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Food Interactions with Prescription Drugs

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Learning Objectives

After reading this module, the participant will be able to:

1. Define the terms pharmodynamics and pharmacokinetcs and their relationship to food-drug interactions.
2. Identify at least five factors affecting the therapeutic outcome of drug therapy
3. Identify potential grapefruit-drug interactions and its potential effect on the client.
4. Discuss the effects of caffeine on the central nervous system and why its intake must be limited in the presence of particular drug classifications
5. Discuss dietary monitoring / modifications needed each medication discussed.
6. Identify five commonly used herbal preparations / supplements that interfere with the pharmacokinetics of certain drugs – identify one drug classification that each of the herbal preparations / supplements affects.

The number of Americans taking prescription drugs increases each year. More than 48 percent of Americans used one or more prescription drug in a one-month period in 2007-2008; one in 10 used five or more. The most commonly used types of drugs included: asthma medicines (bronchodilators) for children, central nervous system stimulants for adolescents, antidepressants for middle-aged adults, and cholesterol-lowering drugs for older adults (Gu, *et al*., 2010). This list denotes the most common diseases in these age groups, but it should also alert us to the risk of excessive prescribing or polypharmacy which may contribute to adverse drug events (Qato, *et al*., 2008).

Besides taking prescription drugs, many Americans utilize over-the-counter medications and herbal preparations, follow unusual diets, and ingest dietary supplements. Although drug-drug interactions are often discussed by physicians and pharmacists, the possibility of negative side effects caused by a drug or drugs interacting with a food or supplement is often overlooked. Of the almost 900 drugs and fixed drug combinations used in the US, more than 400 may interact with food or food components, almost that many may deplete specific nutrients, and more than 300 demonstrate interaction with dietary supplements (Galland, 2010).

This article will alert the dietetic practitioner to possible food-prescription drug interactions.

A Drug's Effect

A drug is prescribed to produce specific, desired effects, but can produce undesired side effects, which may be inconsequential (harmless), hazardous or even lethal. The goal of pharmacology is to maximize the benefits of a drug while minimizing its side effects. Food-drug interactions are related to the drug (dose and form), the condition or disease for which the drug is prescribed, the client's characteristics, and the diet prescribed for the client. While we may not be able to eliminate side effects, often we can manage them, and diet education is one means by which to reduce the risk of negative food-drug interactions.

It is important to note that food is only one factor affecting the therapeutic outcome of drug therapy. Others include gender-related differences (body composition, including fat to lean body mass ratios, and hormonal differences), age and life cycle, genetics (metabolic rate, genetically determined enzymes, and immune system), medical and nutritional status, placebo effect, generic *vs*. trade name drugs, and drug-drug interactions.

Two types of pharmacological interaction are to be noted: Pharmacodynamic and pharmacokinetic.

• **Pharmacodynamic** interactions occur when two substances have pharmacologic actions that enhance or interfere with each other's actions (*e.g*., a drug's dose, action, onset, and duration which ultimately produce the drug response).

• **Pharmacokinetic** actions occur when the absorption, distribution, metabolism, and excretion of one substance is altered by another. Specifically, pharmacokinetic mechanisms may include an alteration of gastrointestinal or urinary pH; stimulation or inhibition of enzymes involved in metabolism or transport of drugs; displacement of a drug from the binding site to plasma proteins; and alteration of solubility (Galland, 2010). Most interactions that we will discuss here are pharmacokinetic.

One common way that food affects drugs is by changing the way that the drug is metabolized. Enzymes metabolize many drugs; certain foods make the enzymes work faster or slower, ultimately decreasing or increasing the time the drug spends in the body. The concentration of the drug in the plasma is altered accordingly.

If a food speeds up the enzyme action, the drug will spend a shorter amount of time in the body than expected, have a lower concentration than expected, and thus may be less effective. The opposite occurs if the food slows the enzyme that metabolizes the drug. That drug will spend a longer time in the body; it may have a high plasma concentration, and may result in dangerous effects.

