I've just turned fifty, my menstrual periods are stopping, and I'm worried sick that one of these days I'm going to break a hip and end up in the hospital. This happened to my mother without any warning when she was sixty-five. She didn't trip over something and fall. She was just walking across the kitchen floor when all of a sudden her leg gave way under her.

I've heard how important calcium is for strong bones, yet I can't drink milk because it gives me a stomachache and diarrhea. I'm afraid to take hormones; I think that's how mother got cancer. Besides, I don't believe in pills, whether they are prescribed by doctors or sold in health food stores. What a dirty deal! This is one of those times when I wish I was born a man.
What is osteoporosis? Everybody is talking about it these days.

Osteoporosis is a disorder related to aging, which is characterized by loss of enough bone minerals so that, even with little force, one or more bones can be broken. The more bone material that is lost, the greater is the risk of breaking your bones. Such a break is known as a fracture. Fractures due to osteoporosis are most common in the wrists, the backbone, and the hips, but they can occur in almost any bone in the body. Victims of this disease are not aware that anything is wrong because in the beginning osteoporosis is subtle and painless until a bone breaks. In some women, but certainly not all, the bones become so weak that they cannot withstand even minor physical forces encountered in daily living. Thus, a cough can break a rib, riding over a bumpy road can fracture a backbone, or nothing more than the weight of a woman's own body can cause her hip bones to crumble.

Osteoporosis sounds very serious. How common is it?

Osteoporosis is one of the most common bone diseases affecting women in affluent Western societies. It also occurs, but to a lesser extent, in aging men in those same societies. In fact, with all of the media coverage it has received during recent years, osteoporosis has become a household word. Even so, few people know very much about this condition.

Let me give you some facts about the disease as it occurs in the United States:
As many as 15 to 20 million persons are affected by osteoporosis in this country alone. It has reached epidemic proportions.

In women over age sixty-five, 35 to 40 percent have suffered from one or more osteoporosis-related fractures.

About 1.3 million fractures attributed to osteoporosis occur annually in people forty-five years and older.

Approximately 100,000 wrist fractures occur annually from osteoporosis.

Hip fractures are especially serious, with 190,000 occurring each year at a cost in excess of 1 billion dollars, and 80 percent of these fractures are in postmenopausal women.

For people who reach the age of ninety, 32 percent of women and 17 percent of men will suffer from an osteoporosis-related hip fracture.

At least 15,000 women die each year as a direct result of hip fractures. Of those who recover, only 25 percent regain full mobility.

The diagnosis and care of people suffering from this disease has become a 4-billion-dollar-a-year health business in the United States.

Women should rightly fear this epidemic disease that can shorten not only their stature, but also their lives.

**Does everyone eventually get osteoporosis if he or she lives long enough?**

Loss of bone material with increasing age does not occur uniformly, and some people actually gain bone in their later years. Furthermore, people in other societies of the world who observe different dietary practices and lifestyles suffer very rarely, if at all, from this bone disease. Therefore, osteoporosis should not be accepted as part of getting older.

**How do I find out if I have osteoporosis? Will an X-ray tell me?**

The strength of a bone is estimated from the compactness or density of the bone material as measured by a variety of methods. With most standard X-ray techniques, it is difficult to estimate bone density accurately. By the time the earliest signs of osteoporosis appear in an X-ray film, about one-third of the bone has already disappeared. Even then the diagnosis is based most often on the types of fractures that are seen in the X-ray film, rather than by how “thin” the bones appear to be in the picture.

Some doctors use a new method called a photon absorptiometry bone scanner to estimate bone thickness. Very small electromagnetic particles called photons are shot through the bone. The density of the bone is determined by the amount of photons it absorbs. Compact bone, being denser, absorbs more photons. As a result of public concern about this
disease, screening clinics are being established all over the country. The cost for annual screening is about 40 to 100 dollars per examination.

**How do the bones become so weak?**

Osteoporosis is an actual decrease in the amount of bone material. The loss includes minerals such as calcium and phosphorus, as well as the protein-rich structural material that forms the bed in which the minerals are deposited.

This generalized loss of bone material can occur under several different circumstances. Osteoporosis is found most often in women after menopause. However, immobilization of a person due to an illness or an accident, as well as certain metabolic conditions such as diabetes or kidney and thyroid diseases, and some medications, such as corticosteroids, can also cause significant bone loss that may lead to early and severe osteoporosis.

**You mentioned that most fractures occur in women past the menopause. How is this condition related to menopause?**

At the time of menopause, the ovaries’ production of the female hormones, estrogens, gradually ceases. As a result the menstrual periods become irregular at first and later stop altogether. Estrogens play an important role in bone metabolism. Bone material everywhere in the body is constantly being formed and broken down throughout life. Estrogens slow the rate of bone breakdown. But hormones do little to increase the rate of formation of new bone tissue. Because of this, giving estrogen pills to postmenopausal women suffering from osteoporosis will not cause bone tissues to regenerate to premenopausal levels; it will only slow the rate of loss from the remaining bone.

Maximum bone thickness is reached at around age thirty-five. After the age of forty a woman who is destined to suffer from osteoporosis loses about 0.5 percent of her skeleton per year. After menopause the rate of loss accelerates to 1 to 2 percent or more per year. The rate of bone loss is most rapid right after menopause, and then it slows down approximately ten years later. By the age of sixty-five 40 percent of the initial adult skeleton is gone.

When a women loses the function of her ovaries earlier than the normal age of menopause in most women, the loss of bone material is even more rapid and her condition is more severe. Usually this premature loss of ovary function is the result of surgery, radiation, or chemotherapy that has been used to treat some other illness.
Tell me more about osteoporosis in men.

The condition does occur in men, but in them it is less severe and rarely begins to appear before age seventy-five, whereas most women begin to show signs of the disease in their fifties and sixties.\(^9\) Men do not naturally pass through a period of rapid decrease in production of reproductive hormones that is comparable to menopause in women. The sustained levels of male androgen hormones and, to some extent, the greater physical activity of men help to maintain their bone strength longer than is likely with women.\(^{11}\)

I don’t understand how something as natural as menopause could be the cause of such a serious disease as osteoporosis. What really causes it?

The cause of osteoporosis involves many factors, but a flaw in the design for females is not one of them. What’s the sense in designing a body intended to last eighty-five years and then equipping it with a set of bones that holds up for only sixty years? We must conclude that osteoporosis is a disease, not an expected, natural condition in life. And, as with other diseases, a cause or causes must exist.

Racial background is considered by many investigators to be important because of the high incidence of the disease in American Caucasian women and its low incidence in Asians and African blacks.\(^7\) However, the protective effects of heredity are difficult to separate from diet and lifestyle. Rarity of osteoporosis in certain populations probably has little to do with their genetic strength. More likely it is a benefit passed on to successive generations through safeguards in diet and custom.

What kind of cultural differences would have an effect on osteoporosis?

Several factors in lifestyle and nutrition have been found to cause bone loss. Smoking tobacco, drinking alcohol and caffeine, and lack of exercise have been associated with greater than usual loss of calcium and other bone matter from the body.\(^{12-15}\) These factors, unlike age and gender, can be controlled and changed; therefore, they can be used as measures in the prevention and treatment of osteoporosis.

