- Vitamins / Minerals in human nutrition

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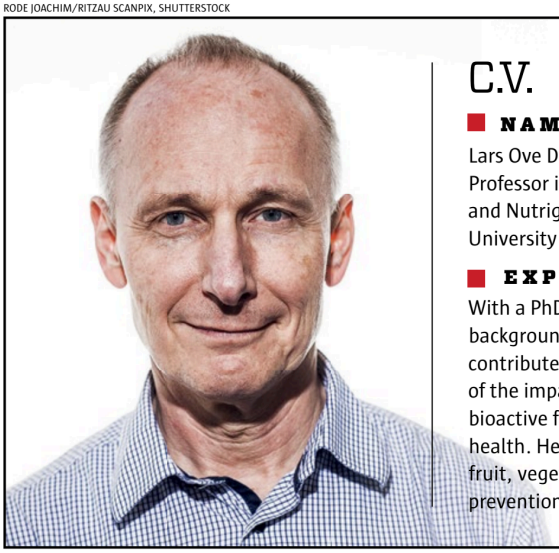
EXPERT SEPARATES FACT FROM FICTION:

SHOULD YOU REALLY BE TAKING VITAMINS?

Every day, millions of people take vitamin pills without really knowing whether they need them or not. We spoke with a leading researcher to find out how vitamins influence your body, and when it is a good idea to take the popular pills.



RODE JOACHIM/RITZAU SCANPIX, SHUTTERSTOCK



C.V.

