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Nutrients: All About Absorption

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Knowing how your body absorbs nutrients can help you fuel Your workouts — and your life.

Before I knew better, I thought caffeine was one of the major food groups. A hit first thing in the morning, followed by several more throughout the day, and I was the queen of productivity. Afternoon slump? No problem. Another cup of joe and I was perky as could be. I'm a dyed-in-the-wool vegetarian and an exceptionally healthy eater, but I was convinced that every healthy meal I painstakingly planned would go down a whole lot better with some caffeine.

Now that I'm more nutritionally enlightened, I've loosened the grip on my coffee cup — a little. I learned that caffeine can reduce nutrient absorption, so this coffee/tea/diet soda fixation was actually robbing my body of some of the nutrients I was so careful to eat. But the more important message that this tidbit brought to my attention is this: Consuming the right foods is not the end of the nutritional story, and just because something makes it to your stomach doesn't mean your body will actually use it as you intended.

"Whether they're from food or supplements, nutrients aren't technically in your body until they've been absorbed," explains Stella Volpe, PhD, RD, associate professor of nursing and Miriam Stirl Term Endowed Chair in Nutrition at the University of Pennsylvania. "Until absorption, things are just passing through."

In other words, optimizing your nutrition involves more than worrying about what you eat. You also need to get a handle on what happens to nutrients once they're down the hatch. Why? Because poor nutrient absorption can lead to a number of ailments, such as osteoporosis, anemia, diarrhea, acne, dry eyes and poor energy production, says Volpe.

Of course, these health challenges have other causal factors, too, but optimizing your body's nutritional absorption reduces your risks of nutritionally based problems across the board. In short, proper absorption gives you more bang for your nutrient buck, and that, in turn, supports greater health and more energetic workouts.

What, Where, How?

Your body absorbs two types of nutrients: macronutrients and micronutrients. Macronutrients (carbohydrates, proteins and fats) are your body's direct fuel or energy sources, whereas micronutrients (vitamins, minerals, etc.) indirectly influence available energy by serving as catalysts to release the macros. But unless they're efficiently absorbed, none of the nutrients can fulfill their duties optimally.

The journey of absorption begins with digestion. After food is chewed and broken down by enzymes in your saliva, it travels into your stomach. There, digestion intensifies through the action of hydrochloric acid as well as enzymes like protease (which breaks down protein), lipase (which breaks down lipids or fats) and amylase (which breaks down carbohydrates).

Some types of nutrients take longer to digest than others (e.g., fat and protein take longer than carbohydrates because enzymes that begin to break down carbs are released earlier in the digestive process). But according to nutrition expert Earl Mindell, PhD, coauthor of *Earl Mindell's New Vitamin Bible* (Warner Books, 2004), a properly chewed "ordinary" meal containing a little bit of everything — carbs, proteins and fats — leaves the stomach in approximately three to five hours.

Keep in mind that while your stomach is certainly a hotbed of digestive activity, virtually nothing (except alcohol) is absorbed there. Your small intestine, the next stop, is the site of virtually all nutrient absorption, including proteins, carbohydrates, fats and water, as well as vitamins and minerals.

There are two primary ways that nutrients cross through the walls of the small intestine and enter the bloodstream: passive diffusion and active transport absorption. "Think of passive diffusion as pouring liquid through a cheesecloth," says Volpe. It's a simple process where nutrients move from an area of high concentration (from inside the intestine) to an area of low concentration (the bloodstream). Active transport absorption means that the nutrient requires a helper or carrier molecule to get it through the intestinal wall out into general circulation.

Although some nutrients are more prone to one type of absorption than the other, all vitamins — including fat-soluble ones (like A, D, E, and K), and water-soluble ones (like B and C) — are absorbed through passive diffusion, according to Bill Wheeler, BS, MS, PhD, ACSM, a nutritional consultant for professional and Olympic athletes. Minerals like calcium and magnesium, on the other hand, are transported actively. Yet many nutrients can be absorbed more readily than

others, depending on what kind of food they're coming from, and also on the body's current nutritional status and relative need for that nutrient.

