Lippincott Questions

Pharmacology

Edition Two:

Chapter One:

1.Which one of the following statements is CORRECT?

A. Weak bases are absorbed efficiently across the epithelial cells of the stomach.

B. Coadministration of atropine speeds the absorption of a second drug.

C. Drugs showing large VD can be efficiently removed by dialysis of the plasma.

D. Stressful emotions can lead to a slowing of drug absorption.

E. If the VD for a drug is small, most of the drug is in the extraplasmic space.

Correct answer = D. Both exercise and strong emotions prompt sympathetic output, which slows gastric emptying. In the stomach a weak base is primarily in the protonated, charged form, which does not readily cross the epithelial cells of the stomach...atropine is a para-sympathetic and slows gastric emptying. This delays the rate of drug absorption. A large VD indicates that most of the drug is outside the plasma space and dialysis would not be effective. A small VD indicates extensive binding to plasma proteins.

1.2 which one of the following is TRUE for a drug whose elimination from plasma shows first-order kinetics?

A. The half-life of the drug is proportional to the drug concentration in plasma.

B. The amount eliminated per unit time is constant.

C. The rate of elimination is proportional to the plasma concentration.

D. Elimination involves a rate-limiting enzymic reaction operating at its maximal velocity (Vmax).

E. A plot of drug concentration versus time is a straight line.

Correct answer = C. The direct proportionality between concentration and rate is the definition of first-order. The half-life of a drug is a constant.

For first-order reactions, the fraction of the drug eliminated is constant, not the amount. A rate limiting reaction operating at Vm would show zero-order kinetics, First order kinetics show a linear plot of log [drug concentration] versus time.

1.3-all of the following statements are true EXCEPT:

A-Aspirin (pKa = 3.5) is 90% in its lipid-soluble, protonated form pH = 2.5.

b-The basic drug promethazine (pKa = 9.1) is more ionized at pH = 7.4 than at pH = 2.

C-Absorption of a weakly basic drug is likely to occur faster from the intestine than from the stomach.

D-Acidification of the urine accelerates the secretion of a weak base, pKa = 8.

E-Uncharged molecules more readily cross cell membranes than charged molecules.

Correct choice = B. As the pH of the solution

Becomes less than the pKa, the ratio [BH+]/ [B] increases; thus [BH +] is greater at pH = 2. At one pH unit on the acid side of pKa, the [HA]/ [A-] =10, or 90% is in form HA, the protonated form of aspirin. Weak bases are more charged in the acidic gastric juice and are not readily absorbed. The drug

which is a weak base is more ionized in acidified urine and less able to be reabsorbed. Uncharged molecules have a greater solubility in

The lipid bilayer of membranes, and thus more readily cross membranes.

1.4 A patient is treated with drug A, which has a high affinity for albumin and is administered in amounts that do not exceed the binding capacity of albumin. A second drug, B, is added to the treatment regimen. Drug B

Also has a high affinity for albumin but is administered in amounts that are 100 times the binding capacity of albumin. Which of the following occurs after administration of drug B?

A. An increase in the tissue concentrations of drug A.

B. A decrease in the tissue concentrations of drug A.

C. A decrease in the volume of distribution of drug A.

D. A decrease in the half-life of drug A.

E. Addition of more drug A significantly alters the serum concentration of unbound drug B.

Correct answer = A. Drug A is largely bound to albumin and only a small fraction is free. Most of drug A is sequestered on albumin and is inert in

Terms of exerting pharmacologic actions. If drug B is administered, it displaces drug A from albumin, leading to rapid increase in the concentration of free drug A in plasma, because almost 100% is now free. Drug A moves out of the plasma into the interstitial water and the tissues. The Vd of drug A increases, providing less drug to the organ of excretion, and prolonging the overall lifetime of the drug. Since drug B is already in

100-fold excess of its albumin-binding capacity, dislodging some of drug B from albumin does not significantly affect its serum concentration.

1.5 the addition of glucuronic acid to a drug

A. decreases its water solubility.

B. usually leads to inactivation of the drug.

C. is an example of a Phase I reaction.

D. occurs at the same rate in adults and the newborn.

E. involves cytochrome P-450.

Correct answer = B. The addition of glucuronic acid prevents recognition of the drug by its receptor. Glucuronic acid is charged, and the drug conjugate has increased water solubility, Conjugation is a Phase II reaction. Neonates are deficient in the conjugating enzymes. Cytochrome P-450 is involved in Phase I reactions.