A drug's absorption can also be affected by food. Like metabolism, food can increase or decrease the activity. For example, when vitamin C (citrus juice) is taken with iron supplements, iron absorption is increased; when milk is taken with tetracycline, the calcium in the milk binds to the tetracycline, forming a compound that the body cannot absorb.

Finally, food can interfere with the intended effects of the medication. For example, a change in vitamin K intake will alter the clot-preventing effect of warfarin (Coumadin®). Vitamin K helps blood to clot. An increase in vitamin K intake will reverse the effects of Coumadin; a decrease in intake will potentiate bleeding. The opposite effect occurs with vitamin E and the "three G's" (garlic, ginseng, and ginger). Large amounts of these foods increase the risk of bleeding.

Food-Drug Interactions

The interactions between food and drugs can be general or specific. When food interacts with absorption it is generally a function of food binding to the drug. Food can either increase or decrease a drug's absorption throughout the GI tract. This general effect determines whether a drug should be taken on an empty or full stomach.

When food will delay (decrease) the absorption of a drug, the drug should be taken on an empty stomach. Some drugs can cause stomach upset, food will help buffer that irritation. Drugs that cause upset stomach should be taken with food. Please see the chart on the following page.

Drugs With and Without Food

Drugs taken with food	Drugs taken without Food
• **Analgesics/Anti-inflammatories/Antipyretics (NSAIDS)** ibuprofen (Advil, Motrin) indomethacin (Indocid) naproxen (Anaprox, Alleve) aspirin*	• **Antihistamines** fexofenadine (Allegra) desloratadine (Claritin) cetirizine (Zyrtec) • **Analgesics/Antipyretics** Acetominphen (Tylenol)

*Aspirin can irritate the stomach lining, it increases the risk for gastric bleeding. A buffered or enteric coated form of aspirin is an option.

Enteric coated aspirin
• **Corticosteroids**
methylprednisone (Medrol)
prednisone (Orasone, Cortan, Deltasone)
beclomethasone (Beconase, Vancenase, Vanceril)
hydrocortisone

However, these drugs can cause hyperglycemia. Individuals with diabetes should check blood sugars frequently as prescribed by a doctor; taking steroids may mean that you must follow a more strict diet plan or that your diabetes medications may need to be adjusted.

Having said that, certain foods can interfere with a drug's metabolism. Let's turn to specific foods.

Grapefruit

Grapefruit juice is a well-known offender that affects many medications (and one of the most extensively studied foods for its affect on medication)! Still because of its actions in reducing atherosclerotic plaque formation, inhibiting breast cancer cell proliferation, and certain antioxidant, antiseptic, cardiotonic, detoxicant, cholesterol lowering and sedative qualities many individuals continue to ingest it routinely. The substance in grapefruit that produces the interaction is found in the fresh fruit as well as the juice.

While the specific components of grapefruit that contribute to the clinical drug interactions are unknown, the inhibition of intestinal cytochrome P – 450 system, which is responsible for the first pass metabolism of many drugs, alters the pharmacokinetics of a variety of medications, ultimately increasing their serum concentrations. In sum, the drugs metabolized by the associated enzymes are not dissolved as quickly as expected, which may cause more of the drug to be absorbed from the intestine. Grapefruit can significantly increase oral drug bioavailability - even to toxic levels.

The inhibition can be quick and irreversible. It can reduce the levels of cellular cytochrome P – 450 system enzymes by as much as 47 percent within four hours of ingestion with the resultant increase in bioavailability of the drug for as long as 24 hours when up to 30 percent of the drugs effect is still detectable (Kiani and Imam, 2007). The difference among individuals is highly variable.

Most notable are the effects on calcium channel antagonists (those that end in –pine such as felodipine, nifedipine, and nisoldipine) and the statin group of drugs (HMG-CoA reductase inhibitors).

