

Prehospital Emergency Pharmacology, 8e (Bledsoe/Clayden)
Chapter 2 Pharmacokinetics and Pharmacodynamics

- 1) Two major divisions of pharmacology are:
A) Pharmacokinetics and pharmacodynamics.
B) Pharmacognosy and biotransformation.
C) Active transport and diffusion.
D) Biotransformation and elimination.

Answer: A

Explanation: A) Pharmacokinetics and pharmacodynamics are the two major divisions of pharmacology.

- B) Pharmacognosy refers to the broad study of natural and synthetic drugs and biotransformation is a function of pharmacokinetics.
C) Active transport and diffusion explain how a medication moves.
D) Biotransformation and elimination is a function of pharmacokinetics.

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- 2) Which of the following factors is NOT a component of pharmacokinetics?
A) Absorption
B) Distribution
C) Biotransformation
D) Binding

Answer: D

Explanation: A) Absorption explains the movement of a medication into the system.

- B) Distribution is how the medication travels to target tissues or organs.
C) Biotransformation is how a medication is broken down in the system.
D) Binding is a component of pharmacodynamics.

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- 3) Drug A requires the use of adenosine triphosphate (ATP) in order to move into the cellular membrane. This type of diffusion is known as:
A) Elimination.
B) Active transport.
C) Facilitated.
D) Osmosis.

Answer: B

Explanation: A) Elimination is the removal of a drug from the body.

- B) Active transport involves the use of energy, such as ATP to move a substance through a membrane that otherwise would not be able to penetrate.
C) Facilitated diffusion requires the use of a helper protein (such as insulin with glucose) to cause a change in the cellular membrane allowing entry of the substance.
D) Osmosis is a passive process involving the movement of water.

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4) Glucose in the bloodstream is a large molecule that cannot readily enter a cell unless it binds with insulin. This BEST describes:

- A) Osmosis.
- B) Diffusion.
- C) Carrier-mediated diffusion.
- D) Absorption.

Answer: C

Explanation: A) Osmosis involves the movement of solvent, normally water.

B) Diffusion is a general term related to the movement of substances and involves both active and passive forms, of which carrier-mediated diffusion is included.

C) Carrier-mediated diffusion most correctly explains the process described.

D) Absorption encompasses a medications progress from its pharmaceutical dosage form to a biologically available substance that can then pass through or across tissues.

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5) The term _____ describes the movement of molecules across a membrane down a pressure gradient from an area of higher pressure to and area of lower pressure normally resulting from hydrostatic forces.

- A) Filtration
- B) Carrier-mediated diffusion
- C) Active transport
- D) Osmosis

Answer: A

Explanation: A) Filtration is correct.

B) Carrier-mediated diffusion occurs when a protein is involved in binding and causing change in membrane shape to allow diffusion.

C) Active transport involves the use of energy to cause diffusion.

D) Osmosis is the movement of water from an area of low solute concentration to an area of high solute concentration.

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6) _____ describes the movement of a medication from the site of application into the body and into the extracellular compartment.

- A) Diffusion
- B) Osmosis
- C) Absorption
- D) Elimination

Answer: C

Explanation: A) Diffusion is the movement of a substance across a membrane from an area of high concentration to lower concentration.

B) Osmosis is the movement of water from an area of low solute concentration to an area of high solute concentration.

C) Absorption encompasses a medications progress from its pharmaceutical dosage form to a biologically available substance that can then pass through or across tissues.

D) Elimination refers to removal of a substance from the body.

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7) Which of the following is NOT a factor in the absorption of a medication?

- A) Surface area
- B) Concentration of the medication
- C) pH of the medication
- D) Medication potency

Answer: D

Explanation: A) Medications are absorbed quite rapidly from large surface areas.

B) Medications administered in high concentrations are absorbed much more rapidly than medications administered in low concentrations.

C) Acidic medications tend to be more rapidly absorbed when placed into an acidic environment while alkaline medications are more rapidly absorbed in alkaline environments.

D) Medication potency refers to the relative amount of a medication required to produce the desired response.

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8) Which of the following forms of absorption is generally the slowest due to the decreased vascular supply?

- A) Subcutaneous
- B) Intramuscular
- C) Intravenous
- D) Sublingual

Answer: A

Explanation: A) The subcutaneous layer of the skin is composed of dense fatty tissue that has poor vascular supply and slow absorption of medications.

B) Muscles generally have very good blood supply promoting absorption.

C) Intravenous injection provides the most rapid (and common) route of absorption.

D) The sublingual area is highly vascular resulting in rapid absorption.

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9) _____ BEST describes the process in which a medication is transported from the site of absorption to the site of action.

- A) Active transport
- B) Diffusion
- C) Distribution
- D) Elimination

Answer: C

Explanation: A) Active transport involves the movement of a substance across the cellular membrane utilizing an energy source.

B) Diffusion describes movement across the cellular membrane and can be an active or passive process.

C) Distribution is the process whereby a medication is transported from the site of absorption to the site of action.

D) Elimination is removal of a substance from the body.

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10) You are treating a patient who suffers from renal disease and decreased perfusion of the kidneys. What effect will this have on the distribution of a drug that normally acts on kidneys, such as the diuretic medication Lasix?

- A) The drug will be present in increased concentrations at the kidneys resulting in toxicity.
- B) The drug will be poorly delivered to the kidneys due to a decreased perfusion and will not produce the desired results.
- C) As the kidneys are a primary organ of elimination, the effects of the drug will be unchanged.
- D) The drug will most likely be metabolized by the liver resulting in the same effects systemically.

Answer: B

Explanation: A) Decreased renal blood flow results in poor delivery of the medication to the kidney.

