Chapter 02 - Drugs and the Body

Drugs do not metabolize the same way in all people. For what patient would a nurse expect to assessfor an alteration in drug metabolism?

A 35-year-old woman with cervical cancer

A 41-year-old man with kidney stones

A 50-year-old man with cirrhosis of the liver

A 62-year-old woman in acute renal failureAns: C

Feedback:

The liver is the most important site of drug metabolism. If the liver is not functioning effectively, as in patients with cirrhosis, drugs will not metabolize normally so that toxic levels could develop unless dosage is reduced. A patient with cervical cancer or kidney stones would not be expected to have altered ability to metabolize drugs so long as no liver damage existed. The patient with renal failure would have altered excretion of the drugs through the renal system but metabolism would not be impacted.

A patient presents to the emergency department with a drug level of 50 units/mL. The half-life of thisdrug is 1 hour. With this drug, concentrations above 25 units/mL are considered toxic and no more drugis given. How long will it take for the blood level to reach the non-toxic range?

30 minutes

1 hour

2 hours

3 hours

Ans: B

Feedback:

Half-life is the time required for the serum concentration of a drug to decrease by 50%. After 1 hour, the serum concentration would be 25 units/mL (50/2) if the body can properly metabolize and excrete the drug. After 2 hours, the serum concentration would be 12.5 units/mL (25/2) and reach the nontoxic range. In 30 minutes the drug level would be 37.5 units/mL, whereas in 3 hours the drug level would be

6.25.

A patient has recently moved from Vermont to Southern Florida. The patient presents to the clinic complaining of dizzy spells and weakness. While conducting the admission assessment, the patient tells the nurse that he have been on the same antihypertensive drug for 6 years and had stable blood pressures and no adverse effects. Since his move, he has been having problems and he feels that the drug is no longer effective. The clinic nurse knows that one possible reason for the change in the effectiveness of the drug could be what?

The impact of the placebo effect on the patient's response.

The accumulative effect of the drug if it has been taken for many years.

The impact of the warmer environment on the patient's physical status.

Problems with patient compliance with the drug regimen while on vacation.

Ans: C

Feedback:

Antihypertensive drugs work to decrease the blood pressure. When a patient goes to a climate that is much warmer than usual, blood vessels dilate and the blood pressure falls. If a patient is taking an antihypertensive drug and moves to a warmer climate, there is a chance that the patient's blood pressure will drop too low, resulting in dizziness and feelings of weakness. Even mild dehydration could exacerbate these effects. Most antihypertensives are metabolized and excreted and do not accumulate in the body. Patients must be very compliant with their drug regimen on vacation. After several years on an antihypertensive drug, the effects of that drug are known; therefore, the placebo effect should not be an issue.

An important concept taught by the nurse when providing medication teaching is the need to provide a complete list of medications taken to health care providers to avoid what?

Spending large amounts of money on medications

Allergic reactions to medications

Drugdrug interactions

Critical concentrations of medications in the bodyAns: C

Feedback:

It is important that all health care providers have a complete list of the patient's medications to avoid drugdrug interactions caused by one provider ordering a medication, unaware of another medication the

patient is taking that could interact with the new prescription. Using the same pharmacist for all prescriptions will also help to prevent this from happening. Informing the provider of all medications taken will not reduce costs of medications, which is best accomplished by requesting generic medications. Allergies should be disclosed to all health care providers as well, but this is not why it is important to provide a complete list of medications taken. Critical concentrations are desirable because that is the amount of drug needed to cause a therapeutic effect, or, in other words, to have the effect the drug is prescribed for.

A pharmacology student asks the instructor what an accurate description of a drug agonist is. What isthe instructor's best response?

A drug that reacts with a receptor site on a cell preventing a reaction with another chemical on adifferent receptor site

A drug that interferes with the enzyme systems that act as catalyst for different chemical reactions

A drug that interacts directly with receptor sites to cause the same activity that a natural chemicalwould cause at that site

A drug that reacts with receptor sites to block normal stimulation, producing no effectAns:

C

Feedback:

Agonists are drugs that produce effects similar to those produced by naturally occurring neurotransmitters, hormones, or other substances found in the body. Noncompetitive antagonists are drugs that react with some receptor sites preventing the reaction of another chemical with a different receptor site. Drugenzyme interactions interfere with the enzyme systems that stimulate various chemical reactions.

A nurse is caring for a patient who has been receiving a drug by the intramuscular route but will receivethe drug orally after discharge. How does the nurse explain the increased dosage prescribed for the oral dose?