1.6 Drugs showing zero-order kinetics of elimination

A. are more common that those showing first order kinetics.

B. decrease in concentration exponentially with time.

C. have a half-life independent of dose.

D. show a plot of drug concentration versus time that is linear.

E. show a constant fraction of the drug eliminated per unit time.

Correct answer = D. Drugs with zero-order kinetics of elimination show a linear relationship between drug concentration and time. In most clinical situations the concentration of a drug is much less than the Michaelis-Menten constant (Km), A decrease in drug concentration is linear with time. The half-life of the drug increases with dose. A constant amount of drug is eliminated per unit time.

1.7 a drug, given as a 100 mg single dose, results in a peak plasma concentration of 20 ug/ml. The apparent volume of distribution is (assume a rapid distribution and negligible elimination prior to measuring the peak plasma level :

A. 0.5 L.

B. 1L.

C. 2L.

D. 5L.

E. 10 L.

Correct answer = D. Vd = D/c; where D = total amount of drug in the body and C = plasma concentration of drug. Thus VD =100mg/20 ug/ml =100 mg/20 mg/L = 5.

Chapter 2:

2.1 A drug with a half-life of 12 hours is administered by continuous intravenous infusion. How long will it take for the drug to reach 90% of its final steady-state level?

A. 18 hours.

B. 24 hours.

C. 30 hours.

D. 40 hours.

E. 90 hours.

Correct answer = D, One approaches 90% of the final Steady-state in 3.3 times $t_{1/2}$ = 3, 3*12~40 hours.

2.2 Which of the following results in a doubling of the steady-state concentration of a drug?

A. Doubling the rate of infusion.

B. Maintaining the infusion rate, but doubling the loading dose.

C. Doubling the rate of infusion and doubling the concentration of the infused drug.

D. Tripling the rate of infusion.

E. Quadrupling the rate of infusion.

Correct answer = A. The steady-state concentration of a drug is directly proportional to the infusion rate. Increasing the loading dose provides a transient increase in drug level, but the steady-state level remains unchanged. Doubling both the rate of infusion and concentration of the infused drug leads to a 4-fold increase in the steady-state drug concentration. Tripling or quadrupling the rate of infusion leads to either a 3-fold or 4-fold

Increase in the steady-state drug concentration.

2.3 Which of the following statements is correct?

A. if 10 mg of drug A produces the same response as

100 mg of drug B, drug A is more efficacious than drug B.

B. The greater the efficacy, the greater the potency of a drug.

C. In selecting a drug, potency is usually more important than efficacy.

D. A competitive antagonist increases ED5o.

E. Variation in response to a drug among different individuals is most likely to occur with a drug showing a large therapeutic index.

Correct answer = D. In the presence of a competitive antagonist, a higher concentration of drug is required to elicit a given response. Efficacy and potency can vary independently, and the maximal response obtained is often more important than the amount of drug needed to achieve it. For example, in Choice A, no information is provided about the efficacy of drug A, so all one can say is that drug A is more potent than drug B. Variability between patients in the pharmacokinetics of a drug is most important clinically when the effective and toxic doses are not very different, as is the case with a drug that shows a small therapeutic index.

2.4 Which of the following most closely describes the clearance rate of a drug that is infused at a rate of 4 mg/min and produces a steady-state concentration of 6 mg/L in the plasma?

A. 67 ml/min.

B. 132 ml/min.

C. 300 ml/min.

D. 667 ml min.

E. 1,200 ml/min.

Correct answer = D. Clearance is the volume of plasma from which all drug is removed in a given time (in this case per minute). At steady state, the excretion rate = infusion rate = 4 mg/min, Thus, clearance (ml/min) = excretion rate (mg/ml)/plasma concentration (mg/ml) = (4 mg/ml)/ (0.O06 mg/ml) = 667 ml/min.

2.5 The antimicrobial drug, tetracycline, is found to be therapeutically effective when 250 mg of drug are present in the body. The $t_{1/2}$ of tetracycline is 8 hours. What is the correct rate of infusion?

A. 7 mg/hr.

B. 12 mg/hr.

C. 22 mg/hr.

D. 37 mg/hr.

E. 45 mg/hr.

Correct answer = C. The correct rate of infusion is R=KdVdC, where Kd = $0.69/t_{1/2}$ = 0.69/8 hours = 0.086 hr-1; therefore, the instantaneous rate of loss of the tetracycline is 8.6 % per hr of whatever amount of drug is present in the body, (VdC = the total amount of drug in the body.) When 250 mg of tetracycline are present in the body, the rate of drug loss is 250 mg x 8.6 %/hour = 250 x 0.086 hr 4 = 21.5 mg/hr.