The less your body has of a specific nutrient, the more readily it will be absorbed. "For instance," explains Wheeler, "if you have a deficiency in, say, vitamin B6, your body will aggressively absorb that nutrient from your food source."

But you generally don't have to worry about absorbing more nutrients than you need. That's because your body constantly strives for homeostasis, a physiological term for balance. "Your body will not absorb more of a given nutrient than it requires," explains Volpe. "When levels are low or you're deficient, your body tries to regain homeostasis by absorbing more of whatever is needed. Once that balance is reached, absorption will again be decreased in order to maintain the appropriate level."

Nutrient Absorption Dynamics

In addition to your body's current nutritional status, there are many other factors that influence how well your body absorbs what you feed it. Here's a look at a few key variables:

1. **Stress:** "A lot of people have digestive problems like indigestion and heartburn, and much of that is related to stress," says Mindell. These conditions are common byproducts of our body's biochemical response to being on constant, low-grade "fight or flight" status, he explains. Because this bodywide nervous-system response is antithetical to digestion (and most nonemergency bodily functions), it negatively affects absorption. Many people take antacids to reduce their symptoms, but antacids can also decrease absorption of some nutrients, so taking them can be counterproductive. A better plan, most integrative health experts agree, is to reduce your exposure to sources of stress — or adjust your attitudes and responses to better deal with the circumstances you can't change. This can relieve indigestion and heartburn and thus restore normal absorption.
2. **Drugs:** Nutrient-drug interactions can work both ways. For example, corticosteroids, often prescribed to reduce inflammation from sports injuries, decrease absorption of calcium and vitamin D. On the other hand, grapefruit and grapefruit juice can enhance the absorption of some pharmaceuticals like Tegretol (an anticonvulsant) and Zocor (used to treat high cholesterol), which may result in toxic levels. Mindell says that any drug has the potential to affect nutrient absorption, so it's best to check with your doctor or pharmacist to find out if your medications could be a culprit.
3. **Alcohol:** Even when nutrient intake approaches the recommended daily amount, alcohol consumption can cause deficiencies, writes Elizabeth Somer, MA, RD, in her book, *The Essential Guide to Vitamins and Minerals* (HarperResource, 1996). According to Somer, alcohol damages the lining of the stomach and small intestines, altering or reducing absorption of vitamins and minerals. A 1993 report from the National Institute on Alcohol Abuse and Alcoholism confirms Somer's findings and adds that alcohol also inhibits the breakdown of nutrients by decreasing secretion of digestive enzymes. The recommendation? Keep alcohol to a minimum.
4. **Caffeine:** You don't necessarily have to give up your morning coffee in order to absorb nutrients, but do wait at least an hour between consuming caffeine and meals or supplements. Iron is one nutrient particularly affected by caffeine, warn Somer and her coauthor Robert Garrison Jr., MA, RPh, in their book *The Nutrition Desk Reference* (McGraw-Hill, 1998). They note that caffeine can reduce iron absorption by up to 80 percent. Consider substituting non-caffeinated versions of coffee, tea and other drinks when you can. Volpe also suggests you soften caffeine's effect on absorption by simply adding a couple of tablespoons of milk or cream to coffee or tea.
5. **Exercise:** Intense exercise can be great for body and soul, but a tough workout (above 75 percent of your maximal oxygen uptake [VO₂ max]) can affect how efficiently you soak up nutrients. "In the long run, working out improves intestinal motility, which is a major benefit for colon health," says Annette Dickinson, PhD, president of the Council for Responsible Nutrition. "But when your body is busy trying to divert blood and nutrients to working muscles, it can't also stay focused on digesting and absorbing your food." That's why it's important to wait a couple of hours between consuming your meals and moving on to your workouts. Note that because intense exercise increases your need for fluid (after about 20 minutes) and electrolytes (after about an hour) to replace the vitamins and minerals lost by sweating, sports drinks are an exception to the don't-eat-and-exercise rule. And carbohydrate drinks may also be needed during endurance events to prevent fatigue. (For more information about timing meals around workouts see "Fueling for Fitness" in our July/Aug. 2004 issue.)