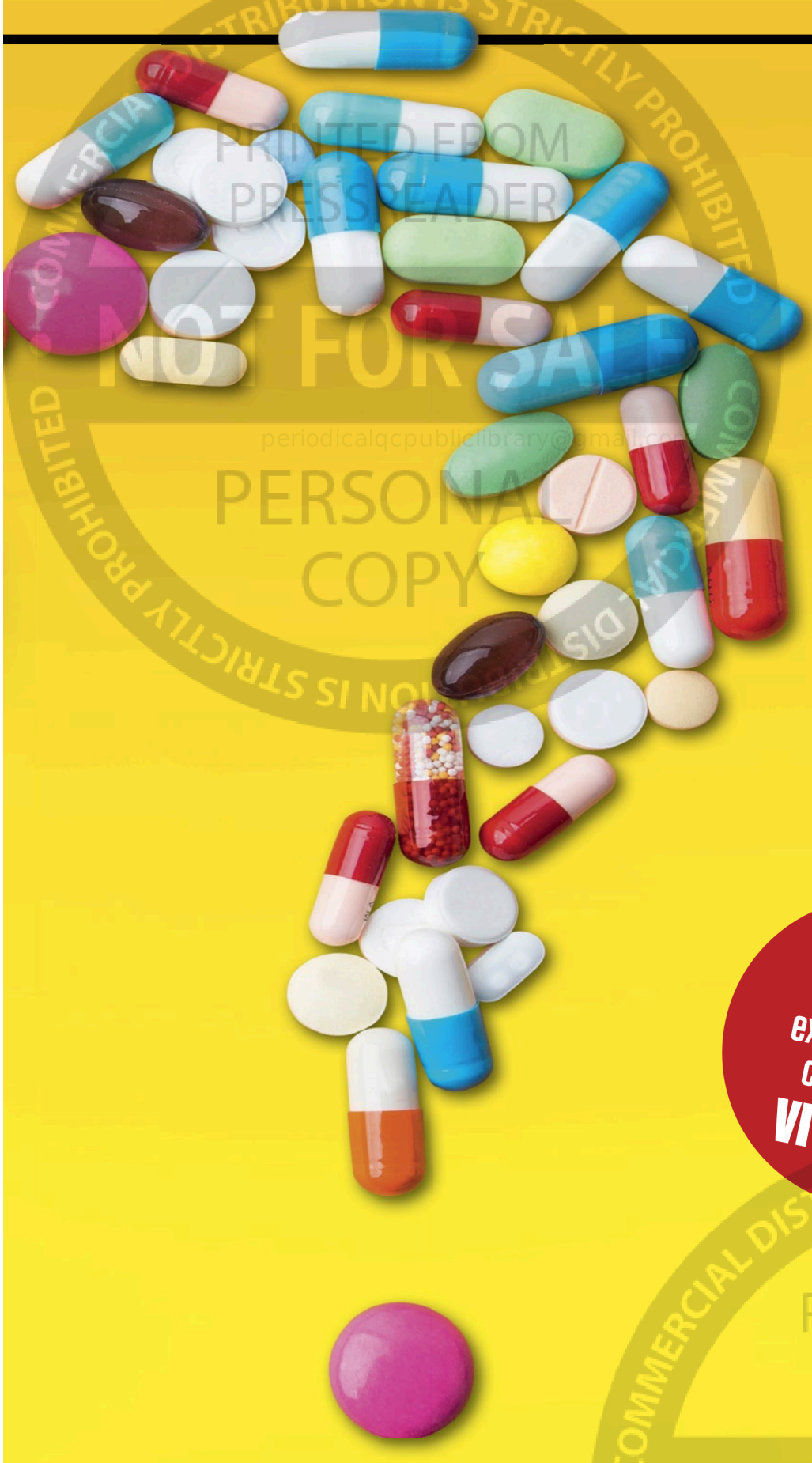
NAME AND TITLE

Lars Ove Dragsted
Professor in Biomedicine and Nutrigenomics, University of Copenhagen

EXPERTISE

With a PhD in toxicology and a background in biochemistry, he has contributed to the understanding of the impact of vitamins and other bioactive food ingredients on our health. He has studied the role of fruit, vegetables and grains in the prevention of lifestyle diseases.

By **Gorm Palmgren**



Discover the surprising expert opinion concerning VITAMINS

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Across the world, millions of people will have started this morning with their usual routine: a cup of coffee, toast or porridge, a scroll of the headlines – and, increasingly, one or more vitamin pills. Ever more people are hearing about the benefits of vitamins in the media, from friends, or at their GP, and off they go to buy tablets containing supplements of various substances.

It is big business. In 2024 the global population spent some US$350 billion on vitamins, and this is growing steadily by around 6% a year. Back in 2018 some 41% of Australian adults reported buying vitamins, minerals and supplements; the US association of supplement providers CRN estimates the figure for US adults at 74%.

But what exactly are vitamins? Which do we need and for which are we at risk of getting too little (or too much)? And do we need supplements at all if we consume a reasonably varied and healthy diet?

Few people taking their pills will be able to answer these questions. So we provide some key answers here, assisted by a leading expert who can tell us everything we need to know, while also dispelling some persistent myths.

350

billion dollars was spent by the world population on vitamin supplements in 2024.