Edition Four:

Chapter 1:

1.1 Which one of the following statements is correct?

A. Weak bases are absorbed efficiently across the epithelial cells of the stomach.

B. Coadministration of atropine speeds the absorption of a second drug.

C. Drugs showing a large Vd can be efficiently removed by dialysis of the plasma.

D. Stressful emotions can lead to a slowing of drug absorption.

E. If the Vd for a drug is small, most of the drug is in the extraplasmic space.

1.2 Which one of the following is true for a drug whose elimination from plasma shows first-order kinetics?

A. The half-life of the drug is proportional to the drug concentration in plasma.

B. The amount eliminated per unit of time is constant.

C. The rate of elimination is proportional to the plasma concentration.

D. Elimination involves a rate-limiting enzymic reaction operating at its maximal velocity (Vm).

E. A plot of drug concentration versus time is a straight line.

1.3 A patient is treated with drug A, which has a high affinity for albumin and is administered in amounts that do not exceed the binding capacity of albumin. A second drug, B, is added to the treatment regimen. Drug B also has a high affinity for albumin but is administered in amounts that are 100 times the binding capacity of albumin. Which of the following occurs after administration of drug B?

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B. A decrease in the tissue concentrations of drug A.

C. A decrease in the volume of distribution of drug A.

D. A decrease in the half-life of drug A.

E. Addition of more drug A significantly alters the serum concentration of unbound drug B.

1.4 The addition of glucuronic acid to a drug:

A. Decreases its water solubility.

B. Usually leads to inactivation of the drug.

C. Is an example of a Phase I reaction?

D. Occurs at the same rate in adults and newborns.

E. Involves cytochrome P450.

1.5 Drugs showing zero-order kinetics of elimination:

A. Are more common than those showing first-order kinetics.

B. Decrease in concentration exponentially with time.

C. Have a half-life independent of dose.

D. Show a plot of drug concentration versus time that is linear.

E. Show a constant fraction of the drug eliminated per unit of time.

1.6 A drug, given as a 100-mg single dose, results in a peak plasma concentration of 20 µg/mL. The apparent volume of distribution is (assume a rapid distribution and negligible elimination prior to measuring the peak plasma level :

A. 0.5 L.

B. 1 L.

C. 2 L.

D. 5 L.

E. 10 L.

1.7 A drug with a half-life of 12 hours is administered by continuous IV infusion. How long will it take for the drug to reach ninety percent of its final steady-state level?

A. 18 hours.

B. 24 hours.

C. 30 hours.

D. 40 hours.

E. 90 hours.

1.8 Which of the following results in a doubling of the steady-state concentration of a drug?

A. Doubling the rate of infusion.

B. Maintaining the rate of infusion but doubling the loading dose.

C. Doubling the rate of infusion and doubling the concentration of the infused drug.

D. Tripling the rate of infusion.

E. Quadrupling the rate of infusion.

Chapter 2:

2.1 Which of the following statements is correct?
A. If 10 mg of Drug A produces the same response as 100 mg of Drug B, Drug A is more efficacious than Drug B.
B. The greater the efficacy, the greater the potency of a drug.
C. In selecting a drug, potency is usually more important than efficacy.
D. A competitive antagonist increases the ED50.

E. Variation in response to a drug among different individuals is most likely to occur with a drug showing a large therapeutic index.

2.2 Variation in the sensitivity of a population of individuals to increasing doses of a drug is best determined by which of the following?

A. Efficacy.

B. Potency.

C. Therapeutic index.

D. Graded dose-response curve.

E. Quantal dose-response curve.

2.3 Which of the following statements most accurately describes a system having spare receptors?

A. The number of spare receptors determines the maximum effect.

B. Spare receptors are sequestered in the cytosol.

C. A single drug-receptor interaction results in many cellular response elements being activated.

D. Spare receptors are active even in the absence of agonist.

E. Agonist affinity for spare receptors is less than their affinity for nonspare receptors.

Edition Five:

Chapter 1:

1.1 A drug, given as a 100-mg single dose, results in a peak plasma concentration of 20 μg/mL. The apparent volume of distribution is (assume a rapid distribution and negligible elimination prior to measuring the peak plasma level):

A. 0.5 L.

B. 1 L.

C. 2 L.

D. 5 L.

E. 10 L.

1.2 A drug with a half-life of 12 hours is administered by continuous intravenous infusion. How long will it take for the drug to reach 90 percent of its final SteadyState level?