If you don't give your body the time it needs to absorb nutrients properly, you won't get a topnotch workout. "If a person's system fails to properly absorb any type of ingested nutrient, macro or micro, exercise performance can and probably will be negatively affected," says Volpe. "That is because the macronutrients — carbohydrates, fats and proteins — are all used for energy. And micronutrients, such as the B vitamins and other vitamins and minerals, although not used for energy directly, are still used in the metabolism of energy production." So a deficit in any of the nutrients means a less-than-optimal energy supply, and your workout will suffer as a result.

A Little Friendly Competition

Another common issue is nutrient competition. It's true that some nutrients jockey for position during absorption. For example, calcium interferes with iron uptake, and copper and zinc as well as zinc and iron can also duke it out, says Katherine Tallmadge, MA, RD, national spokesperson for the American Dietetic Association and author of *Diet Simple: 154 Mental Tricks, Substitutions, Habits & Inspirations* (LifeLine Press, 2004). But don't get too hung up on analyzing all the nutrient interactions. "I think you can obsess too much over how you combine nutrients," says Dickinson. "Some people schedule their intake of different foods at precise times throughout the day to avoid any conflicts, and that's definitely taking it too far."

After all, Mother Nature packaged nutrients together, so is it really necessary for you to separate them? There are cases where you may need to supplement with a single vitamin or mineral. For example, your doctor may recommend iron supplements to correct anemia; female athletes or older people often need extra calcium; and experts recommend that women of childbearing age take extra folic acid to prevent some types of birth defects. But unless there's a medical reason to do it, Mindell says, taking high doses of single vitamins or minerals (e.g., 10 times the recommended daily intake) throws off nutritional balance and increases the likelihood of nutrient competition. (Slightly boosting your intake of individual vitamins or minerals, however, is OK, according to Mindell.)

For the most part, the benefits of combining nutrients in foods, or in a multivitamin/mineral supplement, outweigh any effects from competition, explains Mindell. Consider, for instance, that vitamin C greatly enhances absorption of iron and vitamin D improves calcium uptake. Because of these and other positive nutrient interactions, he says that combining vitamins and minerals in a multi means you don't need as much of a given vitamin or mineral to receive the same benefit. (See "Sure-Fire Supplements" below for recommendations on how to improve supplement absorption.)

Nutrient absorption is one of many miraculous actions your body does behind the scenes to keep you healthy, and if you're like I was, you've probably always taken it for granted. Luckily, you don't have to remake your life to significantly improve how your body handles what you feed it. Follow the guidelines outlined here, and you just may find it a whole lot easier to get what you need.

Victoria Freeman, PhD, is a frequent contributor to *Experience Life*.

SIDEBAR:

Sure-Fire Supplements

For the most part, vitamin and mineral supplements are absorbed the same way as whole food. Still, there are steps you can take to ensure they don't run into any interference.

Bioavailability: This refers to how well a supplement tablet or capsule disintegrates during digestion. Regardless of how potent a product is, if it doesn't break down easily, your body can't use it. Annette Dickinson, PhD, says most supplements break down properly, but for extra assurance look for the United States Pharmacopeia (USP) or NSF International seal, or a manufacturer statement regarding disintegration time. A supplement passing a USP or NSF review has been tested and deemed satisfactory for disintegration ease.

Chelation: Chelation (wrapping a substance in amino acids) is a process that enhances bioavailability of minerals, but experts differ on their actual effectiveness. Earl Mindell, PhD, asserts that chelation greatly improves mineral absorption and that amino-acid-bound chelated minerals are absorbed three to 10 times better than nonchelated ones. But Dickinson cautions that if the process is not done correctly, chelation can actually decrease or even block absorption. "You can chelate a substance so that it is never absorbed," she explains. Kathleen Pompliano, MS, RD, recommends supplements that have the NSF label, which indicates that the product has been reviewed for effective chelation.

Dosage Size: Generally, absorption efficiency decreases as vitamin or mineral quantity increases, according to Dickinson. So if the recommended allotment of your supplement is three tablets daily, she suggests breaking up the doses throughout the day rather than taking them all at once.

Always Take With Food: Combining supplements with food slows down the transit time of the nutrients, and Dickinson says that in some cases the longer nutrients remain in the system, the higher the rate of absorption.