - ACE inhibitors
      - captopril
      - lisinopril
    - Beta Blockers
      - propranolol
      - metropolol
    - Calcium Channel Blockers
      - Verapamil
    - Thiazide Diuetics
      - hydrochlorothiazide

CLASSIFICATIONS

- Diuretics
  - Treat edema and antihypertension
  - Contraindications: hypersensitivity (dehydration)
  - Precautions: renal or hepatic disease, pregnancy
  - Interactions:
    - Potassium wasting and potassium sparing
  - Nursing Implications
    - Monitor weight, assess for electrolyte imbalance,
  - Commonly Used
    - furosemide (Lasix)