Most investigators have considered that the foods we eat exert the strongest influence on the strength of the bones we make.\(^{16}\) This should not be surprising. Each day we take in from one to five pounds of foods which provide the raw materials that our bodies use to function and grow. The building blocks for our bones also come from the foods we eat each day. Because the incidence of osteoporosis varies among different populations
that are following a variety of diets, researchers have looked to the kinds of foods that people eat for clues to the causes of weakness or strength of their bones.

**What nutrients have an effect on my bones?**

The important components of the diet that have been thought to affect the bones are vitamin D, phosphorus, fluorides, calcium, and proteins.

A deficiency in vitamin D has been suspected for a long time because of the important role this vitamin plays in bone metabolism. However, several reasons have been found to explain why osteoporosis is not a disease caused by vitamin D deficiency. In the first place, vitamin D is actually a hormone synthesized in our bodies by the action of sunlight on the skin. The vitamin D levels in a person's body are a direct result of the amount of sunlight received and are not dependent upon dietary sources of this hormone, which is synthesized in the body. Only under very unusual circumstances would someone fail to receive the small amount of sunlight that is required to produce adequate levels of vitamin D. Elderly people who are confined indoors would be most susceptible to vitamin D deficiency. However, even then the lack of vitamin D is not likely to contribute in any way to the development of osteoporosis.

Much research has been done on the treatment of osteoporosis with vitamin D. This approach has not met with success in reducing the numbers of fractures in patients with osteoporosis. Furthermore, vitamin D taken in excess is toxic and can cause serious illness. When used alone to treat osteoporosis, this vitamin can have a harmful effect because it is actually a potent hormone that stimulates reabsorption of bone material.

**I don’t know much about fluorides and phosphorus. How do they affect bones?**

Fluorides and phosphorus are simple chemicals that are incorporated in the bone structure along with calcium. The amount of each in the diet has an effect on bone metabolism. Fluoride salts are present in all natural foods and in some places they are present naturally in higher concentrations in drinking water, while elsewhere they are added intentionally to foods and water supplies. The fluoride element is one of the most effective stimulators of new bone growth, and people living in areas supplied with fluoridated water have greater bone densities than those who are not exposed to higher concentrations of this mineral. However, treatment of osteoporosis with fluoride supplements alone or in combination with calcium and vitamin D has been disappointing. Bone tissue formed under the influence of
large doses of fluoride appears to have less strength, as shown by the
unfortunate fact that this treatment fails to reduce the rate of fractures.20,23
A further disadvantage to the deliberate use of this mineral is that almost
40 percent of the patients who are treated with fluoride develop significant
side effects, including vomiting, bleeding stomach ulcers, and joint pains.24

Dietary phosphorus, present in all foods, is found in high amounts in
meats, dairy products, additives, and soft drinks. Problems of bone me-
tabolism develop when the intake of phosphorus is much greater than that
of calcium, and this imbalance has been suspected as a cause of bone loss
related to age.10 However, several studies have failed to show any deleterious
effects from high-phosphorus diets.10 Treatment of osteoporosis by changing
the calcium-phosphorus balance has been without benefit.10

What about calcium? I see advertisements wherever I look, telling
me to drink milk to keep my bones strong. Should I just force it down,
even if it makes me sick?

The latest recommendation from the National Institutes of Health to help
women prevent early bone loss advises them to consume 1000 to 1500
milligrams of calcium a day.1 This message has the solid backing of the
National Dairy Council and has also made millionaires out of manufacturers
and distributors of calcium supplement pills.

However, these recommendations for additional calcium intake are based
on conflicting data from studies on natural populations and experimental
groups of humans.3 In most published studies about calcium, the correlation
between dietary calcium intake and bone density has been weak or non-
existent.25,26 In other words, people who consume more calcium in their
diets have not been found to develop stronger bones than people who have
low-calcium diets. Studies actually have shown that an intake of 150 to
200 milligrams of calcium daily is adequate to meet the needs of most
normal people, even during pregnancy and lactation.27 The controversy
over recommendations of increased calcium intake will continue for a long
time because of one undeniable fact: most of the world’s population ingests
300 to 500 milligrams of calcium daily, which is much less than the
recommended daily amount of 800 milligrams now being promoted in the
United States. Nevertheless, those people receiving the smaller amounts
are able to grow and maintain normal adult skeletons.25

Let’s look at some of these values for comparison.
Osteoporosis

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>Milligrams (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum calcium need, determined by experiment</td>
<td>150-200 mg</td>
</tr>
<tr>
<td>Worldwide calcium intake in most populations</td>
<td>300-500 mg</td>
</tr>
<tr>
<td>World Health Organization recommendation for minimum intake for adults</td>
<td>400-500 mg</td>
</tr>
<tr>
<td>Food and Nutrition Board recommendation for the USA</td>
<td>800 mg</td>
</tr>
<tr>
<td>Recent proposal for USA by the National Institutes of Health</td>
<td>1000-1500 mg</td>
</tr>
</tbody>
</table>

It must be very confusing for you to see such a wide discrepancy in figures for our daily calcium needs. As we talk further, I shall explain why so much confusion has arisen over this basic dietary component.

All my life I have believed that added calcium, especially from dairy products, is necessary for my health. I thought that people living in third-world countries were deprived of good nutrition because they couldn’t drink three or four glasses of milk every day.

Throughout history, in every part of the world, people have had no trouble making bones that lasted a lifetime, without the need to include any dairy products or calcium pills in their daily diet until recently. Actually, the inclusion of dairy products in the diet had been limited to only a few people because of the lack of refrigeration or the cost of owning a dairy cow. But during the last century technology has advanced to the point where milk can be produced, preserved, and distributed to millions of people in Western nations. Now dairy products are available to most people living in developed countries; and, paradoxically, now too we have this outburst of osteoporosis.

If we examine the worldwide distribution of cases of osteoporosis today, we are struck by the fact that this disease is most common in countries where dairy products and calcium supplements are consumed in the largest quantities: the United States, Sweden, Finland, and United Kingdom. The occurrence of osteoporosis is rare in Asian and African countries, where milk is not consumed because it is not available or because of a very high incidence of lactose intolerance. As many as 90 percent of Asians and blacks have this inability to digest lactose, or milk sugar. People with lactose intolerance learn to avoid most milk products because they often develop diarrhea, stomach cramps, and intestinal gas from milk sugar. On the evidence of the distribution of osteoporosis in the many
countries of the world, we can conclude that eating dairy products does not appear to have a significant protective effect against whatever agent is causing this disease.

