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## Vitamin K

Other common name(s): the clotting vitamin, vitamin K1, vitamin K2, vitamin K3

**Scientific/medical name(s):** 2-methyl-1,4-naphthoquinone, 4-amino-2-methyl-1-naphthol hydrochloride, AquaMEPHYTON®, Konakion®, menadiol diphosphate, menadiol acetate, menadiol sodium phosphate, menadione, menaquinones, menatetrenone, Mephyton®, MK-4, MK-7, phyloquinone, phytomenadione, phytonadione

## Description

Vitamin K is a group name for a number of related compounds. Each form can serve as an essential nutrient needed by the liver in order to form proteins that promote blood clotting and prevent abnormal bleeding. There are 3 basic forms of vitamin K: K1, K2, and K3, but there are subtypes as well. Vitamin K1 (phyloquinone or phytonadione) is a natural nutrient found in green leafy vegetables, such as lettuce, cabbage, collard greens, broccoli, spinach, and turnip greens. Okra, asparagus, prunes, and avocado also contain vitamin K1. Some oils, such as soybean oil, olive oil, and canola oil, contain smaller amounts of vitamin K1. Vitamin K2 (menaquinones or MKs) in foods are mostly in the form of MK4 and MK7. Small amounts of MK4 can be found in animal products such as meats and dairy products. MK7 is a natural product of bacteria that live in the human lower intestine. MK7 is also found in certain fermented products, such as cheese, and in large amounts in the Japanese soy product known as natto. Cooking does not remove the vitamin or stop its action. Vitamin K3 (menadione) is a potent synthetic (man-made) form of vitamin K that is not used in humans.

## Overview

Vitamin K is necessary for normal blood clotting and may be needed for other activities. The human body gets vitamin K from certain foods and bacteria that normally live in the intestines. Available scientific evidence does not support the use of vitamin K supplements for cancer treatment or prevention. However, a small clinical trial found that a vitamin K2 compound seemed to reduce the risk that liver cancer would come back after surgery. Later studies have not shown much effect, and vitamin K is now being tested along with other drugs to find out if that will help more.

How is it promoted for use?

Vitamin K is known mainly as a blood-clotting nutrient. But some alternative medical practitioners claim that vitamin K3 is also an anti-cancer agent. Others claim that high doses of vitamin K3 and vitamin C supplements can slow or stop tumor growth when taken together. Available scientific evidence does not support these claims.

Vitamin K is also promoted as an ingredient in some cosmetic or herbal creams to lighten redness caused by broken blood vessels and to treat skin irritation (burns and sunburns) and scarring. Promoters recommend that these so-called "clarifying" creams be applied to the skin every day for several weeks.

## **What does it involve?**

Healthy adults who eat plenty of leafy green vegetables generally get all the vitamin K they need from natural sources. The Food and Nutrition Board considers 90 micrograms per day for women and 120 micrograms per day for men to be an adequate intake (1 milligram is equal to 1,000 micrograms). Foods usually provide the body with about half of the normal supply of the vitamin, while intestinal bacteria produce the rest.

Only those who have symptoms of a vitamin K deficiency may need to take supplements. The signs of a deficiency include abnormal or excessive bleeding, such as frequent nosebleeds, abnormally bleeding gums, heavy menstruation, or blood in the urine or stool. People with symptoms like these should see their doctors, because these signs may also signal more serious problems. A deficiency may result from extended treatment with antibiotics, which can kill the bacteria that produce vitamin K; liver damage; or intestinal disorders such as celiac disease, cystic fibrosis, or removal of part of the intestine. Chronic malnutrition, including alcoholism, can also cause vitamin K deficiency.

Newborns lack the bacteria in their intestines to produce vitamin K and may be at risk of serious bleeding. Newborns are usually given vitamin K supplements, either as a shot or by mouth, while in the hospital. Babies who get supplements in the hospital do not need any more after they leave unless they have intestinal problems.

Phytonadione or phylloquinone (vitamin K1) and menaquinone (vitamin K2) supplements are available in tablet and capsule form from health food stores and on the Internet. Some K2 (menaquinone or MK) subtypes are sold by name. The U.S. Food and Drug Administration (FDA) does not allow menadione (vitamin K3) to be sold as a dietary supplement for humans, although it is allowed in some feeds for farm animals.

## **What is the history behind it?**

In 1935, a Danish scientist named Henrik Dam published his findings about a previously unknown substance that was required to form clots. It was named for the Danish and German words for clotting, Koagulations-vitamin. Since then, studies in the lab and on animals have tried to learn whether vitamin K plays a role in preventing the development or spread of cancer. To date, there is no convincing evidence available to suggest that it does.

Researchers in the 1990s began to worry about a possible link between childhood cancers, especially leukemia, and injections of vitamin K supplements in newborns. Further study has found no link between cancer and vitamin K injections. The American Academy of Pediatrics' latest recommendations advise that all newborns should receive the injection to prevent serious bleeding.

## What is the evidence?

There is overwhelming scientific evidence that vitamin K is required for normal blood clotting.