Vitamins made rats feel good

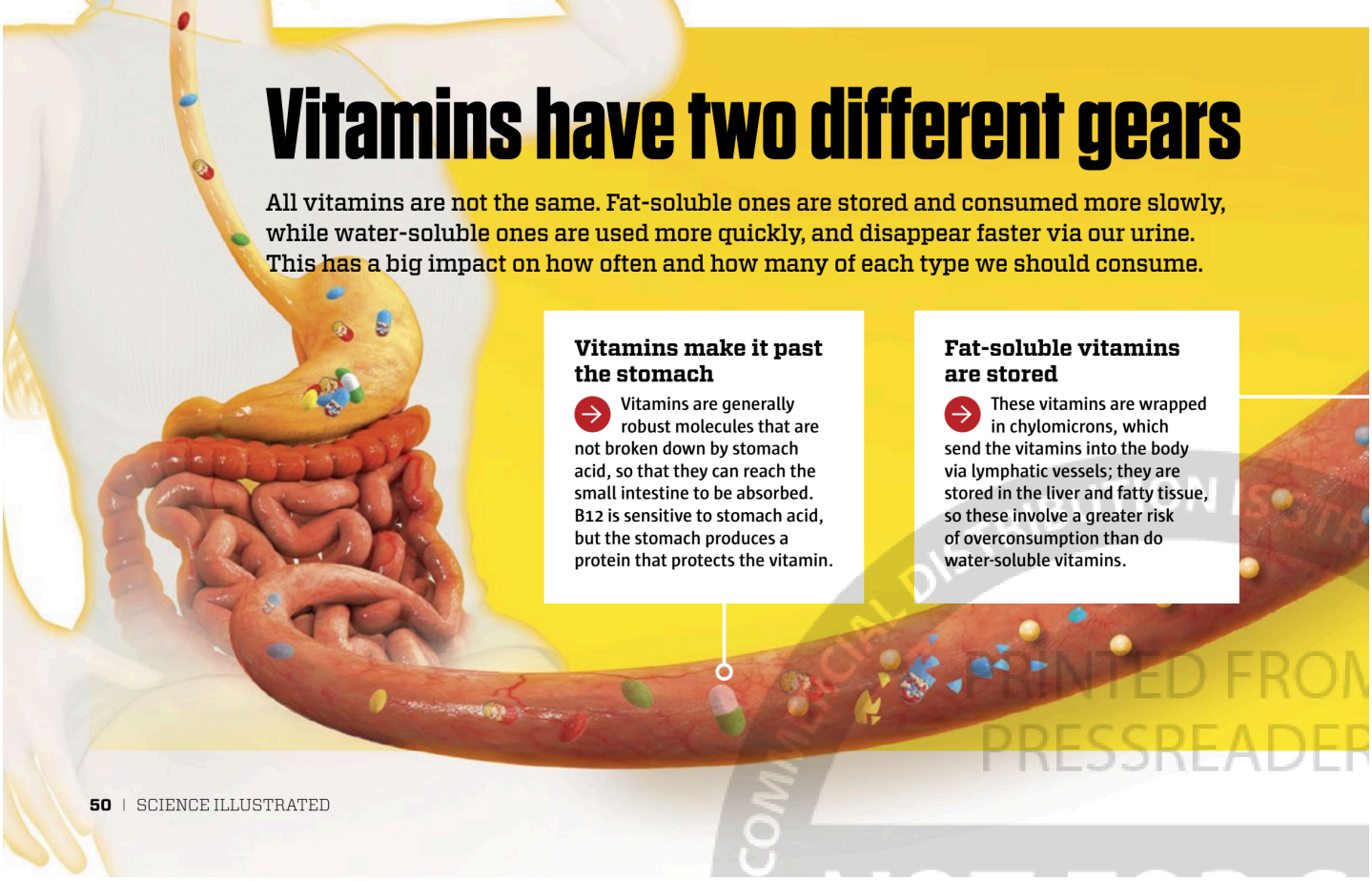
In 1913, American biochemist Elmer McCollum discovered that rats did not thrive if fed only proteins, carbohydrates, fats, and minerals. But if he added a little butter to their diet, the animals did better. He concluded that butter must contain something necessary for ideal nutrition, and this unknown substance was later named vitamin A.

This discovery spurred the search for other vitamins. Over the next 35 years, scientists discovered the 13 vitamins we know today.

Vitamins are organic molecules: they all contain carbon atoms. But unlike other important organic molecules, such as

Vitamins have two different gears

All vitamins are not the same. Fat-soluble ones are stored and consumed more slowly, while water-soluble ones are used more quickly, and disappear faster via our urine. This has a big impact on how often and how many of each type we should consume.



Vitamins make it past the stomach

Vitamins are generally robust molecules that are not broken down by stomach acid, so that they can reach the small intestine to be absorbed. B12 is sensitive to stomach acid, but the stomach produces a protein that protects the vitamin.

Fat-soluble vitamins are stored

These vitamins are wrapped in chylomicrons, which send the vitamins into the body via lymphatic vessels; they are stored in the liver and fatty tissue, so these involve a greater risk of overconsumption than do water-soluble vitamins.

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proteins, carbohydrates and fats, vitamins do not provide energy to the body, and nor do they help to build it.