<table>
<thead>
<tr>
<th>Location</th>
<th>Hip fractures rate /100,000</th>
<th>Dairy intake grams/day/person</th>
<th>Protein intake grams/day/person</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>98</td>
<td>462</td>
<td>106</td>
</tr>
<tr>
<td>Sweden</td>
<td>70</td>
<td>502</td>
<td>89</td>
</tr>
<tr>
<td>Israel</td>
<td>59</td>
<td>315</td>
<td>105</td>
</tr>
<tr>
<td>Finland</td>
<td>44</td>
<td>711</td>
<td>93</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>43</td>
<td>455</td>
<td>90</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>32</td>
<td>95</td>
<td>82</td>
</tr>
<tr>
<td>Singapore</td>
<td>20</td>
<td>113</td>
<td>82</td>
</tr>
<tr>
<td>South Africa/Black townships</td>
<td>6</td>
<td>10</td>
<td>55</td>
</tr>
</tbody>
</table>

Worldwide, the incidence of osteoporosis has a direct correlation to the total protein, and especially, the animal protein intake of a population of people; the more animal protein consumed by the people, the more the osteoporosis in the population. Furthermore, a high consumption of dairy products offers little protection for the bones, since countries with the highest intakes of these products—United States, Sweden, Israel, Finland, and the United Kingdom—also have the highest rates of osteoporosis-related hip fractures. Likewise, a low intake of dairy products appears to in no way harm the bones since the countries with the lowest intakes of dairy products—Hong Kong, Singapore, and rural Africa—have the lowest rates of osteoporosis.28-31 (All numbers have been rounded off to whole numbers. Figures for hip fractures from some countries may actually be from the population of a large city in that country).
If calcium intake has no relation to bone strength, then why are so many people being told to take calcium pills and eat lots of dairy products?

Some studies have shown that bone loss is reduced when postmenopausal women are treated with daily calcium supplements. These are the studies that are emphasized whenever recommendations for increasing calcium intake are made. However, many other studies disagree with those findings and report no benefit to bone density from daily calcium supplements. Large doses of calcium have been given intravenously to women with osteoporosis, and even this aggressive therapy has not shown consistent benefit for the bones. The many studies showing no positive effects of calcium supplementation have apparently had little influence on advice we have received recently from health experts. Although undoubtedly one’s diet should be adequate in its content of minerals and vitamins, the present evidence is far from convincing that osteoporosis is effectively treated, much less prevented, with supplements of calcium in the form of tablets or milk products.

A recent study observed the effect of calcium supplements on the bones of 103 postmenopausal women. The calcium intakes these women received from the foods they ate were supplemented with 500 milligrams of calcium tablets per day. After two years, women who consumed less than 550 milligrams of calcium daily showed bone loss similar to that in those who took as much as 2000 milligrams per day. The investigators concluded that calcium intakes of 1000 to 2000 milligrams a day were ineffective in preventing bone loss in early menopause.

If I don’t get my calcium from dairy products or calcium pills, from what other sources can I get this essential nutrient?

Calcium is found in all foods, and the amounts are sufficient to easily supply enough of this essential nutrient to meet the requirements for growing children and adults. Many green and yellow vegetables and fruits give plentiful amounts of calcium. Meats, poultry, and fish are low in calcium unless you eat their bones. Dairy products, as we have all learned, are concentrated sources of calcium.

The primary source of calcium, as for other minerals, is the soil. Plants absorb minerals from watery solutions in the soil and incorporate them in their tissue cells to serve varying needs. Animals consume the plant parts and absorb the calcium from them. Humans have a highly efficient intestinal tract that, under almost every circumstance, will absorb the correct amount
of calcium to meet the body’s needs. The intestinal cells act as regulators of the amount of calcium that enters the body. The amount absorbed is relatively independent of the amount of calcium that is present in the foods eaten. When the calcium content of the diet is low, then a relatively higher percentage of this mineral is absorbed from the foods. If the diet is high in calcium, then a smaller percentage of the calcium is absorbed. But the body’s need is always the controlling factor regulating the entry of calcium into the cells of the intestinal wall.

I’ve heard that the fiber in plant foods prevents the calcium from being absorbed. Can too many vegetables can lead to calcium deficiency and osteoporosis?

Not only fiber, but also oxylates and phytates, which are found in high concentrations in plants, will combine with calcium and other minerals and prevent them from being absorbed. Experimental studies have shown that this combining action decreases the amounts of those minerals that the body can absorb. This concern is largely experimental and theoretical because actual cases of mineral deficiency caused by these components in vegetable foods are, however, almost nonexistent. While there is a suggestion that in actual living situations, increased consumption of cereals and vegetables will reduce the amounts of minerals that can be absorbed, the added cereals and vegetables themselves will increase the intake of calcium and other minerals, and thereby limit any deleterious effects on mineral status that might be caused by fibers or phytates in vegetable foods. A recent study found no evidence of mineral deficiencies in people maintained on long-term, high-fiber, vegetarian diets. The case for the adverse effects of fiber, oxylates, and phytates has been exaggerated way out of true perspective and unfortunately has become one excuse for many people who protest against adding more vegetables to their diet.

I couldn’t become a strict vegetarian. I’m still worried that I would get a disease from calcium deficiency if I relied only on starches, vegetables, and fruits for my calcium.

An important fact to remember is that all natural diets, including purely vegetarian diets without a hint of dairy products, contain amounts of calcium that are above the threshold for meeting your nutritional needs. In fact, the scientific literature states clearly that "calcium deficiency disease" due to a low calcium intake from natural diets simply does not exist. In other words, all diets provide adequate calcium to meet our health needs,
and for most people in the world today milk is not a part of their diet. The same is true for all adult animals. The guilty agent that causes osteoporosis is not a deficiency in calcium. Since every one of us takes in as much as or more calcium than he or she needs, the excess that is not needed is either passed out of the body with the feces or by way of the kidneys into the urine.

Do you know of any specific examples of people who live on a starch-centered diet and still have healthy bones?

Because of widespread famine in many parts of Africa, many of us have difficulty in thinking of those people as examples of good health. Nonetheless, in times of plenty most Africans eat a diet that gives them ample amounts of grains, vegetables, and fruits. The health of these people does offer an excellent contrast to that of people living in our society, who eat a diet centered on meats and dairy products. A specific example of people with strong bones who after weaning are raised on milk-free diets is the Bantu women of Africa. These women consume 240 to 450 milligrams of calcium a day which is present in grains, fruits, and vegetables. Those amounts are one-half to one-third the amounts of calcium that are consumed each day by American women. Not uncommonly, Bantu women bear as many as ten babies during a lifetime. And they nurse each child for ten months, which places a further demand upon their calcium needs. Yet even with this requirement for large amounts of calcium; and so low an intake by our standards, osteoporosis is almost unknown among these hardy women, and many live to an old age. An estimated 10 percent of the population is more than sixty years old; therefore, these Bantu women reach an age when osteoporosis would certainly appear if it were going to do so.

Couldn’t the low incidence of osteoporosis in blacks be due to their genetic makeup?

Heredity is not likely to be very important, because when African blacks move to affluent countries and change their diets and lifestyles, osteoporosis becomes common among them. Like almost everyone else living in the United States, black women choose a diet centered around meat and dairy products. Through generations of living in this country they have learned the general American way of eating that increases their calcium intake considerably, as well as their protein intake. The incidence of osteoporosis in black women approaches that of Caucasian women eating a high-protein diet.
What does increasing the intake of proteins have to do with bone loss?

An important point about the Bantu women is that their diet provides only about 50 grams of proteins a day. That is less than half the protein intake of most American women.

The first clue implicating proteins in the diet as an important cause of osteoporosis came from studies of different populations, such as Africans and Americans. The more proteins, especially those from animal sources, that are consumed by a group of people in a society, the greater is the incidence of osteoporosis in that population. This strongly positive relationship between protein consumption and osteoporosis is very different from the evidence that little or no correlation exists between strong bones and consumption of dairy products for their content of calcium. See chart page 68.