Drug Classifications Effected by Grapefruit

- **certain benzodiazepines**
  - midazolam particularly (Versed)
- **anticonvulsant medications**
  - carbamazepine (Carbatrol and Tegretol)
- **antihistamines**
  - cisapride
- **antianxiety**
  - diazepam
  - valium
- **anti-arrhythmic drugs**
  - amiodarone (Cordarone)
- **antidepressants**
  - buspirone (Buspar)
  - sertraline (Zoloft)
- **hypnotics**
  - triazolam (Halcyon)
  - zaleplon (Sonata)
- **immunosuppressants**
  - cyclosporine (Neoral, Sandimmune)
  - tacrolimus (Prograf)
- **estrogen and oral contraceptives, and some impotence drugs**

However, drugs within the classifications are affected differently. For example, some statins, simvastatin (Zocor), lovastatin (Mevacor), and atorvastatin (Lipitor), are affected; but it does not appear that grapefruit components have an affect on pravastatin (Pravachol), fluvastatin (Lescol), and rosuvastatin (Crestor).

Preliminary research indicates that cranberry and pomegranate items, olive oil, Seville oranges, grapes, and black mulberries could have a similar, though less robust, effect on the pharmacokinetics of statins in the body.

Speaking of statins, the short acting drugs (fluvastatin (Lescol), lovastatin (Mevacor), and simvastatin (Zocor)) should be taken in the evening to maximize lipid-lowering effects. Evidence suggests that the liver synthesizes the most cholesterol in the early morning hours. Longer acting statins (atorvastatin (Lipitor) and pravastatin (Pravachol)) can be taken any time of the day, but should be taken at a consistent time each day.

Back to grapefruit; it seems like quite a list of drugs that are affected by grapefruit components. Truly, only the medications metabolized by the cytochrome P – 450 system enzymes will be affected by grapefruit juice. Many drugs treating the same conditions have been found to have a minimal/negligible interaction with grapefruit drugs or none.

For example, Ace inhibitors (*e.g.*, benazepril (Lotensin), captopril (Capoten), enalapril (Vasotec), lisinopril (Prinivil, Zestril), Ramipril (Altace)) have not shown any interaction with grapefruit, nor do the group of drugs known as antimicrobials (*e.g.*, antivirals such as indinavir (Crixivan) a protease inhibitor that slows the spread of HIV infection in the body and quinine (Qualaquin), FDA approved for the treatment of uncomplicated malaria). The benzodiazepine alprazolam (Xanax) is not affected, nor are the antipsychotics clozapine and haloperidol (Haldol), nor the anticonvulsant phenytoin (Dilantin). Other common drugs (certirizine (Zyrtec) and loratadine (Claritin)) are considered safe with grapefruit juice.

Tangelos are a hybrid of grapefruit, advise clients to avoid them as well.

Before we continue our discussion of specific food components, let's first discuss bronchodilators, used to treat bronchial disease. This drug classification includes theophylline, albuterol (ventolin, proventil, proventil-HFA, accuNeb, vospire, proAir), Epinephrine. Theophylline deserves discussion. For example, high-fat and high-carbohydrate meals interfere with theophylline, but the form of the drug is important. For example, food has no effect on Slo-bid or Theo-dur. It does interfere with the absorption of Theo-24 and Uniphl and the absorption of Theo-Dur Sprinkles in children.

Caffeine

On that same topic, theophylline, let's discuss caffeine. Caffeine, a methylxanthine, is closely related to theophylline. Both are found in coffee and tea. Caffeine has differing central nervous system stimulant, cardiovascular, and metabolic effects depending on the dose ingested. An average intake of 1-3 cups (85-250mg) may results in a sense of alertness, decreased fatigue, and clear thinking. Higher doses, 3-6 cups (250-510mg) can result in tremors, restlessness, nervousness, and insomnia. In higher doses, one may see seizures and cardiovascular instability. A lethal dose is 10gm (or about 100 cups). If you take theophylline AND consume coffee or tea, you may put yourself at risk.

