

Finding New Health Benefits for Vitamin K

Study links vitamin K levels to longevity.

Vitamin K, once thought important primarily for blood clotting, may have a much wider array of health benefits. One recent Spanish study reported that people with the highest dietary intake of vitamin K were at significantly lower risk of mortality from cardiovascular disease, cancer and all causes. And if you're not already consuming plenty of vitamin K—found in dark leafy greens, broccoli, Brussels sprouts and other vegetables (see box)—it's not too late to start: The study also found that people who increased their vitamin K intake were at lower mortality risk.

"This finding comes from the PRE-DIMED study," notes *Health & Nutrition Letter* editor Irwin H. Rosenberg, MD, "an important and authoritative trial in multiple European centers, which also supports the healthful benefits of the Mediterranean-style diet."

Publishing their findings in *The Journal of Nutrition*, researchers looked at data on 7,216 participants in the PREDIMED study who were at high risk of cardiovascular disease.

Participants completed detailed annual food questionnaires, from which their consumption of the different types of vitamin K was calculated. As an observational study, the research could identify associations but was not designed to prove cause and effect.

Over an average follow-up period of almost five years, participants with the highest intake of the most common dietary form of vitamin K (phylloquinone, sometimes called vitamin K1) were 46% less likely to die of cancer and 36% less likely to die from any cause than those with the lowest intake. Those who in-

creased their phylloquinone intake were at 48% lower risk of cardiovascular mortality, 36% lower risk of cancer mortality, and 43% lower risk of all-cause mortality. Increasing intake of the other common form of vitamin K, menaquinone or vitamin K2, was also associated with reduced cancer and all-cause mortality risk, but not lower cardiovascular mortality.

KEY TO CLOTTING: First identified as an essential nutrient in 1935, vitamin K was initially recognized for its role in promoting blood clotting. In fact, the "K" in the vitamin's name comes from the German word for "coagulation vitamin,"

Koagulationsvitamin. Scientists discovered that vitamin K helps blood to clot by activating certain proteins that are made in the liver. More recent research has found that vitamin K may also activate several other important proteins in the body.

Vitamin K's effect on blood clotting is why patients on blood thinners, such as warfarin (Coumadin), need to avoid fluctuations in their consumption of

foods high in vitamin K. Suddenly boosting your intake of spinach, broccoli and similar foods could decrease the effectiveness of the medication, while cutting back on those vegetables could mean your dose is now too high.

"Blood thinners are among the top 15 drugs prescribed in this country," notes Sarah L. Booth, PhD, director of Tufts' HNRCA Vitamin K Laboratory "and adverse drug events for these drugs account for some staggering numbers among the elderly."

But being put on blood-thinning medication doesn't mean you can never

eat green vegetables again, she emphasizes: "Work with your healthcare provider to have green vegetables in your diet that contain healthy nutrients but may not have the high amount and variability in content of vitamin K that the greens listed have. Paler leaves and other green plant-based products, such as peas, are still healthy but are not so rich in vitamin K. Also, there are ways to have modest amounts of those high vitamin K greens in the diet, such as spinach, such as including some raw spinach in combination with other plant-based foods."

Vitamin K is also found in some green fruits, such as kiwis and green apples (especially the peels), but not in amounts that should be of concern to those on blood-thinning medication. Booth adds, however, "One popular food item that is appearing more often on grocery shelves that may be of concern is green seaweed, especially if consumed in large amounts."

BY THE NUMBERS: Much of what we know about the content of vitamin K in the US food supply comes from research conducted in Tufts' HNRCA Vitamin K Laboratory. Phylloquinone (K1), found in leafy green and cruciferous vegetables, makes up about 90% of our dietary vitamin K. The body can also use K1 from the diet to synthesize menaquinone (K2), which takes several different forms. Menaquinone-4, for example, is found in most dairy products and poultry. Other types of K2 are found in fermented soybean products and fermented cheese.

The US Dietary Reference Intake (DRI) recommendation for vitamin K is 120 micrograms per day for men and 90 micrograms daily for women. True vitamin K deficiency—usually indicated by an inability of the blood to clot normally—is rare. But you still might not be getting enough vitamin K to enjoy its other, less well-studied health benefits: In a review of studies on vitamin K status among the elderly, Booth reported that although older adults seem to consume more vitamin K than younger adults,

many seniors still aren't getting the recommended daily amount.

CARDIOVASCULAR BENEFITS: Tufts researchers have also conducted numerous studies to explore the possible benefits of vitamin K beyond its role in blood clotting. They have recently found, for example, that older adults who have existing calcification in their coronary arteries have less progression of calcification if they receive supplemental vitamin K in amounts attainable in the diet.