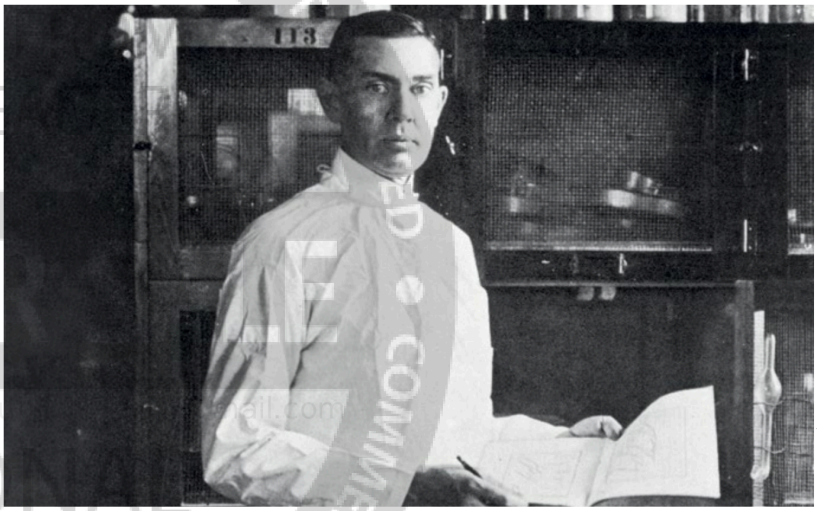
Instead, they act like cogwheels in the complex machinery needed to keep all the body's many functions running smoothly. If a cogwheel – or vitamin – is missing, the whole machinery grinds to a halt, and we risk a wide range of diseases or developmental disorders.

So the need for vitamins is real. But is the fear of vitamin deficiency justified? Does our increasing pill intake benefit anyone other than pill manufacturers?

Science Illustrated posed these questions to Lars Ove Dragsted, who is Professor in Biomedicine and Nutrigenomics at the University of Copenhagen. He says that first and foremost it is good that people are thinking about their vitamin intake, because the concern can be very real.

"Many people are on the low end for one vitamin or another," he notes.

On the other hand, he sees no need to get scared and buy a whole collection of vitamin supplements, just because your doctor finds low levels of a few vitamins.