Caffeine should be avoided when taking anti-microbials such as iprofloxacin (Cipro), levofloxacin (Levaquin), ofloxacin (Floxin), and trovafloxacin (Trovan). Taking these medications with caffeine containing products can increase caffeine level leading to the same excitable symptoms.

Caffeine should also be avoided with certain anti-anxiety drugs, specifically benzodiazepines (*e.g.*, lorazepam (Ativan), diazepam (Valium), alprazolam (Xanax)). Caffeine will lesson the therapeutic effects of the drug and increase excitability (*i.e.*, will not calm you down as expected).

Finally, avoid food containing caffeine when taking drugs used to control gastro-esophageal reflux or heartburn. Drugs such as ranitidine (zantac), cimetidine (Tagamet), famotidine (Pepcid), and nizatadine (Axid). The caffeine, which may irritate the stomach lining, will worsen the conditions you are trying to control.

Potassium

You may need more or less potassium in your diet depending on certain medications. For example, most diuretics cause a loss of potassium; furosemide (Lasix) is an example of a potassium wasting drug. Triamterene (Dyazide) and maxide (a combination of triamterene and hydrochlorothiazide) cause potassium to be spared (retained) in the body. One must monitor intake of potassium, maintaining consistent intake, similar to that at which the therapeutic dose was established.

Potassium is an electrolyte with a narrow margin for error. Too little and you will experience weakness accompanied by abnormal heart rhythms, a breakdown of muscle fibers, fatigue, muscle weakness, and even paralysis; too much and you will experience nausea, irregular heart beat and possible a slow, weak or absent pulse. Examples of high potassium foods – papaya, prune juice, melon, bananas, raisins, mango or kiwi, oranges, tomatoes, potatoes, avocados, asparagus, and Brussels sprouts.

Ace inhibitors, used to treat high blood pressure and heart failure, are category of drugs that responds to potassium. Benazepril (Lotensin), captopril (Capoten), enlapril (Vasotec), lisinopril (Zestril), moexipril (Univasc), and ramipril (Altace) can increase the potassium levels in the body, thus one must limit (or not eat in excessive of one's norm) of potassium.

Along with the discussion of potassium should come a discussion about herbal remedies that can alter potassium levels. For example, chronic use of Senna, used to treat constipation, can lead to potassium loss that may increase the potential of digoxin toxicity.

Licorice Root, taken in large amounts, can deplete potassium in the body, leading to abnormal heart rhythms. It interferes with the effects of some diuretics and drugs commonly prescribed for high blood pressure.

Vitamin K

Vitamin K, produced in the gut by certain bacteria, plays a role in the body's normal production of some clotting factors. Any change in vitamin K level can interfere with blood clotting properly. In the cases in which intestinal bacteria that produce Vitamin K are destroyed by prolonged use of antibiotics and being malnourished, bleeding pattern can be altered.

Anti-coagulants prevent blood clot formation that would cause a heart attack or stroke. One example is Coumadin (warfarin), a blood thinner. Vitamin K is an antagonist – it makes the blood clot. It inhibits the action of Coumadin. Foods high in vitamin K such as spinach, kale, turnip greens, cauliflower, broccoli, Brussels sprouts, other leafy greens, and some vegetable oils and nuts, must be kept constant. Coumadin is highly sensitive to interactions and changes in the diet. Vitamin K has the same effect on other 'blood thinning' medications such as aspirin and nonsteroidal anti-inflammatory drugs-NSAIDs.

Certain drugs (cephalosporins) can alter the absorption of vitamin K; others (phenytoin (Dilantin)) can interfere with the body's ability to use vitamin K. In addition, long-term use of antibiotics can result in vitamin K deficiency as these drugs kill bacteria (the harmful and the beneficial vitamin K activating bacteria). Orlistat (Xenical, Alli), a weight loss drug, and Olestra, a substance added to some foods to prevent the absorption of fat, can reduce the body's ability to absorb fat soluble vitamins, including vitamin K. The FDA has mandated that vitamin K be added to food items containing olestra. This last fact is important if you are on a medication in which vitamin K alters its effects in the body such as Coumadin.