Passive diffusion

Active transport

Glomerular filtration

First-pass effect

Ans: D

Feedback:

The first-pass effect involves drugs that are absorbed from the small intestine directly into the portal venous system, which delivers the drug molecules to the liver. After reaching the liver, enzymes break the drug into metabolites, which may become active or may be deactivated and readily excreted from the body. A large percentage of the oral dose is usually destroyed and never reaches tissues. Oral dosages account for the phenomenon to ensure an appropriate amount of the drug in the body to produce a therapeutic action. Passive diffusion is the major process through which drugs are absorbed into the body. Active transport is a process that uses energy to actively move a molecule across a cell membrane and is often involved in drug excretion in the kidney. Glomerular filtration is the passage of water and water-soluble components from the plasma into the renal tubule.

A nurse is working as a member of a research team involved in exploring the unique response to drugseach individual displays based on genetic make-up. What is this area of study is called?

Pharmacotherapeutics

Pharmacodynamics

Pharmacoeconomics

Pharmacogenomics

Ans: D

Feedback:

Pharmacogenomics is the area of study that includes mapping of the human genome. In the future, medical care and drug regimens may be personally designed based on a patient's unique genetic make-up. Pharmacotherapeutics is the branch of pharmacology that deals with the uses of drugs to treat, prevent, and diagnose disease. Pharmacodynamics involves how a drug affects the body. Pharmacoeconomics includes the costs involved in drug therapy.

The nurse uses what term to describe the drug level required to have a therapeutic effect?

Critical concentration

Dynamic equilibrium

Selective toxicity

Active transport

Ans: A

Feedback:

A critical concentration of a drug must be present before a reaction occurs within the cells to bring about the desired therapeutic effect. A dynamic equilibrium is obtained from absorption of a drug from

the site of drug entry, distribution to the active site, metabolism in the liver, and excretion from the body to have a critical concentration. Selective toxicity is the ability of a drug to attach only to those systems found in foreign cells. Active transport is the process that uses energy to actively move a molecule across a cell membrane and is often involved in drug excretion in the kidney.

A nurse is caring for a patient who is supposed to receive two drugs at the same time. What is the nurse's priority action?

Wash her hands before handling the medications.

Consult a drug guide for compatibility.

Question the patient concerning drug allergies.

Identify the patient by checking the armband and asking the patient to state his name.

Ans: B

Feedback:

A nurse should first consult a drug guide for compatibility when two or more drugs are being given at the same time. After compatibility is determined the medication can be administered. The nurse will perform hand hygiene, check for patient allergies, and ensure the right patient receives the medication by using two identifiers.

The nurse is talking with a group of nursing students who are doing clinical hours on the unit. A studentasks if all intramuscular (IM) drugs are absorbed the same. What factor would the floor nurse tell the students to affect absorption of the IM administration of drugs?

Perfusion of blood to the subcutaneous tissue

Integrity of the mucous membranes

Environmental temperature

Blood flow to the gastrointestinal tractAns:

C

Feedback:

A cold environmental temperature can cause blood vessels to vasoconstrict and decreases absorption or in a hot environment vasodilate and increase absorption of IM medications. Blood flow to the subcutaneous tissues interferes with subcutaneous injection and blood flow to the gastrointestinal (GI) tract causes alterations in absorption for oral medications. The condition of mucous membranes can interfere with sublingual (under the tongue) and buccal (in the cheek) administration of drugs.

The patient is taking a drug that affects the body by increasing cellular activity. Where does this drugwork on the cell?

Receptor sites

Cell membrane

Golgi body

Endoplasmic reticulum

Ans: A

Feedback:

Many drugs are thought to act at specific areas on cell membranes called receptor sites. After the receptor site is activated, this in turn activates the enzyme systems to produce certain effects, such as increased or decreased cellular activity, changes in cell membrane permeability, or alterations in cellular metabolism. Receptor sites are generally located on the outside of cells and allow the drug to bypass the cell membrane. The Golgi body and endoplasmic reticulum are not involved in this process.

Several processes enable a drug to reach a specific concentration in the body. Together they are called dynamic equilibrium. What are these processes? (Select all that apply.)

Distribution to the active site

Biotransformation

Absorption from the muscle

Excretion

Interaction with other drugs

Ans: A, B, D

Feedback:

The actual concentration that a drug reaches in the body results from a dynamic equilibrium involving several processes: Absorption from the site of entry (can be from the muscle, the gastrointestinal (GI) tract if taken orally, of the subcutaneous tissue if given by that route); Distribution to the active site; biotransformation (metabolism) in the liver; excretion from the body. Interaction with other drugs is not part of the dynamic equilibrium.

A nurse is administering digoxin to a patient. To administer medications so that the drug is as effective

as possible, the nurse needs to consider what?

Pharmacotherapeutics

Pharmacokinetics

Pharmacoeconomics

Pharmacogenomics

Ans: B

Feedback:

When administering a drug, the nurse needs to consider the phases of pharmacokinetics so that the drug regimen can be made as effective as possible. Pharmacogenomics is the area of study that includes mapping of the human genome. Pharmacotherapeutics is the branch of pharmacology that deals with the uses of drugs to treat, prevent, and diagnose disease. Pharmacoeconomics includes all costs involved in drug therapy.