How does eating proteins damage the bones?

Proteins in excess cause the body to lose large amounts of calcium and other minerals, which are excreted through the kidneys into the urine. This loss is not compensated for by a sufficient increase in absorption of calcium from the intestines. The net result is that more calcium leaves the interior of the body than is absorbed into it. This creates a condition that is called a negative calcium balance. The measurement of calcium balance is useful because a reasonable correspondence exists between this value and bone loss in postmenopausal women. Therefore, studies of calcium balance in groups of patients can be used as one measurement of the influence of different nutrients on bone metabolism and to judge the effectiveness of various therapies in altering the rate of bone loss.

One common method of determining the calcium balance begins with measuring the total amount of calcium in the foods the subjects are to eat during the test period. Then, during the test, all urine and fecal material from each subject is collected and analyzed for calcium content. Calcium balance is calculated as the total intake minus the sum in the urine and fecal discharges. If this value is positive—that is, if the amount of calcium introduced is greater than the amount lost—the difference represents the amount of calcium that is added to the body and presumed to be stored in the bones. If the value is negative, this indicates that more calcium is lost from the body than is absorbed and that the bones are likely to be sources of this extra calcium that is lost.
I thought I needed lots of proteins in order to grow and be strong. Now you tell me that proteins can damage my bones. I need a whole reeducation about what to eat.

The idea that if a little protein is good then more is better is a common fallacy. The beef industry recently launched a big advertising promotion to tell us that "beef gives strength", taking advantage of the widely accepted myth that high-protein beef is a body-building food. Considering that the giants in the food industry, those marketing meats, dairy products and eggs, sell foods that are high in proteins, we can see why people continue to misunderstand the true place of proteins in their diets.

At most, an adult needs no more than 20 grams of proteins a day, or about two-thirds of an ounce. These proteins are needed to grow hair, replace skin, produce hormones, form tissue cells, and for many other uses. Most Americans consume 105 to 120 grams and more of proteins each day (different studies give a range of estimates). What happens to the excess 100 grams of proteins?

Excess calories from fats and carbohydrates are stored in the form of body fats, but there is no such storage system for proteins. If we did store proteins they would pile up in our muscles, and, after years of gorging on high-protein diets, most of us would resemble body builders, like Arnold Schwarzenegger and the Hulk.

What happens to those excess proteins if they are not stored?

Most of the proteins we eat are broken down into their component amino acids, which are the ingredients that pass through the intestinal wall into the bloodstream. Once they enter the blood, some of the amino acids are used for the body's various needs and some of the excess is metabolized in the liver into urea, a powerful diuretic. Many people who have tried high-protein diets in order to lose weight have experienced the diuretic effect of urea: they lose almost eight pounds of water weight during the first week.

When urea and amino acids enter the kidneys on the way to elimination in urine, they cause not only the loss of excess water but also the excretion of large amounts of minerals. One of the most important minerals lost in that way is calcium. The more proteins that are consumed, the greater is the loss of calcium. Researchers estimate that doubling the amount of proteins in the diet will increase by 50 percent the amount of calcium lost in the urine. Many experimental studies have shown that when healthy adults consume amounts of proteins representative of the amounts many Americans eat every day, a negative mineral balance develops.
to show you the results of some typical calcium-balance studies of people on low- and high-protein intakes.

### EFFECTS OF LOW AND HIGH-PROTEIN DIETS ON CALCIUM BALANCE

<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Calcium Intake (milligrams)</th>
<th>Balance with a low-protein intake</th>
<th>Balance with a high-protein intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.A.</td>
<td>500</td>
<td>+31</td>
<td>−120</td>
</tr>
<tr>
<td>M.H.</td>
<td>500</td>
<td>+24</td>
<td>−116</td>
</tr>
<tr>
<td>R.W.</td>
<td>800</td>
<td>+12</td>
<td>−85</td>
</tr>
<tr>
<td>N.J.</td>
<td>1400</td>
<td>+10</td>
<td>−84</td>
</tr>
<tr>
<td>H.L.</td>
<td>1400</td>
<td>+20</td>
<td>−65</td>
</tr>
<tr>
<td>Average</td>
<td>920</td>
<td>+19</td>
<td>−94</td>
</tr>
</tbody>
</table>

Low-protein diets contained 47 to 50 grams of proteins, and the high-protein diets offered 141 to 150 grams of proteins. Calcium balance figures are calculated for twenty-four hours. These studies used supplementary mixtures of proteins added to the normal diet in order to raise the protein content to higher levels.

In these experiments, the net loss of calcium for subjects eating the high-protein diet averaged a negative 94 milligrams per day. In order for a woman to develop osteoporosis, she'd need to maintain a negative balance of calcium of only 30 to 40 milligrams each day. Considering that the average protein intake in America is around 120 grams each day, and many estimates are higher, we can believe that most Americans are living each day in negative calcium balance and are losing more calcium from their bodies each day than they are absorbing from the quantities of food they devour.

Please note also from these studies that reducing the intake of proteins consistently leads to an average positive calcium balance; this positive balance means that loss of calcium from the bones has stopped. A further reasonable assumption would be that the positive mineral balances mean remineralization of the bones is occurring and thereby the reversal of bone loss.

These examples may start you thinking for the first time that stuffing yourself with more portions of all those favorite foods should no longer be your primary goal at the table. Only a very few ounces of chicken added to the other protein foods in your daily menus could easily swamp your system with enough proteins to cause a negative calcium balance. You can fill yourself up on rice and potatoes and still stay in a safe range of protein intake without the pangs of hunger. In terms of familiar foods, 50 grams of proteins could mean portions like any one of the following: 6 ounces of
Osteoporosis

chicken without skin, 7 ounces of broiled cod, or 1 2/3 cups of low-fat cottage cheese. In contrast, from vegetable sources fifty grams of proteins would be the equivalent of 25 medium boiled potatoes or 11 cups of cooked rice.

Will adding more calcium to my daily intake compensate for the loss of calcium caused by the proteins in my diet?

Increasing calcium intake may improve the balance, especially when a person is on a high-protein diet. However, the studies described here and others consistently show that even large increases in the calcium intake fail to compensate for the calcium losing effects of the proteins. Note in particular that a calcium intake in two of the studies of 1400 milligrams daily, which is consistent with the most recent recommendations by the National Institutes of Health, did little to resolve the negative balance caused by such a high protein level, as is consumed by many people in affluent countries. Investigators have shown that the body does not adapt over long periods of time to the calcium-losing effects of protein. And the losses go on day after day until the bones are so weak an affectionate hug fractures several ribs and a backbone.

On very high protein intakes of 225 grams a day it has been estimated that adults will lose 4 percent of their skeleton per year, even while taking 1400 milligrams of calcium a day. Although a diet providing 225 grams of protein per day offers more than most people would eat, even in affluent countries, many individuals do exceed this level. People on high-protein weight-reducing diets, body builders taking protein powders, and those who indulge a passion for eating chicken, beef, fish, and cottage cheese to the exclusion of vegetable foods are most likely to develop this alarming degree of calcium loss and consequent osteoporosis.

When a low-protein diet is consumed the amount of calcium given has little or no effect on calcium absorption through the intestine into the body. As these studies show, when the diet provides around 50 grams of proteins, an amount closer to our actual needs, all levels of calcium create a positive balance, and raising the intake of calcium makes no improvement in the balance.