Large amounts of vitamin A and vitamin E have been found to antagonize vitamin K – in essence, potentiate the effects of anticoagulants and platelet inhibitors. Excess vitamin A appears to interfere with vitamin K absorption, whereas vitamin E may interfere with the functions of vitamin K dependent clotting factors.

Vitamin E

Vitamin E, used as an antioxidant, is used by some to lower the risk of heart disease and stroke as it may help to prevent the oxidation of LDL cholesterol. While deficiencies are rare, too much can inhibit the action of vitamin K and thus increase the effect of anticoagulant medication. Vitamin E may also interfere with the body's ability to absorb the antidepressant desimpramine (Norpramin), the antipsychotic chlorpromazine (Thorazine), and the beta-blocker propranolol (Inderolol).

Bile acid binding resins (cholestyramine (Questran) and colestipol (Colestid), isoniazid (Tubizid), mineral oil, and orlistat and olestra may decrease the absorption of vitamin E. Anticonvulsant drugs, such as phenobarbital, phenytoin (Dilantin), or carbamazepine (Tegret0l), may decrease plasma levels of vitamin E.

Calcium

Calcium supplementation may decrease the absorption of beta blockers propranolol (Inderal) and atenolol (Tenormin). Calcium supplementation may decrease the effect of calcium channel blockers (nifedipine (Procardia), verapamil (Isoptin), and diltiazem (Cardiazem). And as stated earlier, those on calcium channel blockers, need to avoid licorice and grapefruit. Those taking hydrochlorothiazide and calcium supplementation are at risk for hypercalcemia. And one should use caution with calcium / vitamin D supplementation and digoxin (Lanoxin), as either may increase the drug's effect and risk of toxicity. High bran and high pectin foods should be avoided when taking digoxin (Lanoxin). Either can decrease absorption of the drug.

Herbal preparations, though 'natural' are not necessarily safe with your standard medications.

The four G's (garlic, ginger, ginkgo biloba, and ginseng)

Garlic is used as an antimicrobial and to lower cholesterol and blood pressure. It is generally considered safe, but side effects can include fatigue, headaches, and upset stomach. Garlic and the other herbal supplements have not been evaluated by the Food and Drug Administration for safety, purity, and effectiveness.

Ginger is most often used for its anti-nausea and anti inflammatory properties.

Ginkgo biloba has traditionally been used to improve mental / cognitive function, to slow macular degeneration, and to improve blood circulation and is used for its antioxidant actions.

Ginseng is known to reduce stress and fatigue, and improve stamina, healing, and well being.

While these benefits encourage their use, Garlic, Ginger, Ginkgo biloba, and Asian Ginseng all potentiate bleeding (inhibit blood clotting, interfere with blood coagulation) and thus interfere with the action of aspirin, anti-coagulants (warfarin (Coumadin) and heparin), and antiplatelet drugs such as clopidogrel (Plavix). All are contraindicated in individuals with bleeding disorders. Be aware that glucosamine and parsley also have antiplatelet properties.

Garlic, Ginkgo biloba, and Ginseng may lower your blood sugar. None should be taken if you are already taking insulin and oral diabetic drugs.

In addition to the drugs listed above, garlic can interfere with the absorption of isoniazid (INH). It may increase the body's break down rate of saquinavir (Invirase) (a protease inhibitor) and non-nucleoside reverse transcriptase inhibitors (NNRTIs), medications used for HIV, thus decreasing the effective of the medications.

High doses of Ginkgo biloba can decrease the effectiveness of anticonvulsant medications such as carbamazepine (Tegretol) or valproic acid (Depakote). Taking ginkgo in conjunction with selective serotonin reuptake inhibitors (SSRIs), including escitalopram (Lexapro), fluoxetin (Prozac), paroxetine (Paxil), and sertraline (Zoloft) may cause serotonin syndrome. Symptoms include tachycardia, hyperthermia, restlessness, and sweating. Ginkgo can lower blood pressure therefore antihypertensive medications, specifically nifedipine (Procardia), should be used cautiously with this drug classification.