The nurse is explaining how medications work to a group of peers and explains that disruption of asingle step in any enzyme system disrupts what?

Cell life

Cell membrane

Cell receptor sites

Cell function

Ans: D

Feedback:

If a single step in one of the many enzyme systems is blocked, normal cell function is disrupted. Cell life and cell membrane may be impacted by disruption of some enzymes but not all enzymes. Receptor sites would not be disrupted by disruption in a single step in the enzyme system.

The processes involved in dynamic equilibrium are key elements in the nurse's ability to determinewhat?

Dosage scheduling

Amount of solution for mixing parenteral drugs

Timing of other drugs the patient is taking

How long the patient has to take the drugAns: A

Feedback:

These processes are key elements in determining the amount of drug (dose) and the frequency of dose repetition (scheduling) required to achieve the critical concentration for the desired length of time. The processes in dynamic equilibrium are not key elements in determining the amount of diluents for intramuscular (IM) drugs; they do not aid in the timing of the other drugs the patient is taking or how long the patient has to take the drug.

What factor influences drug absorption?

Kidney function

Route of administration

Liver function

Cardiovascular function

Ans: B

Feedback:

Drug absorption is influenced by the route of administration. IV administration is the fastest method; drug absorption is slower when given orally. Kidney function impacts excretion, liver function impacts metabolism, and cardiovascular function impacts distribution.

What does the lipid solubility of the drug influence?

Absorption of the drug

Metabolism of the drug

Excretion of the drug

Distribution of the drug

Ans: D

Feedback:

Factors that can affect distribution include the drug's lipid solubility and ionization and the perfusion of the reactive tissue. The lipid solubility of a drug does not influence absorption, metabolism, or excretion.

The nursing students are learning about the half-life of drugs. A student asks the instructor to explainhalf-life. What is the instructor's best response?

Half-life of a drug is the time it takes for the amount of drug in the body to decrease to half of thepeak level it previously achieved.

Half-life is the amount of time it takes for the drug to be metabolized by the body.

Half-life is the amount of time it takes for half of the drug to reach peak level in the body.

Half-life of a drug is the time it takes for the drug to reach half its potential peak level in the body.

Ans: A

Feedback:

The half-life of a drug is the time it takes for the amount of drug in the body to decrease to half the peak level it previously achieved. Therefore Options B, C, and D are not correct.

The patient is taking a 2-mg dose of ropinerol XR. The drug has a half-life of 12 hours. How long willit be before only 0.25 mg of this drug remains in the patient's system?

A) 24 hours

B) 36 hours

C) 48 hours

D) 60 hours

Ans: B

Feedback:

The half-life of a drug is the time it takes for the amount of drug in the body to decrease to half of the peak level it previously achieved. At 12 hours there will be 1 mg of the drug available to the body. At 24 hours there will be 0.5 mg; at 36 hours there will be 0.25 mg; at 48 hours there will be 0.125 mg, and at 60 hours there will be 0.0625 mg.

The patient has a diagnosis of multiple sclerosis and is taking the drug interferon beta-1a (Rebif). The patient takes this drug by subcutaneous injection three times a week. The dosage is 44 mcg per injection. If the patient takes an injection on Monday, how much of the drug would still be in the patient's system when she takes her next injection on Wednesday, assuming the half-life of the drug is24 hours?

A) 22 mcg

B) 16.5 mcg

C) 11 mcg

D) 5.5 mcg

Ans: C

Feedback:

The half-life of a drug is the time it takes for the amount of drug in the body to decrease to 1 half the peak level it previously achieved. On Tuesday, there would be 22 mcg remaining in the body, so option A is incorrect. On Wednesday 11 mcg would remain, so option C is the correct answer. At 12 hours before taking the next dose on Wednesday, there would be 16.5 mcg remaining. If the injection were not taken on Wednesday, 12 hours after the dose was due, there would be 5.5 mcg remaining.

The patient is a 6-year-old child who is taking 125 mg of amoxicillin every 6 hours. Assuming that thehalf-life of Amoxicillin is 3 hours, how much Amoxicillin would be in the child's body at the time of the next administration of the drug?

A) 62.5 mg

B) 46.875 mg

C) 31.25 mg

D) 15.625 mg

Ans: C

Feedback:

The half-life of a drug is the time it takes for the amount of drug in the body to decrease to 1 half the peak level it previously achieved. Option A would occur at 3 hours after the original dose of amoxicillin. Option B would occur 4 1/2 hours after the original dose. Option C would occur at 6 hours after the original dose. Option D would occur at 7 1/2 hours after the original dose.

A drug with a half-life of 4 hours is administered at a dosage of 100 mg. How much of the drug will bein the patient's system 8 hours after administration?