B) Correct.

C) The decreased blood flow to the kidney will prevent the drug from producing the desired results.

D) If a drug is meant for a specific organ of tissue, it must reach the site in order to be effective.

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11) While researching the drug amiodarone, you read that the drug is considered to be highly protein bound upon entering the body. Knowing this, you can deduce that:

- A) The drug is largely ineffective when administered by intravenous route.
- B) The drug's half-life will be relatively short due to the rapid elimination of the free, or unbound, percentage.
- C) Much of the drug remains active in the bloodstream and only a small percentage is bound in tissues.
- D) The drug remains bound to proteins but will slowly release the active component when necessary resulting in a long half-life.

Answer: D

Explanation: A) When administered in therapeutic dosages, intravenous routes provide the most rapid, effective dose.

B) The drug will have a long half-life as the bound component will slowly release as the free or unbound active component is metabolized.

C) When the drug is highly protein bound, much of the drug will be stored in protein reservoirs. Only a small amount remains in the bloodstream as an active metabolite.

D) Correct.

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12) The blood-brain barrier is a preventive barrier that prevents MOST _____ medications from reaching the brain.

- A) Lipid-soluble
- B) Water-soluble
- C) Non-ionized, unbound
- D) Barbiturate

Answer: B

Explanation: A) Lipid-soluble medications readily pass the blood-brain barrier.

B) Water-soluble medications cannot permeate the blood-brain barrier.

C) A non-ionized, unbound medication can pass the blood-brain barrier.

D) A barbiturate is an example of a non-ionized, unbound drug.

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13) The process by which a medication passing through the liver may partially or completely inactivate many medications is known as:

- A) First-pass effect.
- B) Prodrug effect.
- C) Protein reservoir binding.
- D) Plasma binding effect.

Answer: A

Explanation: A) Correct.

B) A prodrug is an inactive precursor of a drug prior to conversion to an active metabolite.

C) Protein reservoir binding occurs when a portion of a drug is bound to proteins but may be released for use at a later time.

D) Plasma binding occurs with proteins when a portion of a drug is bound to proteins but may be released for use at a later time.

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14) A medication's half-life refers to the:

- A) Concentration of a drug.
- B) Dose required to be therapeutic.
- C) Time required for the total dose of a medication to be decreased by one-half.
- D) Removal of a medication from the body.

Answer: C

Explanation: A) Concentration refers to the amount of drug available.

B) The therapeutic index is the difference between minimal therapeutic dose and toxic level of dose.

C) Correct.

D) This defines the process of elimination.

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15) _____ is the length of time that a medication concentration is sufficient in the blood to produce a therapeutic response.

- A) Half-life
- B) Duration of action
- C) Efficacy
- D) Affinity

Answer: B

Explanation: A) Half-life is the time required for one-half of the dose of a medication to be removed from the body.

B) Correct.

C) Efficacy is the ability of a drug to produce the expected response.

D) Affinity is the force of attraction between a drug and its receptor site.

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16) Which of the following is the MOST common way that medications exert their actions?

- A) Receptor site binding.
- B) Changing the physical properties of a cell.
- C) Chemically combining with another chemical.
- D) Altering the normal metabolic pathway.

Answer: A

Explanation: A) Correct.

B) While all answers listed are ways in which a drug may exert its actions, receptor site binding is the most common.

C) While all answers listed are ways in which a drug may exert its actions, receptor site binding is the most common.

D) While all answers listed are ways in which a drug may exert its actions, receptor site binding is the most common.

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17) A medication such as nalbuphine binds with a specific receptor site causing an expected effect, but blocks another medication from triggering the receptor. This is known as a/an:

- A) Agonist.
- B) Antagonist.
- C) Agonist-antagonist.
- D) Beta blocker.

Answer: C

Explanation: A) An agonist binds to a specific receptor causing a desired response.

B) An antagonist blocks a receptor site, but does not produce the expected result.

C) Correct.

D) A beta blocker is an example of an antagonistic effect.

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18) _____ is the relative amount of a medication required to produce a desired response.

- A) Antagonism
- B) Efficacy
- C) Therapeutic threshold
- D) Potency

Answer: D

Explanation: A) An antagonism produces a blocking effect at a receptor site.

B) Efficacy is the power of a medication to produce a therapeutic effect.

C) Therapeutic threshold is the minimum concentration of a medication required to cause a desired response.

D) Correct.

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19) If a drug exceeds its therapeutic index, the drug will:

- A) Cause the desired response.
- B) Be toxic to the patient.
- C) Not have any effect on the patient.
- D) Be present in the minimal level and may not cause the desired response.

Answer: B

Explanation: A) For a drug to cause a desired response, it must remain within the therapeutic index.

B) The difference between the minimum effective concentration and the toxic level is the therapeutic index.

C) If a drug exceeds the therapeutic index, it will be toxic to the patient.

D) The minimal dose required is known as the minimum effective concentration.

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20) Which of the following statements is TRUE regarding medication administration to the children and elderly?

- A) Liver and kidney functions in both populations are altered leaving both susceptible to altered medication responses.
- B) Doses need to be significantly higher in both populations to produce the desired effect due to decreased liver functions.
- C) Both populations should be treated the same as all patients as the therapeutic index does not change.
- D) Pediatric patients have well developed livers, while elderly patients suffer from decreased liver function.

Answer: A

Explanation: A) Correct.

B) Doses need to be altered accordingly to the appropriate population being treated.

C) While the therapeutic index may change, the patient's ability to metabolize or excrete the medication will affect how much drug may be available.

D) The infant population does not have well developed renal and hepatic function.

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