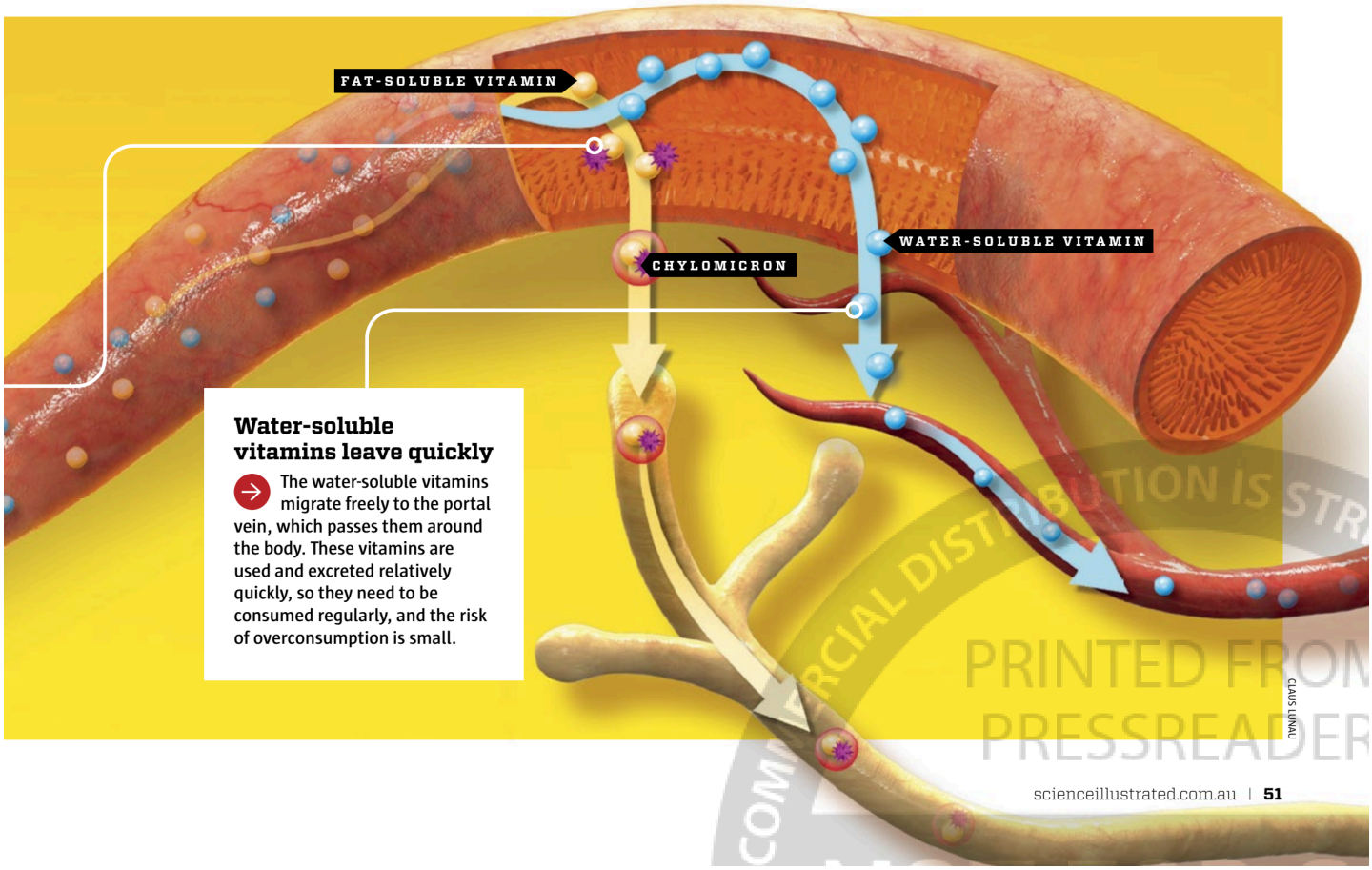


THE GRANGER COLLECTION/RITZAU SCANPIX

Biochemist Elmer McCollum discovered the first vitamin, A, as well as starting the first rat colony in the United States to be used for nutrition research. He was an influential figure in the US nutrition debate of the 1920s, his recommendations contributing significantly to increased sales of milk and leafy greens.

"The fact that the level is below the official recommendation does not necessarily correspond to a harmful deficiency," says Professor Dragsted. "Recommendations are made with a significant margin."

In general, he says, we can take it easy when we have mild vitamin deficien- ▶



CLAUS LUNAU

Water-soluble vitamins leave quickly

The water-soluble vitamins migrate freely to the portal vein, which passes them around the body. These vitamins are used and excreted relatively quickly, so they need to be consumed regularly, and the risk of overconsumption is small.

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cies. These are often temporary and can be relatively easily restored via increased attention to diet, pehaps combined with vitamin pills for a short period of time.

But he notes two specific vitamins to which it is more important that we pay attention, as it can be challenging for some people to get enough naturally: these are vitamins B12 and D.

"B12 deficiency and the resulting anaemia is a particular problem for the elderly," explains Lars Ove Dragsted, adding that vegans also risk B12 deficiency as the vitamin is primarily found in animal products.

B12 is also a water-soluble vitamin, so while it is absorbed faster in the body than fat-soluble vitamins, it is also more quickly used up and excreted with urine. That is why it is particularly important to consume this vitamin regularly.

Vitamin D, on the other hand, is fat-soluble. It is more difficult to absorb, but is also stored in the body for longer. The challenge with vitamin D is that it primarily forms when we are exposed to sunlight. Australia is clearly more blessed in this regard than the Nordic countries in which Prof. Dragsted operates, but even deficiencies can develop in older adults, people with darker skin, and those who spend a lot of time indoors.

