



The Drug-Food Interactions

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ABSTRACT

Drug-food interactions are real challenge at drug prescription. It may act at different levels, mainly pharmacokinetic and pharmacodynamic levels, and they regulate the taking of drugs based meals. These interactions can be beneficial in increasing serum levels of certain drug.

Keywords: Drug; Food interactions; Pharmacokinetic; Pharmacodynamic

INTRODUCTION

Some nutrients can modify pharmacokinetic and pharmacodynamic parameters of certain drugs. Drugs also have an impact on nutrients bioavailability. So what are the involved mechanisms?

TYPES OF INTERACTIONS

Pharmacokinetic interactions

Absorption modification:

Effects on the digestive physiology:

Modification of acid secretion: Ionizable drugs are influenced by postprandial variation of pH.

Bile secretion modification: A higher bile secretion, after a high-fat meal, improves the absorption of lipophilic molecules, and can even induce an overdose. In other cases it can turn the drug into an ineffective form.

Modification of the gastrointestinal motility: The extended sojourn time in stomach and intestinal peristalsis stimulation by the meal can modify the bioavailability of the simultaneously taken drugs and influencing their efficiency.

Modification of membrane transport: Competition phenomenon leading to saturation of transporter by the protein components of the alimentary bolus.

Physicochemical interaction between food and drugs:

Interaction with minerals and trace elements: Resorption of certain drugs is strongly influenced by their coadministration with milk or calcium salts, magnesium, iron or aluminum (chelate forming).

Interaction with foods rich in fibers: A food diet rich in fibers extends by 6 hours the absorption of digoxin and decreases that of tricyclic antidepressants.

Interaction with foods rich in oxalic and phytic acid: To avoid deficiencies, minerals (calcium, iron, magnesium, phosphorus, potassium, sodium) and trace elements (copper, fluorine, iodine, lithium, selenium, zinc) should be administered on an empty stomach or at least 2 hours after ingestion of foods rich in oxalic or phytic acid (insoluble salts forming).

Distribution changing:

On an empty stomach, the amount of free fatty acids that binds albumin is important. After a meal, it decreases. Thus, on an empty stomach, the albumin fixation of drugs decreases by competing with free fatty acids. In case of malnutrition, albuminemia decreases, increasing the free fraction of drugs.

Metabolism modification:

Enzymatic induction: Alcohol, some alkaloids (nicotine), protein-rich diet, and polycyclic aromatic hydrocarbons (PAHs) generated by barbecuing, found in cruciferous vegetables such as broccoli, Brussels sprouts can induce the activity of CYP450 (cytochrome p450 isoenzyme).

Enzymatic inhibition: Grapefruit juice is an enzymatic inhibitor of CYP3A4. Pineapple juice inhibits CYP2C9, starfruit inhibits seven cytochromes.

Local blood flow modification: The Serum levels of drugs with high hepatic extraction ratio, administered daily, are increased when administered after a meal rich in protein.

Modification of the metabolism by the lymph circulation: A high fat meal increases the bioavailability of lipophilic molecules by modifying their solubility by the action of bile salts, reducing the first pass effect through absorption via the lymphatic way.

Modification of the elimination:

Change in urinary pH: Food does not significantly alter urinary pH but potentiates other factors affecting urinary pH, especially sodium bicarbonate.

Changes in renal clearance: A big protein content in a meal increases renal blood flow, creatinine clearance and glomerular filtration of drugs.

Pharmacodynamic drug interactions

Influence of biogenic amines in foods:

The combination of isoniazid to food rich in tyramine is not recommended. NSAIDs predispose to the appearance of histamine urticaria.

Influence of diet in patients on anticoagulants: Food containing vitamin K (beets, Brussels sprouts, broccoli ...) should be eaten with caution in order to not unbalance the treatment and obtain the desired INR.

Influence of potassium: The patient should monitor his food intake of potassium in association with drug-induced hypokalemia (thiazides) or hyperkalemia as potassium-sparing drugs (NSAIDs).

Influence of licorice among a hypertensive patient: The hypertensive person or patients on corticosteroids or treated by drug-induced hypokalemia must not consume too much licorice.

Influence of fiber content in case of hypercholesterolemia: In France, the goal of health-nutrition national program (PNNS) is to increase by 50% consumption of fibers for people with high cholesterol levels.

Influence of the sulfites content on asthmatic patients: An asthmatic intolerant to sulfites should avoid the consumption of wine, products containing sulfites such as dried fruit, preserves, cider, dehydrated potatoes.

Influence of thioglycosides content on thyroid insufficient patients: Thioglycosides inhibit the penetration of iodine, causing a decrease in the thyroid hormones synthesis.

Influence of the fluorine content on children: Any prescription of fluoride supplementation should be preceded by a daily assessment of fluoride quantifiable sources. The administration of fluoride supplements should be away from meals, dairy products, and preferably at bedtime or 1 hour before meals.

CONCLUSION

A rigorous study of the involved mechanisms, allows a best managing these interactions without harming the efficiency of drug therapies and providing optimal nutrition.

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