I would like to emphasize that the calcium-losing effect of protein on the human body is not an area of controversy in scientific circles. The many studies performed during the past fifty-five years consistently show that the most important dietary change that we can make if we want to create a positive calcium balance that will keep our bones solid is to decrease the amounts of proteins we eat each day. The important change is not to increase the amount of calcium we take in.
Is it simply the diuretic effect of proteins that washes the calcium out of the body, or do proteins have other effects?

Other properties of proteins also affect calcium metabolism in the kidneys and in the bones. Proteins are made up of different combinations of approximately twenty assorted building blocks called *amino acids*. Some of these amino acids have a direct effect upon the tubules of the kidneys, preventing the reabsorption into the body of calcium that enters the tubules from the bloodstream. As a result, that soluble calcium is lost in the urine.

Proteins and amino acids are weak acids. These acids act by still another mechanism that prevents the reabsorption of calcium by the kidney. Also, as these weakly acidic proteins and amino acids enter the bloodstream, they must be neutralized to prevent them from causing harm to the body. To accomplish this, bone material must be dissolved to provide calcium and phosphates. The alkaline phosphate from this combination neutralizes the amino acids, and the freed calcium ions are available to be excreted by the kidneys and lost to the body.

Another adverse effect on calcium balance is caused by those amino acids which contain sulfur. All twenty of the common amino acids are made of different arrangements of the elements carbon, hydrogen, oxygen, and nitrogen. Three of these twenty amino acids also incorporate the element sulfur in their structures, and they have a very powerful calcium-losing effect on the kidneys. Animal proteins have an especially high content of sulfur-containing amino acids. Methionine is a typical sulfur-containing amino acid. Roughly twice as much of this amino acid is present in meats as in grains, and five times as much methionine is found in meats as in beans. In 1930, the first study was published that showed that in humans a diet with a high meat content caused the loss of large amounts of calcium and a negative calcium balance. And yet, fifty-five years later, our learned medical authorities are still pondering the cause of osteoporosis!

So you’re saying that too much protein is the most important cause of osteoporosis, and that animal protein is the worst of all. Are there any examples of people who eat lots of animal protein and have very “thin” bones?

One well-studied example is the Eskimos. The Eskimos’ traditional diet consists almost entirely of meats from fishes, walruses, seals, and whales, and it provides 200 to 400 grams of protein daily. Eskimos also eat plenty of calcium in fish bones; their intake is estimated to be as much as 2500 milligrams of calcium per day, which is a very large amount indeed. Both men and women, as they age, show early and large loss of bone material. Eskimos over the age of forty have an average of 10 to 15 percent less bone
than do comparable Caucasians in the United States. Eskimo women lose 10 to 12 percent of their skeleton per decade, compared with a 9.5 percent loss estimated for American white females. In general, Eskimo bones appear to be ten years older than those of American women. This condemns even more a high-protein diet when we consider that Eskimos have the protective advantage of being very active physically.

If all this information is this well supported by research, then why do so many health professionals ignore the effects of proteins and simply say that adding more calcium to our diet will prevent osteoporosis?

That is a simple question to ask and a difficult one to answer, when we consider what the scientific studies that have been performed to date show about the effects of proteins and calcium on our calcium balance. Consider these factors as possible influences upon present recommendations. To prevent bone loss by lowering the protein content in the diet is a therapy that the food industry, not to mention most consumers, just will not accept. Lowering the protein intake in our national diet would cause meat, egg, and dairy industries to suffer great economic hardship. Approaching the problem by ignoring the role that proteins play and recommending instead that we gulp down more calcium each day offends no established industrial interest. In fact, recommending more calcium boosts the business of the dairy industry and the companies that produce calcium supplements. Then, too, from the consumers' viewpoint, if high-protein foods are blamed for causing osteoporosis, we might have to give up all those tasty delicacies we've learned to love, like steaks, chicken, fish, and cottage cheese. Instead we'd have to like lower-protein grains and fresh fruits and vegetables. Some very big changes will be required from everyone if and when this issue ever comes to public and scientific attention, where it belongs.

Once I heard a dietitian say that even though the meats we eat are high in proteins, they contain lots of phosphorus that prevents calcium loss. Is this true?

Phosphorus will decrease the loss of calcium caused by the high protein content of a diet, but in most studies the improvement seen is not sufficient to correct the negative calcium balance and prevent the devastating effects on bones. Meat is high in both proteins and phosphorus. In most experiments, eating meat caused a negative calcium balance in subjects fed such a diet. Two recent studies have shown an increase of 23 percent or more in calcium excretion when tuna fish and other meats are added to the diet. Another experiment specifically designed to demonstrate the effects of phosphorus on calcium metabolism in human subjects, showed a 28 percent increase...
in calcium loss when a low-protein intake was raised to a high-protein intake, even when a high phosphorus level was provided by the diet.\textsuperscript{57} Again, the adverse effects of meat in a population are demonstrated by the exaggerated bone loss seen in Eskimos who eat little else besides meats.\textsuperscript{70}

Controversy over the effect of meats on calcium balance continues today because of the opinions expressed by one group of investigators whose work is supported by research grants from the National Livestock and Meat Board and the National Dairy Council.\textsuperscript{73,74} They claim that meats do not adversely effect calcium balance, presumably because of the high phosphorus content of the meats.\textsuperscript{73,74} The discrepancy in results between this group’s work and that of others has yet to be explained. However, the selection of the human subjects studied by these investigators has been criticized.\textsuperscript{10} Because of existing health problems with some of the subjects used in their experiments, a negative calcium balance may not have been observed as expected when meats were added to the diet.

Perhaps milk is a better source of calcium than pills. All my life I have heard that milk will build strong bones and teeth. Won’t drinking milk cause the calcium balance to become positive?

Although the effect of milk consumption on calcium balance seems like an obvious issue to investigate, almost no research has been done on this important subject. Actually, the first study done to determine the effects of milk consumption on the calcium metabolism of healthy postmenopausal women was reported in February 1985.\textsuperscript{75} This study, funded by the National Dairy Council, attempted to show the benefits of drinking milk for women susceptible to osteoporosis. However, the study’s results failed to show a significant increase in calcium balance when the diets of these women were supplemented with three 8-ounce glasses of low-fat milk daily for one year. According to these investigators, “...this may have been due to the average 30 percent increase in protein intake during milk supplementation.” In their scientific wisdom, they concluded by recommending a reduction in protein intake in the diet from other sources than milk (such as chicken and fish) in order to improve calcium balance. The women drinking the milk supplement were still in negative calcium balance after one year of taking nearly 1500 milligrams of calcium daily!\textsuperscript{75}

All my life I’ve believed that milk was nearly a perfect food. It’s hard for me to adjust to what you’re telling me now.

Let’s suppose you actually do need 1000 to 1500 milligrams of calcium a day and that this need is satisfied by drinking three or four 8-ounce glass of milk a day in addition to calcium in other foods you eat. Even if it is
recommended, so much milk could mean that as much as one-third of the calories in the diets of many older women would be derived from milk alone.

