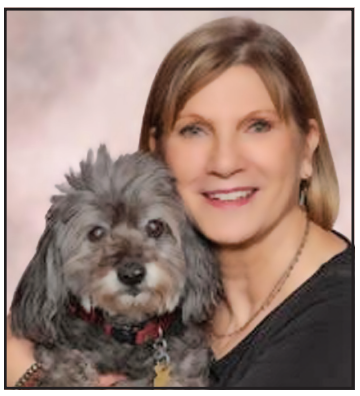
Exciting New Research on the Many Health Benefits of Vitamin K



Dr. Kate Thomsen and Silky

Vitamin K is one of the fat-soluble vitamins. The others are Vitamins A, D and E. Fat soluble means that these vitamins are circulated throughout the body via transport molecules made from fats. They will also move from the intestines into the blood most efficiently when taken with fatty foods. The body only stores very small amounts of Vitamin K in fat and in the liver and Vitamin K can be rapidly depleted without regular dietary intake. However, the body recycles Vitamin K – reusing it many times thus decreasing our dietary requirement. For many years we only knew that Vitamin K regulated the activity of clotting factors in the liver (Factors II, VII, IX, X and proteins C, S and Z). We knew that Vitamin K is needed for clotting to occur. We also knew that Vitamin K deficiency causes excess bleeding because sufficient clotting cannot occur.

Vitamin K was discovered by Henrik Dam, a Danish scientist. In the late 1920s he experimented with chickens fed a low-fat diet and found that they suffered from bleeding that took a long time to stop. His 1935 paper published in Nature, reports that the addition of hempseed to the chickens' low-fat diet prevented the excessive bleeding. Dr. Dam concluded that some substance in the hempseed was helping the blood to coagulate (clot) and named it Vitamin K (for Koagulation, Danish). The chickens fed a low-fat diet must have been bleeding due to a Vitamin K deficiency. In 1943 he shared the Nobel Prize with Edward Doisy for the discovery and chemical nature of Vitamin K.

All babies are Vitamin K deficient at birth. Vitamin K does not cross the placenta well in pregnancy and it is very low in breast milk. Vitamin K deficiency bleeding in babies can occur in their intestines or brains up to the time they are 6 months old when they can get Vitamin K from solid foods. In 1961 the American Academy of Pediatrics began routinely recommending Vitamin K be given to infants at birth to prevent Vitamin K deficiency bleeding.

Going back again in history there was, also in the 1920s, an outbreak of severe bleeding in cows that had undergone minor routine procedures such as dehorning. After much investigation, it was found that these cows in the Northern US and Canada were eating moldy hay made from the sweet clover plant. It took until 1939 for Dr Karl Link and his student Harold Campbell to isolate the offending anticoagulating (anti-clotting) compound. A molecule called coumarin (responsible for the sweet smell of freshly cut grass) is found in many plants including sweet clover. When coumarin interacts with certain fungi it forms dicoumarol which was preventing the cow's blood from clotting. Dicoumarol did this by preventing Vitamin K from recycling – creating a relative Vitamin K deficiency and it was a very strong one. From this knowledge, a less strong anti-clotting substance was synthesized and named warfarin. Warfarin, another Vitamin K recycling inhibitor, was only used as a rat poison until 1951. At that time a man attempting suicide, using the rat poison warfarin, was successfully saved by reversing the excessive bleeding with Vitamin K Soon after warfarin became a pharmaceutical with the trade name Coumadin and was marketed as an anti-coagulant or blood thinner. Coumadin was part of the treatment plan for President Eisenhower following his heart attack in 1955. Until recently Coumadin has been used as the major treatment for or prevention of blood clots in persons with venous thrombosis, pulmonary embolism, atrial fibrillation, and cardiac valve replacement. Newer "blood thinning" drugs have taken its place for reasons explained below.

Vitamin K is not actually a single compound but is the name of a family of compounds that share a similar structure: a ring structure with variable side chains. Vitamin K1 is called phylloquinone. Foods high in Vitamin K1 include the green leafy vegetables like spinach, kale, broccoli and cabbage and some plant oils such as soybean, canola, olive and cottonseed. (Olive oil is the only one of these oils I recommend) Vitamin K1 is poorly absorbed however, only about 10% makes it from the intestines into the blood. It has a short life and makes it to the liver to regulate the clotting factors but only a small amount will leave the liver for functions elsewhere.