A. 18 hours.

B. 24 hours.

C. 30 hours.

D. 40 hours.

E. 90 hours.

1.3 Which of the following results in a doubling of the steady-state concentration of a drug?

A. Doubling the rate of infusion.

B. Maintaining the rate of infusion but doubling the loading dose.

C. Doubling the rate of infusion and doubling the concentration of the infused drug.

D. Tripling the rate of infusion.

E. Quadrupling the rate of infusion.

1.4 A heart failure patient shows digoxin toxicity. She received 125 mcg as standard dose. Serum levels were reported to be 2 ng /mL (2 mcg/L). Target therapeutic level is 0.8 ng/mL. What dose should she receive?

A. 25 mcg.

B. 50 mcg.

C. 75 mcg.

D 100 mcg.

E. 125 mcg.

1.5 The addition of glucuronic acid to a drug:

A. Decreases its water solubility.

B. Usually leads to inactivation of the drug.

C. Is an example of a Phase I reaction.

D. Occurs at the same rate in adults and newborns.

E. Involves cytochrome P450.

1-Correct answer = D. Vd = D/C, where D = the total amount of drug in the body, and C = the plasma concentration of drug. Thus, Vd = 100 mg/20 mg/mL =100 mg/20 mg/L = 5 L.

2-Correct answer = D. A drug approaches 90 percent of the final steady state in (3.3) (t1/2) = (3.3) (12) = ~40 hours.

3-Correct answer = A. The steady-state concentration of a drug is directly proportional to the infusion rate. Increasing the loading dose provides a transient increase in drug level, but the steady-state level remains unchanged. Doubling both the rate of infusion and the concentration of infused drug leads to a fourfold increase in the steady-state drug concentration. Tripling or quadrupling the rate of infusion leads to either a three- or fourfold increase in the steady-state drug concentration.

4-Correct answer = B. Vd = dose/C = 125 mcg / 2 mcg/L = 62.5 L. Vd (C2 – C1) = dose to be received = 62.5 (0.8 mcg/L – 2 mcg/L) = –75 mcg. Subtract this dose from standard dose. New dose to be administered = 125 mcg – 75 mcg = 50 mcg.

5-Correct answer = B. The addition of glucuronic acid prevents recognition of the drug by its receptor. Glucuronic acid is charged, and the drug

conjugate has increased water solubility. Conjugation is a Phase II reaction. Neonates are deficient in the conjugating enzymes. Cytochrome P450 is involved in Phase I reactions.

Chapter 2:

2.1 Drug X produces maximal contraction of cardiac muscle in a manner similar to epinephrine. Drug X is considered to be a (n)

A. Agonist.

B. Partial agonist.

C. Competitive Antagonist.

D. Irreversible antagonist.

E. Inverse agonist.

2.2 Which of the following statements is correct?

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D. Spare receptors are active even in the absence of agonist.

E. Agonist affinity for spare receptors is less than their affinity for nonspare receptors.

1-Correct answer = A. An agonist mimics the actions of an endogenous ligand. A partial agonist would only produce a partial effect. An antagonist would block or decrease the effects of an endogenous agonist, producing an opposite effect to that of the endogenous ligand. An inverse agonist would reverse the constitutive activity of receptors and exert the opposite pharmacological effect of receptor agonists.
2- Correct answer = D. In the presence of a competitive antagonist, a higher concentration of drug is required to elicit a given response. Efficacy and potency can vary independently, and the maximal response obtained is often more important than the amount of drug needed to achieve it. For example, in Choice A, no information is provided about the efficacy of Drug A, so all one can say is that Drug A is more potent than Drug B. Variability between patients in the pharmacokinetics of a drug is most important clinically when the effective and toxic doses are not very different, as is the case with a drug that shows a small therapeutic index. The other choices are incorrect statements.
3-Correct answer = E. Only a quantal dose–response curve gives information about differences in the sensitivity of individuals to increasing doses of a drug. The other choices do not provide this information.
4-Correct answer = C. One explanation for the existence of spare receptors is that any one agonist receptor binding event can lead to the activation of many more cellular response elements. Thus, only a small fraction of the total receptors need to be bound to elicit a maximum cellular response. The other choices do not accurately describe spare receptor systems.