> **LARS OVE DRAGSTED**
> PROFESSOR IN BIOMEDICINE AND NUTRIGENOMICS
>
> **Too much can be just as bad as too little.**

Modern lifestyles and poverty can also jeopardise our vitamin balance. In 2024 a Western Australian man in his early 50s was diagnosed with scurvy, once a sailor's disease for those lacking fresh fruit and veg, but now "a re-emerging disease". The afflicted male had fallen on hard times, short of cash and so neglecting his diet, sometimes skipping meals entirely, and he had been unable to afford supplements prescribed after weight loss surgery.



IRRI/WIKIMEDIA COMMONS

Golden rice has been genetically engineered to contain beta-carotene, a precursor to vitamin A, which is in short supply in the general diet in some parts of the world.

Many vitamins are not found directly in the diet, but appear as 'provitamins' that must be converted into active vitamins via biological processes in the body.

The bright yellow and red colours of carrots and tomatoes, respectively, are due to beta-carotene; this has no vitamin activity in itself, but is converted into vitamin A in the intestines and liver.

One common myth about vitamins is that they are better absorbed through food than via pills, and that it is therefore best to get them naturally. But that is a misconception, says Prof. Dragsted.

"Vitamin pills are generally very well utilised, because the supplements are formulated for good absorption," says Dragsted. Vitamin A, he notes, is absorbed far better from pills than from food.

Despite their importance, there is risk associated with getting too many vitamins as well as too few, says Lars Ove Dragsted. They play an important role, but in large quantities some vitamins can be harmful.

"Vitamins are highly bioactive substances," he explains.

A vitamin pill typically contains some 1-2 times the recommended daily allowance, and for some vitamins only 3-4 pills may be needed for the body to reach the harmful limit. This is certainly the case with fat-soluble vitamin A.

Water-soluble vitamins rarely reach harmful levels in the body, yet vitamins B3, B6 and C could cause itching, numbness and diarrhoea at high doses.

Personalised pills

In the future, the relationship with our daily vitamin pill is likely to become a more personalised affair, with the content of different vitamins more tailored to individual needs. Our personal genes determine how well our cells can absorb certain vitamins, how efficiently they are converted from inactive provitamins to active vitamins, or how well they fit into the body's important machinery.

In 2020, Finnish researchers found they could determine if a person needed vitamin D supplements by studying their genes. A review article from 2018 found specific variants of 19 different genes reflecting personal needs for vitamin B12.

But until personalised vitamin pills are released, we face a confusing mix of myths and facts about vitamin pills.

"Remember that we often only need supplements of a few vitamins," says Lars Ove Dragsted, urging us to take vitamin talk with a grain of salt. "Supplements are mainly consumed by those who do not need them. But it is typically not harmful to anything other than your wallet." SI