Taking dairy products in order to obtain the additional calcium invites some serious risks to health. Three classes of components in cow’s milk provide calories: fats, proteins, and carbohydrates. Each of these is associated with known health hazards. The fats are believed to be involved in the cause of heart attacks, cancer, and obesity; the proteins can cause food allergies, mineral imbalance, and possibly kidney damage; and lactose, the major carbohydrate in milk can cause a number of digestive problems in many people. \( ^{76} \) Dairy products are deficient for human needs in iron, fiber, as well as essential fatty acids, vitamin B1 and vitamin C. Also, dairy products all too often are highly contaminated with chemicals from the environment, bacteria and viruses. \( ^{76} \) In the United States more than 20 percent of the dairy cows are infected with leukemia viruses. \( ^{77} \) When these viruses are fed to chimpanzees, the experimental animals have developed leukemia. \( ^{77} \)

How can a food having so much potential to cause so many different illnesses in people be the source of a nutrient necessary for human health? Nature was never so unkind; only people prevent nature’s intentions. By observing the way in which milk is used by animals, we see that after the weaning period, no animals depend on milk for calcium, and no other animal living in a natural setting drinks the milk of another species.

Another concern with the multi-million dollar advertising campaign laid on us by the dairy industry is based on the fact that the increased consumption of fats from all those dairy products may decrease the incidence of osteoporosis in women in our country by a means no one in the dairy industry will point out: simply by increasing the number of women dying early in life from heart disease or cancer, long before they reach an age when they would be at risk for osteoporosis. Women who think they are sensible by choosing to eat the low-fat forms of dairy products are still contributing to their risks for food allergies, kidney and bone damage from excess proteins, and problems of lactose intolerance. \( ^{76} \)

I can certainly agree with you that my nutritional needs are not the same as those of a baby calf. So from now on I won’t drink milk. Will calcium pills hurt me also?

The human intestinal tract has built-in safety mechanisms that protect us from much of our dietary foolishness. When we drink cow’s milk or swallow pills loaded with potentially toxic minerals such as calcium, the active intestinal lining blocks the entry into our bloodstream of high doses
of this mineral that otherwise could kill us. Without this protection our blood calcium levels would rise, and soft tissues, such as those in muscles and kidneys, would develop calcium deposits. Calcification of the kidneys can result in kidney failure and early death.

"Calcium overdose" can actually be caused by a once-popular form of therapy for duodenal "stomach" ulcers called the Sippy Diet. This regimen consisted of antacids and milk products taken at alternate hours. The diet’s purpose was to lower the acid content of the stomach to speed healing of the ulcer. But, unfortunately the Sippy Diet led to a high level of calcium in the blood, an alkaline system, and calcification of the soft tissues. Apparently the antacids hindered the body’s ability to protect itself from the high calcium content of the dairy products.

Another recent finding with a few popular calcium supplements should discourage you from using certain products. This is the additional hazard of contamination with dangerous chemicals. Some brands of bone meal and dolomite contain harmful amounts of lead, arsenic, mercury, and other toxic metals.

Could taking an uncontaminated calcium supplement without antacids offer a little added benefit without causing any harm?

As I’ve mentioned, some studies have shown that benefits can be gained from calcium supplements taken daily, but only when people are on a high-protein calcium-losing diet. Because of the virtual absence of toxic reactions to calcium pills, you will not harm yourself by taking daily an additional 500 to 1000 milligrams of calcium in tablet or capsule form. Furthermore, the extra calcium is not likely to increase your risk of developing kidney stones. Also, as mentioned, if you have already learned the benefits of a diet sensible in protein content, then the additional calcium will simply pass on through the intestine.

The concern I have about calcium supplements is that people who take them will focus their attention on the wrong issues. Instead of concentrating on eating the right foods and being physically active, they may believe that a single pill swallowed each day will compensate for the choices of an incorrect diet and a disinclination to exercise. Also, as a minor point, for most of us the money spent on these calcium pills could be better used for other things.

Certainly I can see that we were never naturally intended to take calcium pills in order to keep our bones intact. And I find it just as hard to believe that taking estrogen pills daily is reasonable. Most of my friends are on these pills. Do you think I should be too?
Estrogen supplements definitely prevent bone loss in postmenopausal women. However, some studies have shown that once a woman stops taking the supplements her bones rapidly decrease in density, meaning that they lose calcium. Therefore, estrogen therapy to prevent osteoporosis appears to be a commitment for a woman to take this hormone for the rest of her life.

Once osteoporosis has begun, estrogen replacement therapy will do little or nothing to replace the lost bone material. The estrogens work by slowing down the rate of bone loss, not by increasing bone production. If estrogen therapy is not started within the first few years after the beginning of menopause, before a significant amount of bone is lost, then estrogens given after that will come too late to have beneficial effects for most women.

Are you trying to tell me that all postmenopausal women should be taking this hormone?

No! The present trend among physicians to prescribe estrogens is causing millions of women numerous health problems. The addition of daily estrogens stimulates, beyond the intended period for a ‘normal life,’ the uterus, breasts, and ovaries, and thereby increases the risk of developing cancer in these estrogen-responsive organs. The risk depends on the duration of treatment and the dosage of estrogens. The evidence for the relationship between estrogens and the development of uterine cancer is very well established: risk levels are estimated to be as much as 5 to 14 times greater for women receiving estrogens than they are for women not receiving the hormones. This means that an additional forty to fifty cases of cancer of the uterus can be expected in every 1000 women who take estrogen pills for fifteen years. Compare that figure with the five to ten cases of uterine cancer that occur in untreated women. Once the estrogens are stopped the risk of cancer decreases over the next two years to non-user levels.

Furthermore, gallbladder disease occurs two to three times as frequently in women receiving estrogen therapy as in those not taking it. Some evidence also suggests that the risk of cardiovascular complications, such as strokes and heart attacks, is increased with this form of therapy. However, other evidence does not support these predictions.

Estrogen supplements have been found to cause or worsen diabetes and high blood pressure in some women. These hormones are also found to increase the likelihood of a woman developing inflammation and blood clots in the veins which can lead to pulmonary embolism, where blood clots travel to the lungs, and can cause death.

Estrogen therapy to prevent osteoporosis also has a few other important
drawbacks. Because of the increased risk of endometrial cancer, women being treated will need biannual uterine biopsies to check for any evidence of such cancer. A uterine biopsy is a painful procedure and few women will permit its repetition for screening purposes. Most women will suffer also from the nuisance and discomfort of a lifetime of monthly menstrual periods while they are taking the popular program of estrogen therapy that includes a combination of female hormones. Frequent visits to the doctor’s office for refills of prescriptions can also be expected.

Because of all these adverse consequences, many doctors feel that the widespread use of estrogen replacement therapy in postmenopausal women is not really achieving the purposes for which it is designed. These doctors encourage diet and exercise as the first line of defense against osteoporosis.91

I’ve heard that I can take another pill in place of estrogen for one week in the month in order to prevent cancer of the uterus. Is this right?

The female hormone progesterone is commonly prescribed along with estrogen because of preliminary evidence that this combination will reduce the high risk of cancer of the body of the uterus.92 However, not enough studies have been done to assure physicians that the cancer-causing effects of estrogens are eliminated with the addition of progesterone.46 Sequential birth control pills which contain progesterone have not prevented the development of uterine cancer in young women.93

The recent popularity of prescribing progesterone along with estrogens may lead to more blood vessel disease, because progesterone raises the levels of harmful cholesterol in the blood.94 Furthermore, taking a pill every day leaves many women with the feeling that they are incurably ill. All considered, estrogens, even in combination with progesterone, are far from an ideal answer to the problem of premature bone loss in postmenopausal women.

