

# Vitamins E & K, clotting counterweights

Have you ever wondered why the vitamin alphabet skips from E to K? The intervening letters were reclassified as different B vitamins and other substances including omega 3 & 6 in the 1930s. And K was retained because this vitamin helps with blood coagulation, or *koagulation* in German (see below). Vitamins E and K are both fat-soluble, but while K clots, E thins the blood by stopping the platelets clumping together.

## Vitamin E

With its reputation as an antioxidant and protector against heart disease, many vitamin E sources are now labelled as 'superfoods'. It's a fat-soluble vitamin that's found in all varieties of nuts, popcorn, seeds and seed oils. Avocados, egg yolk, dairy and fish oils are other rich sources. You are unlikely to be low in vitamin E unless you are on a low fat diet or have a condition that makes it difficult to digest fat, such as gallstones or cystic fibrosis.

Like the other vitamins, E's existence was arrived at by deduction. Researchers at Johns Hopkins University in Maryland found that rats on a diet in which lard was the only fat source couldn't reproduce (sometimes I wonder why I write these). This was corrected by adding either wheat germ or, bizarrely, lettuce. (There, a *raison d'être* for the sorry plant! Prawn cocktail anyone?) Initially labelled anti-sterility factor, the substance took its place in the vitamin alphabet in 1925.

Gladys Emerson at Berkeley was, in 1936, first to isolate the vitamin, from a combination three different seed oils. Because it was essential for fertility, Evans (one of the JHU pair who had deduced the existence of the substance) named it tocopherol from the Greek meaning 'to bear young', with -ol to show that it was an alcohol.

Its association with superfoods is partly justified in that tocopherols mop up free radicals (harmful by-products of metabolism), protecting our cell membranes from oxidation damage. In 1945 brothers from Ontario Evan and Wilfred Shute published a monograph claiming that vitamin E can slow and even reverse atherosclerosis (hardening of the arteries). Modern research has largely confirmed this and trials have found that modest doses do protect against heart attack and stroke caused by thrombus (clot, as opposed to bleed or haemorrhagic stroke). Its role in preventing cardio-vascular disease is due to its blood thinning properties. People taking anticoagulant drugs such as Warfarin and Aspirin shouldn't take high doses of vitamin E as it could put them at risk of haemorrhage.

## Vitamin K

Vitamin K was identified in 1929 by the Danish scientist Henrik Dam. He was investigating the role of cholesterol by feeding chickens a diet in which it was absent. Several weeks later, the chickens started bleeding, but health couldn't be restored simply by reintroducing cholesterol. In turn, foods containing the other known vitamins were tried, but none were effective. This pointed to the existence of a second substance, named in a German medical journal as the *koagulationsvitamin* or vitamin K.

The vitamin acts as a co-enzyme in the production of prothrombin and other clotting factors in the liver. The anticoagulant drug Warfarin actually works by blocking the recycling of vitamin K. People taking Warfarin are often told not to eat too much dark green veg. And vitamin K is given for Warfarin overdose, or to prevent bleeding if a Warfarin patient needs emergency surgery. It's also needed to work alongside vitamin D in the formation of healthy bones.

Vitamin K1 is found in leafy green veg and is a by-product of photosynthesis (this is why it's not found so much in root veg). It accepts an electron from chlorophyll and is destroyed – so

please don't store your sunflower oil on the window sill. Spinach, broccoli, cabbage and kale are great (the darker green, the better), especially with a knob of butter as K is one of the fat-soluble vitamins. Avocados and kiwis also score highly, as do oats, whole wheat and olive oil.

It's converted to vitamin K2 (the form used by the body) by bacteria in the large bowel, but there are food sources of K2 and these are offal and fermented foods such as ripe cheeses and natto. K2 is also present in meat if the animal has been grass-fed (because of the link with chlorophyll). People on long-term antibiotics may need vitamin K supplements because antibiotics work against the natural gut flora.

Babies are born with a sterile digestive tract because all nutrition comes via the placenta. Since the early 1960s, newborns have been given an injection at birth until their own gut flora becomes established.

Vitamin K is separated from its protein sources by pancreatic enzymes in the small bowel. Then bile salts enable it to be absorbed for onwards transport via the circulation to the liver. So pancreatic, small bowel or gall bladder disease could cause deficiency, but this is so rare that, in adults, RDAs have not even been set.

It's odd that E & K seem to counter each other. Both attract almost magical claims, but the only consensus is that these foods are best absorbed from natural sources rather than supplements. May your blood clot only where needed!

## **Sources**

Various Wikipedia articles

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