Some studies have suggested a link between low blood levels of this vitamin K and increased risk for some types of cancer. A large European epidemiologic study published in 2008 found higher risk of prostate cancer in men with low intake of some forms of vitamin K. But people who take in plenty of vitamin K usually get it from fruits and vegetables. This means that people who get lots of vitamin K from foods are more likely to take in many other vitamins and phytochemicals that can affect cancer risk. In some cases, vitamin K may be given credit for benefits that are actually due to other compounds that appear in the same foods. So studies like this, which only look at large groups of people, may not be very useful for looking at the effects of vitamin K intake.

There have been some studies examining whether menadione (vitamin K3) can help overcome cancer cells' resistance to certain types of chemotherapy drugs. Results in lab animals and cell cultures are mixed, but there is no evidence available of significant effects in humans yet.

An animal study done in 1998 found that a man-made form of vitamin K known as compound 5 might slow the growth of cancer cells. Since then, several more studies have suggested that this and other forms of vitamin K might be active against cancer cells in laboratory dishes or mice. Laboratory studies are pinpointing how these compounds work, with some finding that certain vitamin compounds seemed very active against liver cancer. Some clinical trials on humans have already begun. The goal is to find out whether vitamin K compounds can help in cancer treatment or prevention.

A small Phase I clinical trial in California tested different doses of intravenous vitamin K3 in people with advanced cancer. The patients did not improve. In that study, several patients also had allergic reactions, especially at higher doses.

A 2006 clinical trial suggested that menatetrenone (also called MK4, a subtype of the vitamin K2 group) might be able to reduce recurrence of liver cancer after surgery. This was a small pilot study, and later studies did not show much effect. MK4 is now being tested along with other drugs after surgery for liver cancer, with some promising early results.

A small clinical trial from Japan suggested that vitamin K lowers the risk of developing liver cancer among women with cirrhosis. Further study is needed.

There are also studies of MK4 that suggest it may decrease osteoporosis and possibly fracture. Some studies suggest that vitamin K might have a role in keeping bones strong, especially in older people. Studies suggest that it has an effect, but it is unclear whether it is the most effective way to prevent bone loss and fracture. Further research is needed to confirm this and, if confirmed, to find out the best way to use the vitamin.

Two small human studies looked at vitamin K cream and gel to see whether it helped bruises to fade faster after laser treatments. Researchers had people apply the vitamin K twice a day to one side of their

body and the cream or gel without the vitamin (placebo) to the other. Bruises seemed to go away a bit more quickly on the side of the body on which vitamin K was used. Still, the effect of the vitamin cream or gel was not very different from placebo. More studies still need to be done to find out whether this is a worthwhile treatment and if so, how to best use it.

## Are there any possible problems or complications?

This product is sold as a dietary supplement in the United States. Unlike companies that produce drugs (which must be tested before being sold), the companies that make supplements are not required to prove to the Food and Drug Administration that their supplements are safe or effective, as long as they don't claim the supplements can prevent, treat, or cure any specific disease.

Some such products may not contain the amount of the herb or substance that is on the label, and some may include other substances (contaminants). Actual amounts per dose may vary between brands or even between different batches of the same brand. In 2007, the FDA wrote new rules to improve the quality of manufacturing for dietary supplements and the proper listing of supplement ingredients. But these rules do not address the safety of the ingredients or their effects on health.

Most such supplements have not been tested to find out if they interact with medicines, foods, or other herbs and supplements. Even though some reports of interactions and harmful effects may be published, full studies of interactions and effects are not often available. Because of these limitations, any information on ill effects and interactions below should be considered incomplete.

Natural vitamin K is considered safe as a normal part of a daily diet. Supplements of the vitamin are not usually needed unless a doctor finds a problem that requires them.

Injectable formulas of vitamin K (vitamin K3) can cause allergic reactions and some toxic effects. During clinical trials of vitamin K3, some patients experienced flushing of the face, numbness in their arms and legs, chest pain, and shortness of breath. Immediate severe allergies can cause shock and even death. Sometimes a milder reaction happens in the form of an itchy bump that comes up where the injection was given. The bump can take over a month to go away and can sometimes cause scarring. Injectable vitamin K can also cause red blood cells to be destroyed in some people.

Rarely, allergic rashes can develop after using vitamin K creams on the skin.

Those who are on the blood-thinning medication warfarin (Coumadin) should know that vitamin K can make warfarin less effective. Talk with your health care provider before taking vitamin K supplements or changing the amount of vitamin K you take in through foods. The effects of Vitamin K from fermented sources (MK7), such as cheese and natto, can last days longer than vitamin K from plants. Talk to your doctor about how these foods might affect your lab test results if you are taking warfarin.

Pregnant women who are on anti-seizure medicines should get vitamin K supplements for 2 to 4 weeks before giving birth because of increased risk of bleeding in the newborn. Otherwise, the safety of

vitamin K supplements during pregnancy is not known, although the amount of vitamin K from foods is thought to be safe.

Relying on this type of treatment alone and avoiding or delaying conventional medical care for cancer may have serious health consequences.

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Note: This information may not cover all possible claims, uses, actions, precautions, side effects or interactions. It is not intended as medical advice, and should not be relied upon as a substitute for consultation with your doctor, who is familiar with your medical situation.

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