Be aware that cellanade, promoted to eliminate cellulite, increases the risk of bleeding as it contains ginkgo, fish oil, sweet clover, bladderwrack, grape seed extract, borage seed oil, and lecithin.

Asian Ginseng may alter the effects of calcium channel blockers. It can block the pain killing effects of morphine. It can potentiate the effects of anti-psychotic medications. And, ginseng can increase the effect of caffeine and other drugs that stimulate the central nervous system, resulting in nervousness, sweating, insomnia, and irregular heart rate.

Ginseng, in addition to guarana (used to treat drowsiness), licorice root (used to treat peptic ulcers), and yohimbe (used to treat impotence) can increase blood pressure. Each could negate the effects of antihypertensive medication.

St. John's Wort

St. John's Wort, used as an anti-depressant, can interact (either increasing or decreasing their effect) with a number of prescription drugs: digoxin (lowering its concentration), blood thinners, antidepressants, the antiviral drug invirase, the anti-rejection drug cyclosporine, and some cancer medications.

Fatty Acids

Research suggests that taking the recommended amount of omega three fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), in the form of fish oil supplementation may provide cardiovascular protective benefits (*e.g.*, lower blood pressure and triglycerides and slow the build up of plaque) and reduce inflammation in the body. Fish oils have the same interfering action with platelet aggregation as noted above and interfere with the same medications: aspirin, anticoagulants, antiplatelet drugs and nonsteroidal anti-inflammatories. In addition, fish oils can cause lead to a potential vitamin E deficiency when taken for longer periods and inhibit the action of anti hypertensive medications and the LDL-cholesterol mechanics of statin drugs. Taking orlistat (Xenical, Alli) in combination with fish oils can decrease absorption.

Hawthorn

Hawthorn leaf (used to lower blood pressure, reduce the frequency of chest pain, treat irregular heart rhythms, and control atherosclerosis) should not be used with digoxin. The herb may lower the heart rate too much, possibly causing heart failure. In addition it should not be used when one is on anti hypertensive medication as it will augment the work of the drugs.

Let's return to classification of medications:

The following should be not be mixed with blood thinners: angelica (used to treat gynecologic disorders), chamomile (used to treat stomach disorders), coenzyme Q-10 (used to treat cardiomyopathy and as an immune system enhancer), feverfew (used to control migraine headaches and reduce inflammation), green tea (used to prevent high cholesterol), guarana (used to treat drowsiness), and st john's wort (used as an anti-depressant).

Antibiotics (*e.g.*, Cephalosporins, Macrolides, Penicillins, Quinolones Sulfonamides, and Tetracylines) can cause stomach upset, but pay attention to two interactions in particular. One must be cautious when consuming calcium-containing foods, minerals (*e.g.*, iron) and antacids when taking Quinolones (*e.g.*, ciprofloxacin) and Tetracylines (*e.g.*, vibramycin, minocin) as these items decrease the drugs concentration. One should take antacids, multivitamin supplements, calcium, iron, or zinc supplements and dairy products two hours before or after taking medication.

Tetracycline, an antibiotic, and several anti-fungal agents (*e.g.*, Fluconazole (Diflucan), Griseofulvin (Grifulvin), Ketoconazole (Nizoral)) do not work as expected when consumed with dairy products. Dairy products inhibit absorption. Iron supplements can also cause tetracycline not to work well.

MAO inhibitors (Nardil and Parnate) are a group of drugs used to treat depression. Many dietary restrictions exist for individuals taking this classification of medication. For example, one must limit the amount of tyramine to prevent a possible fatal raise in blood pressure or stroke. If MAO inhibitors are taken with foods high in tyramine, a rapid, fatal increase in blood pressure may occur. Food high in tyramine include processed cheese (American processed cheese, cheddar, blue, brie, mozzarella, and Parmesan), yogurt, sour cream, beef or chicken liver, cured meats such as sausage and salami, game meat, dried fish, and caviar, beer and red wine, yeast extracts, avocados, bananas, sauerkraut, soy sauce, miso soup, fava beans, ginseng, and caffeine containing foods such as coffee, tea, chocolate, and cola drinks.

