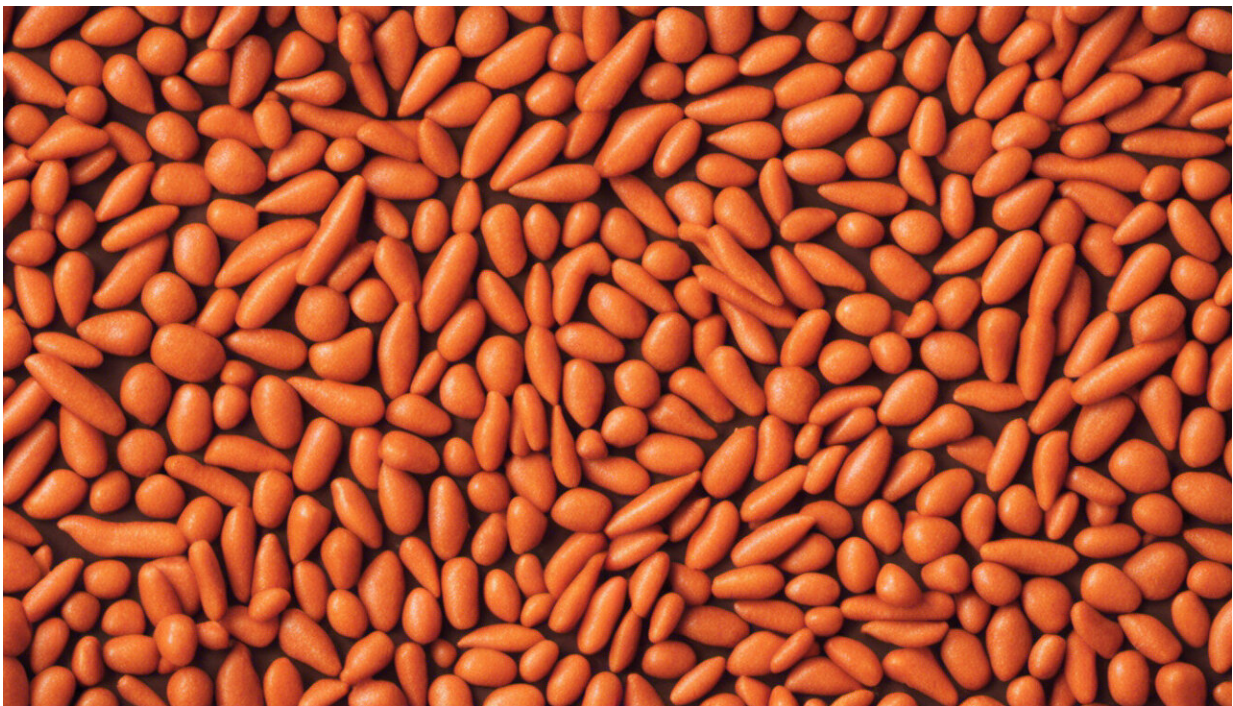


Carrots and pumpkin might reduce your risk of cancer, but beware taking them in pill form

March 31 2017, by Simon Chapman



Credit: AI-generated image ([disclaimer](#))

In February this year, ABC's Four Corners broadcast a critical and compelling program on complementary medicines, [Swallowing it: How Australians are spending billions on unproven vitamins and supplements.](#)

The program certainly tapped into a growing trend. The value of the global vitamins and dietary supplements market is predicted to reach [US\\$59.6 billion](#) by 2020; in Australia in 2014-15, 49% of women and 34% of men had [bought vitamins](#) in the past six months. Companies like Swisse and Blackmores have a lot riding on keeping up this demand.

Yet, the vast majority of this mass consumption, often helped along by celebrity endorsement, is just generating oceans of very expensive urine; relatively few people have medical conditions requiring specific nutrient supplements.

So why do so many people waste their money?

Seduced by reductionism

Scientific reductionism is the seductive "mental shortcut" or cognitive [heuristic](#) that assumes you can understand complex phenomena by analysing each of its elements: the whole is just the sum of its parts.

In reductionist reasoning, a piece of fruit is nothing more than the sum of all the compounds it contains. So if you don't have enough time to buy, cook and eat a diet rich in the sources of vitamins and minerals we all need, you can buy a set of pills containing the vitamins and other nutrients that go to make up a carrot, a fish or a banana.

