Calcium is the most plentiful mineral in the human body. Almost all of it—99%—is stored in the skeleton, where it serves to maintain healthy bones and teeth. But that’s not all it does. Calcium is also essential for the normal functioning of muscles, blood vessels, and nerves. Tiny amounts are dissolved in the fluid inside and outside every cell in the body. Too much or too little calcium can be deadly to those cells, so the body carefully controls its blood levels.

Occasionally, however, calcium buildup in soft tissues can cause medical problems or skew test results. For example, even if your blood calcium levels are normal, calcium deposits called calcifications may accumulate at the site of tissue damage. Women who develop these deposits or other calcium accumulations (kidney stones, for instance) may wonder whether they’ve been taking in too much of the mineral—in the form of supplements for bone health, among other things. Do they have good reason to worry about that?

In general, the answer is “no.” Researchers haven’t identified any direct links between calcium intake (via food or supplements) and soft tissue accumulation. So how does calcium get deposited beyond the bones? Here’s what we know so far.

**Breast calcifications**

Calcifications in breast tissue are found in about 50% of women over age 50 and 10% of younger women. There are no symptoms; you become aware of them only when mammography reveals white spots or flecks of various shapes and sizes. Most are benign, but some occur in conjunction with breast cancer, so a radiologist must determine whether a biopsy or further testing is needed.

Benign breast calcifications can form as a response to injury. When any part of the breast is damaged—by surgery, radiation, trauma, infection, or a cyst—fat cells die, releasing fatty acids that combine with calcium to form deposits. For example, calcification may occur along the seat belt line after an accident (see photo at left) or in an area that has been irradiated to treat breast cancer.

Calcifications can also occur in the glandular tissue where milk is produced (the lobules) and in the ducts that carry milk to the nipple. Even when you’re not pregnant or breastfeeding, the lobules secrete small amounts of calcium-containing fluid. If that calcium crystallizes, it may show up on a mammogram. Calcifications in the lobules are sometimes widespread, but almost always benign. Calcifications in the ducts, on the other hand, are occasionally a sign of preinvasive ductal carcinoma in situ (DCIS).

There are several reasons for the connection between calcifications and breast cancer. In DCIS, for example, cancer cells in the center of the ducts can die because they lack access to blood and nutrients, leaving a calcified line along the path of the duct. Calcifications may also be associated with invasive cancer in areas where cancer cells have died.
Calcium continued

in damaged connective tissue between cancer cells, and in places where DCIS calcifications are present as well.

In general, microcalcifications (less than 1 mm across) are more suspicious than macrocalcifications (more than 2 mm across), and tightly clustered deposits more so than more dispersed ones. If your doctor believes there’s any chance of malignancy, she or he will recommend a biopsy. (The vast majority turn out to be benign.) Other imaging techniques are of limited value in visualizing calcifications.

Consumption connection? Calcium intake through diet and supplements is not associated with benign breast calcifications. Moreover, a 2009 study of more than 60,000 Swedish women found that greater calcium intake did not raise the risk of breast cancer.

Cardiovascular calcification

Calcium can accumulate in the arterial plaque that develops after an injury to the vessel wall. The plaque is usually soft to begin with, but eventually tends to harden and become calcified. In addition, blood vessel cells themselves sometimes convert into bone-forming osteoblasts, producing extra calcium on the spot.

Coronary arteries. People with arterial calcifications are more likely to develop heart disease, but it’s unclear whether calcified plaque is more likely than soft plaque to rupture and cause a heart attack.

The risk of coronary artery disease can be predicted by the amount of calcium in the coronary arteries, as measured by CT scanning—even after correction for other heart disease risk factors. But the American Heart Association does not recommend these heart scans if you can tell by your medical history or other risk factors that you are at low or high risk for heart disease. If you are at intermediate risk (a 10% to 20% chance of a heart attack in the next 10 years), a coronary artery calcium scan may help your doctor determine how aggressively to pursue therapies such as statins.

If you develop chest pain, scanning for coronary artery calcium may help determine whether heart disease is the cause. Echocardiography—a procedure that uses sound waves to create moving pictures of the beating heart—may reveal calcification of the aortic valve, which greatly raises the risk for coronary artery disease.

Brain-related arteries. In most patients who undergo brain CT scans, for whatever reason, the carotid (neck) and vertebral (spine) arteries show signs of calcification. These calcifications may be an independent risk factor for stroke: a 2007 study found that

Milk-alkali syndrome: Return of an old problem

Decades ago, ulcer patients were told to eat lots of milk and cream and take sodium bicarbonate (an alkali) to neutralize acid and protect the stomach lining. Some of these patients (2% to 18%, depending on the study) developed a life-threatening condition called milk alkali syndrome, characterized by high blood calcium, high blood pH, kidney dysfunction, and calcifications of the cornea, lung, and lymph nodes.

