

# Cheese and health: the cheese matrix

*When asked, "Do you ever eat cheese?", 97% of Dutch people answer, "Yes." Most eat cheese on bread, especially at lunch: 40% eat a cheese sandwich every day, and another 37% do so 2 or 3 times a week.<sup>1</sup> On average, a person eats 45 grams of cheese per day in the Netherlands. Cheese plays an important role in our daily diet and contributes a great deal to our intake of nutrients. But cheese also contains saturated fat and salt. A question often asked is: how healthy is cheese?*

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**W**hen you think of typical Dutch food, the cheese sandwich quickly comes to mind. Most Dutch people like cheese, and could not even live without it, according to a study by GfK.<sup>1</sup> As a result, cheese makes a substantial contribution to the intake of protein, minerals and vitamins. But cheese also contains saturated fat and salt. In this article, we address the question: how healthy is cheese, really?

The most consumed cheese in the Netherlands is 48+, but there are many other types with different levels of fat (see box). All cheese, however, has a few things in common. Cheese is rich in vitamin A and vitamin B12 and in minerals like calcium, phosphorus, magnesium and

zinc. Cheese is also a source of vitamin B2, selenium and protein. Along with milk and dairy products, cheese provides about 60% of the daily intake of calcium and 40% of the daily intake of vitamin B12 in the Netherlands. On its website, the Netherlands Nutrition Centre states, "Dairy is therefore important for a healthy diet in the Netherlands." But cheese also contains fat, with the amount of fat depending on the fat content (see box). About 60% of the fat in cheese is saturated fat. Eating saturated fat is associated with an increase in LDL cholesterol, which in turn is a causal risk factor for cardiovascular disease. Cheese is also a salt-rich product. During the brining process, cheese lies in a salt bath for a period of time, which makes the outside firmer and also gives the cheese a protective layer, the rind. Salt is associated with increased blood pressure, which is also a causal risk factor for cardiovascular

disease. So you could say that cheese contains both health-positive and health-negative nutrients. To know what direct association cheese has with health risks, it is best to look at the underpinnings of the Dutch food-based dietary guideline which is translated in the communication model: the Wheel of Five.

## Reasoning behind the Wheel of Five

Some cheese is included in the Wheel of Five, but only cheese with less than 820 mg of sodium per 100 grams and fat content up to 30+. The scientific underpinnings of the Wheel of Five consist of roughly two documents. First, the food-based dietary guidelines, and second, the nutrition standards for vitamins, minerals, saturated fat, etc. In establishing the food-based dietary guidelines, the Health Council looked primarily at the effects of foods on

non-communicable diseases. It also looked at three causal risk factors: blood pressure, LDL cholesterol and obesity.<sup>2</sup> Subsequently, the findings in the food-based dietary guideline were translated by the Netherlands Nutrition Centre into the Wheel of Five. The Wheel of Five has been optimized so that it both considers the health aspects of whole foods on non-communicable diseases and complies with nutrient recommendations. Because of this optimization, if you eat according to the Wheel of Five, you will not consume more than 10 energy% saturated fat and not too much salt and consume a nutrient adequate diet. These two aspects are interesting when it comes to dairy products.

### Food-based dietary guidelines

In the food-based dietary guidelines, the Health Council concludes that dairy intake (milk, yogurt and cheese) is associated with a lower risk of colon cancer, and that yogurt in particular is associated with a lower risk of type 2 diabetes. These conclusions are based on meta-analyses of cohort studies. Randomized controlled trials (RCTs) are not available. Based on its findings, the Health Council advises, "Have a few servings of dairy per day, including milk or yogurt." In the food-based dietary guidelines, the Health Council – remarkably – makes no statements on the relationship between dairy intake and the risk of cardiovascular disease and stroke. This was looked at for the guidelines,<sup>2</sup> but no relationship was found, even though dairy products contain saturated fat and – in the case of cheese – salt. The Health Council also made this clear in its explanation of the guidelines. To the question "The Health Council recommends several daily servings of dairy products, including milk or yogurt. Why is this not broken down into whole, semi-skimmed and skimmed dairy?" the Health Council answers, "There is evidence that a few servings of dairy are good for health. However, the scientific evidence that low-fat and skimmed dairy are better is too weak to break down."<sup>3</sup>

In short, the health aspects of dairy do not seem to be compromised by the presence of saturated fat and – in the case of cheese – salt. Does this mean that saturated fat is



not unhealthy? No, it's not that simple. But the effect of saturated fat appears to depend on the food you ingest it with. The effect of saturated fat in a snack is different from when it is "packaged" in a dairy product. The food matrix of dairy – the whole complex product – seems to dampen or offset the effect of saturated fat. It is also possible that specific compositions of saturated fatty acids have different effects on health.