In another study, blood levels of phylloquinone were measured in 296 participants with extreme coronary artery calcification progression and 561 randomly selected participants without the condition. Although the data suggested that low K1 levels were associated with greater calcification progression, the difference was not statistically significant. Low K1 was significantly associated with coronary artery calcification progression in antihypertension medication users, however. Booth and colleagues concluded, "Intervention trials are needed to determine whether improving serum vitamin K1 reduces coronary artery calcification progression, especially in hypertensive individuals."

Previous Tufts research has linked blood levels and dietary intakes of K1 to inflammation, another factor in cardiovascular disease. Researchers who looked at data from 1,381 participants in the Framingham Offspring Study, average age 59, compared vitamin K levels to 14 different biological markers (biomarkers) of inflammation. As blood levels and intake rose, those biomarkers of inflammation fell.

More recently, researchers reported that people who have high concentrations of biomarkers of inflammation have poor vitamin K status. Chronic inflammation has also been associated with a range of conditions that include arthritis, Alzheimer's disease and cognitive decline, and type-2 diabetes. Vitamin K may also help prevent diabetes by affecting blood-sugar control: In a three-year study, older men who received

vitamin K supplementation showed less progression of insulin resistance. And Tufts researchers have found that higher blood levels of vitamin K1 are associated with lower risk of osteoarthritis in the hand and knee.

BUILDING STRONGER BONES?: Scientists also continue to explore vitamin K's role in bone metabolism, which could be important to fighting osteoporosis and the fractures often associated with aging. One Japanese study, for example, compared dietary differences in various regions with data from a national survey on the incidence of hip fracture. Researchers found that people in areas where certain vitamin K-rich foods were consumed in abundance had fewer hip fractures. The opposite also proved true: People in regions where intake of vitamin K was lower had more fractures.

Another study, in the Netherlands, suggested that the menaquinone-4 form of vitamin K2 may help maintain bone strength in postmenopausal women, along with proven bone-boosters calcium and vitamin D. In the three-year study of 325 healthy older women, the researchers found that those taking daily supplements of menaquinone-4 maintained hipbone strength, while women on a placebo suffered weakening. While no benefit was seen for bone-mineral density, women in the menaquinone-4 group also showed better compression strength, bending strength, impact strength and femoral neck width than those in the placebo group.

But the National Osteoporosis Foundation <nof.org> says it's premature to recommend supplementation: "At this time, research does not support the practice of taking vitamin K supplements to prevent osteoporosis and broken bones. Taking a supplement doesn't always have the same effects as eating whole foods that contain that same nutrient. Also, because vitamin K plays a role in blood clotting, getting too much vitamin K could cause problems in individuals who take blood thinning medicines or are at risk of blood clots. More research will help us to deter-

TAKE CHARGE!

Food sources of phylloquinone, the most common dietary form of vitamin K, include:

- ◆ Mustard greens, 1/2 cup cooked—415 micrograms
- ◆ Turnip greens, 1/2 cup cooked—265 micrograms
- ◆ Swiss chard, 1 cup raw—299 micrograms
- ◆ Spinach, 1 cup raw—145 micrograms
- ◆ Kale, 1 cup raw—113 micrograms
- ◆ Broccoli, 1/2 cup cooked—110 micrograms
- ◆ Brussels sprouts, 1/2 cup cooked—109 micrograms

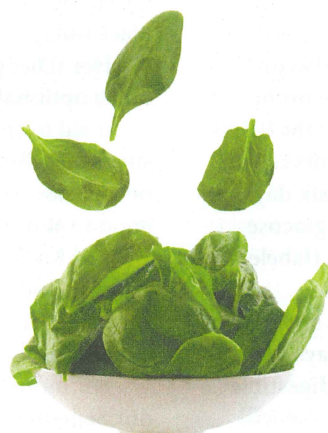
Source: USDA Nutrient Database

mine the amount and type of vitamin K that is necessary for bone health. Until we know more, try to get enough vitamin K from food sources."

WHAT'S NEXT?: Science continues to explore other frontiers of research on vitamin K. For example, Booth notes, "Menaquinone-4 is relatively high in brain tissue, but its exact functions are not known. In the future, if we identify functions unique to menaquinone-4, the presence of this form of the vitamin in meat and dairy foods may prove to be important."

The growing understanding of the role of vitamin K beyond blood clotting has led some researchers to call for increasing the recommended amounts for dietary intake. In 2001, the Institute of Medicine, which sets DRIs, slightly increased its recommended levels of vitamin K. At the time, however, the institute explained that there wasn't yet enough scientific evidence to justify larger increases.

As science continues to search for such evidence, the best advice is to get at least the recommended amounts from a healthy diet. Most of the foods highest in vitamin K are also packed with other important nutrients, so making sure your vitamin K intake is OK is bound to pay dividends.



Leafy greens like spinach are among the best sources of vitamin K. (Image © Thinkstock)