Biophosphonates such as alendronate (Fosamax), ibandronate (Boniva), and risedronate (Actonel), must be taken with plain water at least 30 minutes before taking any other food or beverage as any item will markedly reduce the absorption and effectiveness of these drugs. Boniva must have a one hour window between its ingestion and other items.

In sum, interactions between food and drugs can have a significant influence on the success (or failure) of drug treatment. Interactions are not always considered negative, as some interactions may increase effectiveness of the drug or decrease the potential side effects, yet it is generally the detrimental outcomes that are not anticipated. Herbal preparations add to the concerns. These products are not highly regulated or monitored, may contain little of the advertised substance if any, and may contain substances not anticipated. Some herbal preparations, like certain foods, can interact adversely with specific medications.

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Examination

1. In the years 2007-2008, one out of ten Americans used _____ or more prescription drugs in a one month period.
   A. One
   B. Two
   C. Four
   D. Five

2. Prescription drugs will interact with
   A. Food
   B. Over the counter drugs
   C. Herbal preparations
   D. Dietary supplements
   E. All of the above

3. When certain foods make enzymes work faster, the drug will spend a longer amount of time in the body than expected, resulting in a higher plasma drug concentration.
   A. True
   B. False

4. Which of the following medications should be taken on a FULL stomach
   A. Antihistamines (including Allegra, Claritin, and Zyrtec)
   B. NSAIDS (including Advil, Indocid, Alleve)
   C. Aspirin
   D. Corticosteroids (including Medrol, Deltasone, Beconase, and hydrocortisone)

5. Individuals should not consume grapefruit (fruit or juice) if taking
   A. alprazolam (Xanax)
   B. carbamazepine (Tegretol)
   C. phenytoin (Dilantin)
   D. pravastatin (Pravachol)

6. Caffeine must be limited / avoided if your client is taking
   A. Anti-depressants
   B. Bronchodilators
   C. MAO inhibitors
   D. Oral diabetic agents

7. Individuals taking potassium wasting diuretics such as furosemide (Lasix) must monitor their potassium intake. Which of the following is appropriate?
   A. Increase daily intake of canned soups
   B. Eliminate banana and oranges from the diet
   C. Monitor intake of potassium, maintaining consistent intake, similar to that at which the therapeutic dose was established
   D. Add licorice root to the daily diet

8. Vitamin K levels in the body are affected by
   A. Dietary intake of green leafy vegetables
   B. Long term use of antibiotics
   C. Vitamin A
   D. Vitamin E
   E. All of the above

9. High bran and high pectin foods will decrease the absorption of
   A. Beta blockers
   B. Digoxin (Lanoxin)
   C. Hydrochlorothiazide
   D. Vitamin K

10. Garlic, Ginger, Ginkgo biloba, and Asian Ginseng have this in common
   A. All potentiate bleeding
   B. All lower blood sugar
   C. All decrease the effectiveness of anti-conversant medications
   D. All interfere with the absorption of INH

11. While beneficial, omega three fatty acids can
   A. Increase the platelet aggregation of aspirin, anticoagulants, antiplatelet drugs and NSAIDS
   B. Cause vitamin E toxicity
   C. Inhibit the action of LDL cholesterol mechanics of statin drugs
   D. Potentiate the effects of anti-psychotic drugs

12. When prescribed a new medication, one should
   A. Stop taking all similar drugs
   B. Add herbal preparations to offset the action of the new drug
   C. Discuss all medication with pharmacist, medical doctor, and dietitian to identify any potential food-drug interactions
   D. Do nothing different; just add the new drug to daily regime

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