Right? No, actually.

A good example of the simplistic appeal of reductionism is the assumption that because tobacco smoke has [over 70 known carcinogens](#), removing some of them will make smoking less dangerous. A no-brainer?

This is what three major US tobacco companies [once tried](#) to imply

when they chemically engineered "reduced carcinogen" brands.

But [a study](#) of cigarette smoke emissions across different brands concluded that reducing some carcinogens in the smoke mix had two effects – "risk swapping", when one specific carcinogen exposure was reduced at the cost of another's exposure increasing, or "risk shifting", when a specific exposure was reduced at the cost of that exposure increasing within another carcinogen group.

The impact on actual carcinogenic risk remains unknown when tobacco companies manipulate the presence of one or several carcinogens but sell products with all the 68 or so others intact.

Dietary reductionism

Reductionist thinking flourishes most in popular understanding of nutrition and is at the very epicentre of the appeal of complementary medicine. The vitamin and supplement shelves of pharmacies and complementary medicine shops are groaning with single and multi-vitamin and supplement bottles all promising swallowing their contents daily just must be good for you.

Perhaps the most famous of all salutary tales about the folly of reductionist thinking in medicine concerns beta-carotene. Beta-carotene is an organic red-orange pigment abundant in plants and fruits. It is a member of the carotenoid group, the main source of vitamin A in our diets (along with retinol in liver, butter, cheese and chicken skin). Beta-carotene levels in the diet are seen as a good indicator of overall fruit and vegetable consumption. Carrot, orange sweet potato and [pumpkin](#) are the richest sources of beta-carotene, with spinach and kale and any brightly coloured fruits and vegetables also good sources.

Studies of the diets of whole populations and their sub-groups (such as

vegetarians) had long observed those who ate the most beta-carotene tended to have lower population-wide rates of several cancers.

Could beta-carotene pills prevent cancer?

By the [early 1980s](#), leading epidemiologists like Oxford University's [Richard Doll](#) and [Richard Peto](#) were speculating that diets high in beta-carotene protected people from developing cancer. This speculation stimulated several long-term trials of whether taking beta-carotene supplement pills might influence cancer rates.

The most famous was the [Carotene and Retinol Efficacy Trial \(CARET\)](#). In this study, people – including those at high risk of cancer like those exposed to asbestos at work, and smokers – were given daily 30mg of beta carotene plus 25,000IU of retinol and followed for an average four years between 1983 and 1997.

In May 1996, the bombshell results from the study were published in the [New England Journal of Medicine](#). A total of 388 new cases of lung cancer were diagnosed. And the clanger? The study participants randomised to receive the beta-carotene and retinol supplements had a 28% higher incidence of lung cancer than those given placebos. As a result, the trial was stopped 21 months early.

The study provoked intense interest and [commentary](#). In 2008, a [meta-analysis](#) of four studies of beta-carotene supplementation involving 109,394 people taking an average of 20-30mg of beta-carotene supplements a day confirmed the CARET results. It found that in smokers, those taking the supplements had a 24% increased risk of [lung cancer](#). Beta-carotene was found in 70% of 47 common multivitamins used by people in the studies.

The beta-carotene supplementation story is a textbook illustration of the

folly of reductionist thinking in preventive health. As one [letter writer](#) to the *New England Journal of Medicine* put it:

"Beta-carotene was also acting as a marker of increased fruit and vegetable consumption and thus of many other components that have cancer-preventing potential (vitamin C, folate, other carotenoids, polyphenols, and many plant compounds)."

Others argued the dose of beta-carotene in the CARET study pill was too high. Others argued the specific form of beta carotene likely used in the CARET trial (all-*trans*-beta-carotene) was just one of 272 different isomers of beta-carotene and was probably chosen because it was the only one made commercially in large quantities (by BASF, Hoffmann-La Roche, and Sumitomo) and available for purchase. Perhaps the people who conducted the study, they argued, picked the wrong beta-carotene?

All these "what ifs?" may well have substance and we may one day find the holy grail of cancer preventing agents. But when the results are highly unlikely to be much different to the preventive effects of eating a mixed diet emphasising fruit and vegetables, I know which plan to continue to follow.

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