How about younger women who have had their ovaries removed. Should they take estrogens?

When, as a result of surgery, radiation, or chemotherapy, a woman’s production of estrogens from her ovaries is interrupted before the normal time of natural menopause, then estrogen therapy may be indicated in addition to a healthy diet and regular exercise.95 However, for some women, especially those with cancer, the use of estrogens may be contraindicated. The estrogen pills will improve menopausal symptoms, known as hot flashes. These symptoms occur more intensely with the sudden ending to the production of estrogens after surgical removal of the ovaries. Estrogens
also prevent thinning and dryness of vaginal linings which make sexual intercourse painful.

Vaginal problems caused by the lack of natural estrogens may be treated with estrogen creams. The hormones in these creams are absorbed into the body, but in amounts much smaller than those from pills taken by mouth. Women who wish to continue an active sexual life after menopause may choose to use these vaginal creams. No association between vaginal estrogen creams and cancer of the uterus has been observed as yet. Benefits still must be weighed against the slight risks because of the internal absorption.

When a woman who has lost the function of her ovaries early in life reaches the age of natural menopause, at about the age of forty-six, then a decision should be made to stop taking the estrogen pills. Of course, the healthier low-protein diet and program of regular exercise must be maintained.

How do I prepare a diet low in proteins that will still provide all the proteins I need for body repair and functions?

According to the calcium balance studies mentioned earlier, this would mean lowering the intake to about 50 grams of proteins per day for most people. This level agrees with the recommendations for minimum daily requirements set by the Food and Nutrition Board of the United States, which are 47 grams for women and 56 grams for men. The World Health Organization suggests a lower minimum level of proteins per day: 29 grams for women and 37 grams for men. Both of these recommendations include safety margins to satisfy the protein needs of all people and actually are requirements set two to three times higher than the need for most healthy adults. Therefore, a level of protein intake that is healthy for your bones is also healthy for the rest of your body and easily satisfies all your protein needs.

The high-protein diet that causes experimental subjects to be in a negative calcium balance is realized when subjects are fed a synthesized protein mixture in addition to regular food. The natural proteins in food have less calcium-losing effect than these synthetic mixtures because of the phosphorus content in the natural foods and a decreased availability of the proteins in natural foods. Also, vegetable sources of proteins have less of an adverse effect on calcium balance because these foods are less acidic and lower in their content of sulfur-containing amino acids than animal sources of proteins. Actually, considerably more than 50 grams of proteins from vegetable sources can be eaten daily while still keeping most people in a positive calcium balance.

You won’t need a nutrition handbook to figure out the number of grams
of proteins you'll want in your daily menu. The margins for safety and effectiveness are really quite large when you plan a diet that is based on plant sources of food. First of all, it is virtually impossible to design a diet too low in proteins when you use unprocessed starches and vegetables, as long as you eat enough to satisfy your caloric needs. Second, basing your meal plan on starches, vegetables, and fruits and limiting the high-protein vegetable foods such as beans, peas and lentils will provide a low enough level of proteins to assure a positive calcium balance. Pick your favorite starch for the main part of your meal, such as sweet potatoes, white potatoes, rice, or whole wheat pasta. Add to that plenty of fresh fruits and vegetables. Red meats, poultry, fish, shellfish, eggs, and dairy products are quite high in protein and therefore should be kept to a rare feast in your diet.

A trend today is to select foods lower in fats in order to avoid obesity, heart disease, and cancer. Chicken, shrimp, tuna canned in water, low-fat cottage cheese, and skim milk have become “healthier” food choices for many Americans. However, animal foods promoted as being low in fat are just the very ones that are highest in proteins. In following the trend, many people are only trading the problems of artery disease for those of bone disease.

Look at these examples:

<table>
<thead>
<tr>
<th>FOOD</th>
<th>% CALORIES OF PROTEINS</th>
<th>% CALORIES OF FAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole milk</td>
<td>21</td>
<td>49</td>
</tr>
<tr>
<td>Skim milk</td>
<td>41</td>
<td>2</td>
</tr>
<tr>
<td>Cottage cheese (regular)</td>
<td>51</td>
<td>36</td>
</tr>
<tr>
<td>Cottage cheese (low-fat)</td>
<td>79</td>
<td>3</td>
</tr>
<tr>
<td>Pork</td>
<td>23</td>
<td>75</td>
</tr>
<tr>
<td>Beef</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>Chicken</td>
<td>76</td>
<td>18</td>
</tr>
<tr>
<td>Cod fish</td>
<td>89</td>
<td>5</td>
</tr>
</tbody>
</table>

Starchy foods, most vegetables, and almost all fruits have protein contents that are the most sensible for humans to eat. Important exceptions to this general rule are beans, peas, and lentils, which are starchy foods high in proteins. They should be restricted to one cup per day or less, on the average, for people without bone disease, and should be eliminated entirely from the diet of someone with osteoporosis who is attempting to make large improvements in their calcium balance. On the other hand, most
fruits are lower in proteins and can be eaten more liberally.

Let's take a look at the protein and fat contents of some fresh fruits and vegetables.

<table>
<thead>
<tr>
<th>FOOD</th>
<th>% CALORIES OF PROTEIN</th>
<th>% CALORIES OF FAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pears</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Sweet potatoes</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Oranges</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Rice</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Potatoes</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Corn</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Spaghetti</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Kidney beans</td>
<td>26</td>
<td>4</td>
</tr>
<tr>
<td>Lentils</td>
<td>26</td>
<td>3</td>
</tr>
<tr>
<td>Peas</td>
<td>30</td>
<td>4</td>
</tr>
</tbody>
</table>

One effective way to decrease protein intake is to use sweet "empty-calorie" foods containing little protein, such as sugar, honey, maple syrup, molasses, and fruit juices. However, some people will not be able to tolerate these simple sugars because of medical problems such as elevated triglyceride levels, hypoglycemia, or obesity. Tooth decay and the development of a nutritional imbalance can occur if these "empty-calorie" foods are used in too large amounts.

**Will exercise help prevent osteoporosis?**

Exercise is another very important factor in keeping your bones strong. People who are confined for a long time to bed because of illness or injury lose substantial amounts of bone. This loss is estimated to range from 200 to 300 milligrams per day. Astronauts in space, even for short periods of time, show a measurable loss of bone. Fortunately, bone lost as a result of immobilization is rebuilt when weight-bearing activities are resumed. Experimental studies show that postmenopausal women with "thin bones" can increase the density of their bones with a regular daily exercise program.

You must realize that once the factors that cause bone loss are corrected, the body has the ability to rebuild the bones as is clearly seen in cases of osteoporosis caused by lack of physical activity. However, lack of activity is not a major problem for most women. The excess protein content of their diets is the real villain. Therefore, correcting the negative calcium balance is most effectively accomplished by lowering the protein content of the diet. Daily exercise and proper nutrition provide the circumstances that will most
effectively strengthen bones weakened by years of poor diet and physical inactivity.