The syndrome pretty much disappeared when this ulcer treatment was abandoned, but it has recently re-emerged, mainly among women taking high doses of calcium carbonate in supplements as well as antacids such as Tums, which contain calcium carbonate. In a recent study, Texas researchers examined the charts of all patients admitted to a university hospital for high calcium levels between 1998 and 2003. After excluding patients with kidney disease and hyperparathyroidism, they found that milk alkali syndrome was the culprit in 9% of cases overall and 26% of those involving very high blood calcium levels. The syndrome is more likely to occur in people who consume more than 2,000 milligrams (mg) per day of elemental calcium—that is, the amount of calcium in the supplement rather than the amount of the supplement itself, which is usually calcium carbonate. (A 500-mg tablet of calcium carbonate typically contains 200 mg of elemental calcium.) Also at risk are women who combine high-dose calcium with vitamin D to increase its absorption. Dehydration, a risk for women with bulimia or chronic morning sickness, can also raise calcium levels by upsetting the blood’s acid-base balance. Read the label on your supplement and make sure you’re taking no more than the recommended amount: 1,200 to 1,500 mg of elemental calcium per day.
calcifications are especially common in people who have had a clot-related (ischemic) stroke.

**Consumption connection?** Evidence is limited, but calcium intake doesn’t appear to increase the risk of calcification in coronary arteries. In fact, a high level of calcium in the diet is usually thought to be beneficial to heart health, because it’s associated with lower blood pressure and lower weight. Recently, however, there have been some worrisome findings. Some studies (but not all) have found an increased risk of heart attacks among women taking calcium supplements. Researchers involved in 15 randomized trials of calcium supplements for various conditions are now pooling their data on adverse events among almost 12,000 people to look for any association.

**Vascular calcification in the breast**

Breast arterial calcifications (BACs) are common findings on a mammogram (see photo at right) and do not raise the risk of cancer. But could they signal calcification in other blood vessels, raising the risk of heart disease?

Women with BACs do have a higher risk of heart disease, but recent research at the University of Connecticut indicates that the presence of BACs does not predict the development of heart disease. Instead, it appears that aging is the common cause of both BACs and heart disease.

**Kidney stones**

The kidneys are key players in controlling calcium balance. Each day, about 10 grams of calcium filter through your kidneys; about 1.5% of it is excreted in urine and the rest is reabsorbed. Kidney stones develop when crystals separate from liquid in the urine and form a hard mass. The most common type is made of calcium oxalate. According to recent research at Harvard, people prone to kidney stones excrete about one-third more of their calcium intake in urine than people who don’t have kidney stones. They may be absorbing more dietary calcium and thus excreting more, or they may be losing calcium from their bodies, which raises their risk for low bone density as well as kidney stones.

If you develop kidney stones and your urine shows high levels of calcium, you may be prescribed a thiazide diuretic to promote the retention of calcium in bone and decrease its release into the urine. If there are high levels of calcium in both your blood and your urine, you may be tested for hyperparathyroidism, a disorder that disrupts calcium regulation and raises the risk of kidney stones.

**Consumption connection?** Many consumer Web sites and even some physicians suggest that people who have had kidney stones should lower their calcium intake to prevent a recurrence. They are incorrect. In fact, dietary calcium actually appears to reduce stone formation. Recently, researchers at Harvard Medical School reported that women who adopt a DASH-style diet—a calcium-rich regimen best known for helping to lower blood pressure—have a 40% lower risk of developing kidney stones. “We’re really excited about the DASH diet as a treatment for kidney stones,” says Harvard’s Dr. Eric Taylor. Dietary calcium has this effect because it binds with oxalic acid (found in spinach, tea, chocolate, and other plant foods) and prevents its absorption in the intestine. This means less oxalic acid for the kidneys to process and a lower risk of developing calcium oxalate kidney stones.

**Calcium in joints and tendons**

The synovial fluid inside your joints contains calcium, and so does the cartilage lining the joints. When that calcium crystallizes, the resulting tiny shards wear away the joint surface and spur the release of enzymes that further break down cartilage. Calcium-containing crystals are found in 60% of knee joints undergoing replacement surgery for osteoarthritis.

Calcium can also accumulate in tendons—especially the rotator cuff tendons of the shoulder—creating a condition called calcific tendinitis. The accumulation seems to occur where there is some kind of tissue damage or cellular change, although traumatic injury or overuse is not necessarily involved. The effects depend on the number, location, and size of the calcifications. Sometimes they cause no symptoms at all, but they can become inflamed, causing considerable shoulder pain and limited range of motion. Calcific tendinitis is treated with anti-inflammatory medications, moist heat, or ice to relieve pain and physical therapy to maintain range of motion.

Unlike calcifications in other parts of the body, tendon deposits are occasionally broken up and removed with a needle or by surgery (arthroscopic or open).

**Consumption connection?** Except in certain rare metabolic disturbances that raise blood calcium, calcification of joints and tendons is a local process that’s not influenced by calcium intake.

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