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### The 10% energy rule

Does this lack the reasoning to advise against whole-milk dairy products? The Wheel of Five recommends mainly low-fat and semi-skimmed dairy products. Why only the low-fat product varieties? This mainly has to do with the conditions that >

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## Fat content in cheese per gram of dry matter

The most sold cheese in the Netherlands is 48+, but cheese can also have other fat content, from 10+ to 60+. This is the fat content per gram of dry matter, that is, minus water. Cheese consists of about 40% water, and young cheese contains more water than aged cheese. For this reason, aged 48+ cheese contains more fat than young 48+ cheese. The plus sign indicates that the fat content is an approximation, but never less than that because of legal requirements. Skimmed 10+, 20+ and 30+ cheese contains less fat and more calcium per 100 grams.

the Netherlands Nutrition Centre uses for the Wheel of Five. One condition is that the Wheel of Five must meet the nutrition standard for saturated fat, which cannot exceed 10% of energy in the entire diet. By including only low-fat and semi-skimmed dairy products and 30+ cheese, the general standard of 10% is not exceeded. Future guidelines could perhaps distinguish between food groups such as dairy and others containing saturated fats.

### Cheese

In the dairy food group, cheese occupies a special place. Due to the production process, cheese contains more nutrients per 100 grams than milk and yogurt products, but also more saturated fat and salt. However, it appears that despite the greater amount of saturated fat and salt, cheese intake is not associated with an increased risk of cardiovascular disease or stroke. In fact, there is strong scientific evidence that the intake of fermented dairy products and cheese has no negative effects on cardiovascular disease risk, and, in some cases, is actually associated with

a protective effect. A 2017 meta-analysis shows that there is no relationship between the intake of either whole or low-fat dairy products and the incidence of cardiovascular disease. Also, no effect on higher mortality risk was observed. The same meta-analysis showed that fermented dairy, including cheese, was associated with a statistically significant lower risk of cardiovascular disease. For every 20 grams of cheese per day, the risk decreased by 2%.<sup>4</sup> There also appears to be a neutral or protective association between cheese intake and stroke.<sup>5</sup> And the intake of cheese compared to butter has a lowering effect on LDL cholesterol, the causal risk factor for cardiovascular disease.<sup>6</sup>

### Cheese matrix

How is it that despite the presence of saturated fat and salt, cheese does not show an increased risk of cardiovascular disease and sometimes even a protective effect? It could have to do with the food matrix/dairy matrix. Foods have long ceased to be regarded as a sum of the nutrients they contain, because this often cannot explain the health aspects mentioned in the food-based dietary guidelines. For example, the cheese matrix affects digestion and the release of nutrients. Perhaps the cheese matrix also has a tempering effect on risk factors such as LDL cholesterol. Up to this point, few RCT studies have been conducted on the effects of the cheese matrix on health. However, there is a good example of one RCT. A

recent study looked at the effects of whole-milk cheese, low-fat cheese and butter on LDL cholesterol. In all three, calcium, casein and butter were added to ensure they contained equal amounts of calcium, fat and protein. A reduction in LDL cholesterol was observed across the cheeses and butter. In fact, the lowest LDL cholesterol levels were found with the whole-milk cheese.<sup>7</sup> This indicates that the dairy matrix has a differential effect on LDL cholesterol. When it comes to the health aspects of foods, you cannot rely only on the operating mechanisms of the nutrients. The entire product matters. And such matrix effects are most noticeable in cheese.

### Conclusion

Cheese contains saturated fat and salt, but cheese consumption is not associated with cardiovascular disease. This has been shown by both epidemiological and mechanistic studies. These effects may be explained by the dairy matrix or cheese matrix. More research is needed to find out which factors in the dairy matrix are responsible for this. It is also possible that the specific saturated fatty acid composition of dairy products has a different effect on cardiovascular disease and LDL cholesterol than products with a different composition. In any case, there is no evidence to advise against full-fat or fatty cheese in dietary guidelines. <

## References

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