You're saying that even after my bones have been weakened through years of wrong eating and laziness, they will get stronger if I change my diet and exercise regularly?

Correcting the negative calcium balance is one of the major goals of all therapies for osteoporosis, including diet therapy. Many studies have shown that a positive calcium balance is easily achieved when the dietary protein level is decreased to around 50 grams a day, even on lowest calcium intakes. \(^{57-61,64}\) The effect of diet on people with severe osteoporosis was recently demonstrated in a hospital study. \(^{101}\) A high-protein diet and a low-protein diet were fed at different times to five patients with severe osteoporosis who had received no kind of treatment. A negative calcium balance of 64 milligrams a day was observed on the high-protein diet. On the low-protein diet the calcium balance was a positive 40 milligrams a day in favor of bone remineralization. The protein levels in this study and the results obtained are consistent with the many other studies that have been done on healthy young men and women. Then these investigators added estrogen and calcium supplements to the diets and found that the effects of these therapies on calcium balance were inconsistent.

I've heard that some doctors are giving another kind of hormone that comes from fish to treat osteoporosis. Does this work?

The hormone you're referring to is called calcitonin. The calcitonin concentrations are surprisingly higher than normal in postmenopausal women with untreated osteoporosis. \(^{102}\) Although this hormone is formed naturally in our bodies, the commercial product available in pharmacies today is derived from salmon and inhibits bone loss without the serious adverse effects of estrogens. However, calcitonin must be given daily as an injection, and local and generalized allergic reactions have been reported. This approach is experimental, and results from the studies performed so far are somewhat conflicting. \(^{103}\) The claim that calcitonin can prevent bone loss in patients with postmenopausal osteoporosis appears to be based on a single controlled study. \(^{104}\) This drugs acts by slowing down breakdown, similar to the effect of estrogens, and therefore can not be expected to rebuild lost bone.

The cost of the drug is 10 dollars a day, to which the cost of the injections must be added. And the therapy is given over a period of two years or longer, making it impractical for most people even if future evidence should show a definite benefit for those who suffer with osteoporosis.
I have read that exercise can stop a woman's menstrual periods and cause her to develop osteoporosis, and also that fat women have less chance of developing osteoporosis. How can this be?

These issues make sensational news stories, and there is a bit of truth in both. Very strenuous exercise, not just moderate daily exercise, reduces the ovaries' production of estrogens in some athletic women. This is often seen with long-distance runners. A decrease in menstrual function is especially common when the calorie intake of the diet is also inadequate. Menstrual periods stop or become irregular. And there is some evidence that these women are more likely to develop exercise-related fractures.

Estrogens are also part of the explanation of fewer cases of osteoporosis in overweight women. Body fat converts male hormones, called androgens, into estrogens. The more fat that is available, the more estrogens are produced. As we have discussed, estrogens decrease bone loss, and as a result these obese women have fewer osteoporosis-related fractures. Because of their extra pounds, they must carry around more weight each day, and that in itself may help to strengthen their bones.

Thus, one common factor for both of these apparently paradoxical situations is the estrogen levels in a woman's body. These issues should not lead anyone to making incorrect conclusions. Obesity is never a sign of good health. And remember, moderate exercise is always beneficial to health.

How can someone know if they are getting better from eating a low-protein diet and taking more exercise?

Determining success from these approaches is difficult. Tests for calcium balance are complicated and expensive. Sensitive measurements of bone density by the photon absorption test will show the benefit over a period of time, but equipment for this test is not readily available to most physicians even though the cost is quite reasonable. If available and affordable, then photon absorptiometry bone scanner tests every six months may give you valuable information on your progress. However, the most important information you can look for is fewer new fractures. Since treatment using a healthier diet and a little exercise is without cost or danger, there is no reason to delay.

I certainly don't feel like a helpless victim of osteoporosis now that we've had this talk. I really don't foresee any difficulty in changing my diet and lifestyle. I can clearly understand the value of this alternative approach.

You have learned enough about the ideal state of health and your nutritional
needs to avoid being conned by the commercial messages and advertising approaches that will do you little good, if any, and might do much harm. I’m sure you will no longer believe the self-proclaimed guardians of your health, who recommend quantities of milk and handfuls of calcium pills without considering the probable damaging impact on your health that these products can cause. You also understand that the risks from estrogen therapy may not be worth the potential benefits. However, as with all therapies, the patient has the most to lose or gain, whatever he or she does. Therefore, ultimately you will have to make the choice yourself.

Most people—and, sad to say, our health and dietary professionals are included among them—are focusing their attention on the minor dietary influences affecting bone metabolism. Although calcium, phosphorus, and fiber in the diet do have a small effect on calcium balance, the overriding determinant of calcium and bone metabolism in osteoporosis is the excessive amount of protein, and especially animal protein, in the foods most people eat.

Osteoporosis is not an inevitable part of growing older, but is rather a degenerative disease resulting from improper care of your body during your younger and middle years. Now that you know a better set of rules to live by, your efforts can be directed towards preventing osteoporosis by eating a proper diet and choosing to follow a healthful lifestyle.

Osteoporosis cannot be reasonably considered to be a disease from cow’s milk deficiency, a calcium pill deficiency, nor an estrogen pill deficiency. That it is a disease from too much meat and other high-protein foods and inadequate physical activity is a lot easier for us to believe. Until the dangers from eating excess amounts of animal proteins is recognized, when we plan our personal diets ourselves, and when national health policies are established by our guardian authorities, osteoporosis will continue to be a major disease of epidemic proportions for postmenopausal women in affluent societies.
Osteoporosis

- A low-protein diet is essential in preventing and treating osteoporosis.
- A low-protein diet is centered around a variety of starchy foods, with the addition of fresh or frozen fruits and vegetables:
  - Limit or avoid entirely high-protein starchy foods such as beans, peas, and lentils.
  - Unless contraindicated for other reasons, you may use "empty calorie" simple sugars in limited amounts. Contraindications would be sensitivity to sugar with resulting high triglyceride levels or hypoglycemia.
  - All animal products should be excluded initially. With improvement of osteoporosis or in healthy individuals about 1 cup on the average of beans, peas, and lentils can be used daily and high-protein animal products can be consumed on festive occasions, like turkey for Thanksgiving.
  - Moderate daily physical activity is very important in maintaining or regaining bone density and strength.
  - Avoid caffeinated beverages, alcoholic beverages, and smoking tobacco.
  - Estrogens should not be taken routinely by women as they pass through menopause. However, women who are unable to adopt a low-protein diet and daily physical activity must weigh the risks of taking estrogens with the probable benefits.
  - Estrogens should be taken by women who lose their ovarian function prematurely if there are no other contraindications.
  - Estrogen vaginal creams may be a small compromise acceptable to women wanting to remain sexually active after menopause.
  - The addition of 500 to 1000 milligrams of an uncontaminated calcium supplement to the above will do no harm, but probably no good, for anyone able to lower their dietary protein intake to a sensible level. Those unable to give up the high-protein foods will gain a slight benefit from the addition of calcium in the form of a daily supplement to their diet. Also, people with a diagnosis of osteoporosis may wish to include a supplement in hopes of gaining a slight additional benefit from the added calcium.
  - Dairy products should never be considered as the calcium supplement because of associated health hazards.
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