Vitamin K2 is known as menaquinone and is mostly produced by bacteria. Intestinal bacteria metabolize K1 from plants into K2 in the human colon. Since all forms of Vitamin K are absorbed in the small intestines, this intestinal conversion of K1 in the colon is believed to be a minimal contributor to our requirements. There are several types of menaquinones named for the length of their side chains. Vitamin K2 as MK-7 is found in fermented products such as hard cheeses, sauerkraut and natto (a Japanese breakfast food made from fermented soy beans). Vitamin K2 as MK-4 can be found in butter, egg yolks, lard and other animal foods. Animals produce it from dietary phylloquinone or synthetic Vitamin K in animal feed. Vitamin K2 as MK-4 and especially MK-7 have been the focus of intense research in recent years.

Research on Vitamin K expanded in the 1970s when it's multifunctional nature was discovered. It was found that Vitamin K acts on a certain protein structure, changing it so that it can perform its function. There are at least 17 of these Vitamin K dependent proteins that have been identified to date. Of these, seven are involved with blood clotting, and several bind calcium, enabling it to move around. Some Vitamin K dependent proteins help deposit calcium (osteocalcin deposits it in bone) and some Vitamin K dependent proteins remove calcium from soft tissues (matrix Gla protein known as MPG in blood vessels). By this time, our many years of experience with Coumadin, a Vitamin K inhibitor, had shown what lack of Vitamin K looks like: an increased risk of osteoporotic fractures, arterial calcification, and overall mortality. From this, we understood more of what Vitamin K can do—the opposite of this!

Even though there are no official US recommendations to use Vitamin K2 to improve bone health there is accumulating evidence to do so. Studies have shown that Vitamin K2 improves bone quality which leads to a reduction in fractures even though bone density may not have shown improvement. A 2006 review of high-quality studies showed that Vitamin K2 reduced vertebral fractures by 60%, hip fractures by 77% and nonvertebral fractures by 81%. In 2004 the Rotterdam Study showed that Vitamin K2 prevents soft tissue calcification. In this study the participants who consumed the greatest amounts of Vitamin K2 had the lowest risk of cardiovascular disease, cardiovascular calcification, and the lowest chance of dying from cardiovascular disease. Vitamin K deficiency has been associated with an increased risk of osteoarthritis of the knee and cartilage lesions. Vitamin K2 supplementation reduces inflammation in rheumatoid arthritis as evidenced by a lower CRP (marker for inflammation) level. Animal and human studies have shown that Vitamin K2 supplementation improves insulin resistance. Early studies are showing a possible role for Vitamin K2 in cancer suppression and Vitamin K has shown a positive association with cognitive health.

This new research helps us understand the dreaded calcium paradox: how can one have both osteoporosis (too little calcium) and atherosclerosis (too much calcium) at the same time? This is Vitamin K deficiency. Vitamin K keeps calcium in its right place: bound to the surface of bones and teeth, not depositing in the arteries or making kidney stones or gall bladder stones, AND it keeps the blood clotting when it should. More to come on this, I'm sure.

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Integrative and Holistic Health and Wellness

- Adequate intake of Vitamin K for an adult (set by the Institute of Medicine) is 120mcg/day for a male and 90mcg/day for a female
- At risk of Vitamin K deficiency: persons with chronic kidney disease, fat malabsorption conditions (inflammatory bowel disease, cystic fibrosis), persons taking Vitamin K antagonist (Coumadin)**, persons on a low fat diet or taking Orlistat, Xenical, Olestra, cholestyramine, dilantin, long term antibiotic use, persons taking mineral oil

***If you are taking coumadin: discuss with your health care provider before increasing your Vitamin K-containing foods or supplements. You can affect your clotting risk.*

- Vitamin K deficiency symptoms: easy bruising or bleeding (nosebleeds, heavy menstrual bleeding, bleeding gums, blood in the urine or stool, black tarry stools). See a medical professional quickly. Vitamin K deficiency may also have no symptoms but still have long term consequences like osteoporosis, fractures, atherosclerotic plaque…
- Getting Your Daily Dose: Vitamin K1—eat 200 grams of vegetables per day; Vitamin K2 – eat some form of fermented foods daily (fermented vegetables like sauerkraut or half an ounce of natto) or raw dairy products such as hard and soft cheeses, raw butter, and kefir – all from grass fed animals. The Rotterdam study showed you need a minimum of 45 micrograms of Vitamin K2 daily to prevent arterial calcifications
- I recommend a supplement of Vitamin K as MK-7: 100 - 200 micrograms per day taken with a meal containing some fats

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