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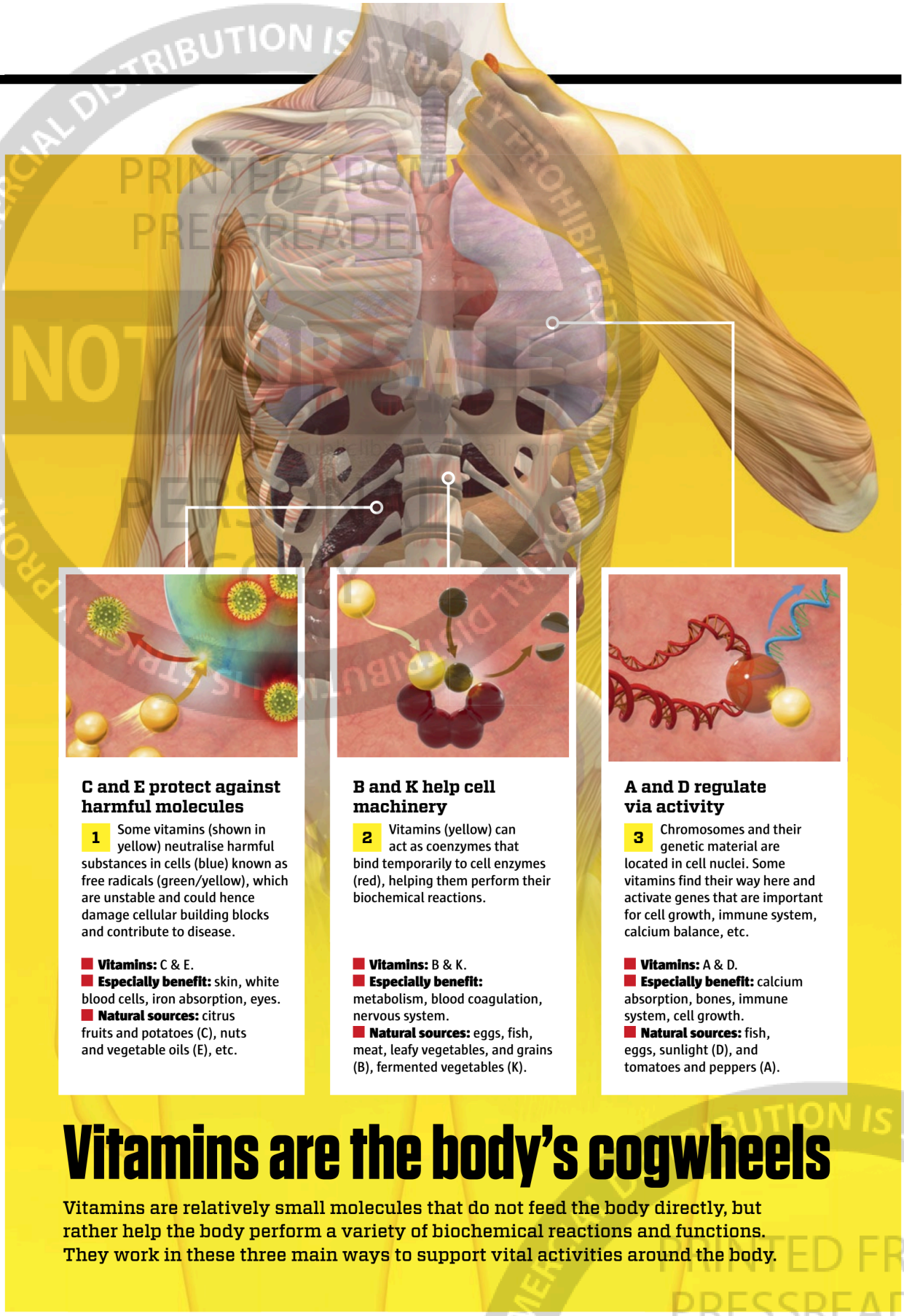

C and E protect against harmful molecules

1 Some vitamins (shown in yellow) neutralise harmful substances in cells (blue) known as free radicals (green/yellow), which are unstable and could hence damage cellular building blocks and contribute to disease.

- **Vitamins:** C & E.
- **Especially benefit:** skin, white blood cells, iron absorption, eyes.
- **Natural sources:** citrus fruits and potatoes (C), nuts and vegetable oils (E), etc.

B and K help cell machinery

2 Vitamins (yellow) can act as coenzymes that bind temporarily to cell enzymes (red), helping them perform their biochemical reactions.

- **Vitamins:** B & K.
- **Especially benefit:** metabolism, blood coagulation, nervous system.
- **Natural sources:** eggs, fish, meat, leafy vegetables, and grains (B), fermented vegetables (K).

A and D regulate via activity

3 Chromosomes and their genetic material are located in cell nuclei. Some vitamins find their way here and activate genes that are important for cell growth, immune system, calcium balance, etc.

- **Vitamins:** A & D.
- **Especially benefit:** calcium absorption, bones, immune system, cell growth.
- **Natural sources:** fish, eggs, sunlight (D), and tomatoes and peppers (A).

Vitamins are the body's cogwheels

Vitamins are relatively small molecules that do not feed the body directly, but rather help the body perform a variety of biochemical reactions and functions. They work in these three main ways to support vital activities around the body.

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