DNAisyou.

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Losing weight with DNA.

DNAisyou.

Report

Weight | Nutrition
Physical exercise | Motivation

Personal report of: **Name + Surname**

Become your best self.

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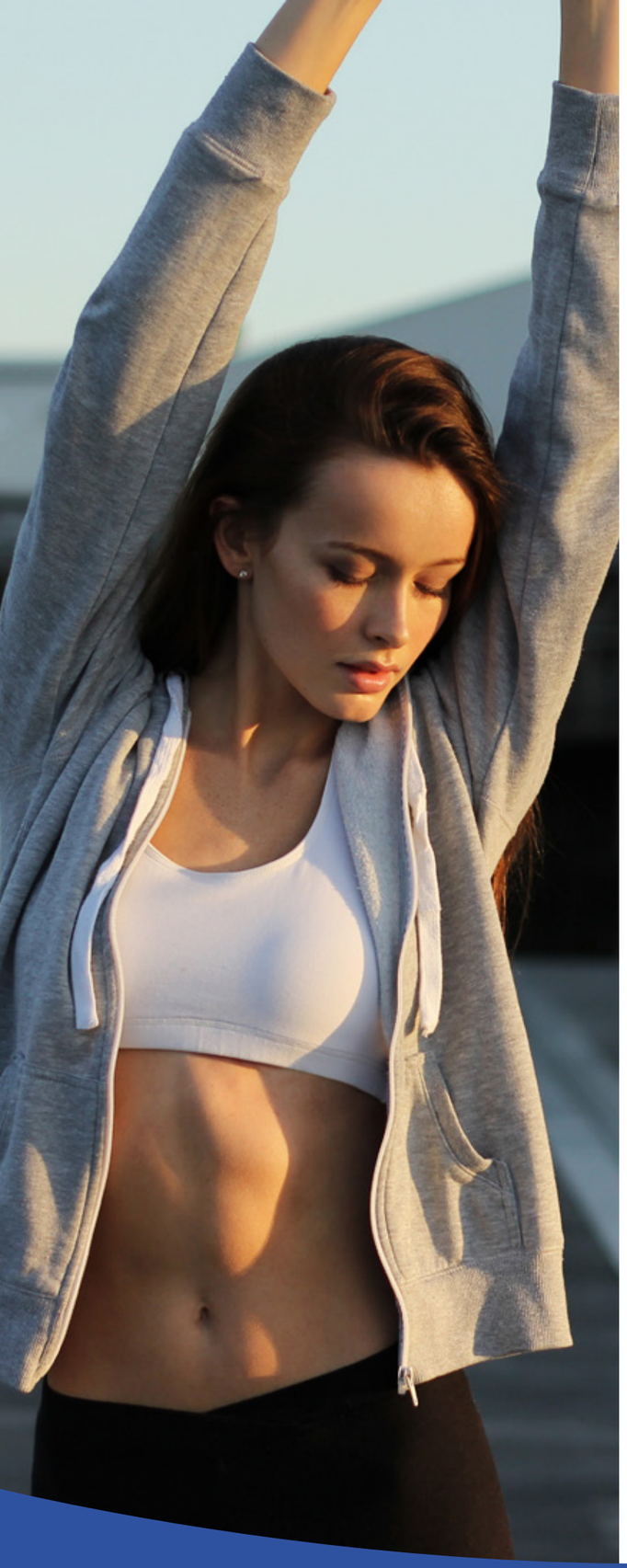

Welcome to yourself.

Dear (name),

In this report you can read the results of your DNA analysis for weight loss. Using 66 genetic markers, we have examined various components for you. What, for example, can you best eat to lose weight? How many calories does your diet have to consist of? What does your DNA tell you about the influence of your physical activity on losing weight? And what kind of sport would you do best?

We give you answers and tips on all questions.

The advisory report consists of several chapters. You can read more about the researched gene and your genotype after each chapter about the components that are based on information from your DNA.

Do you have questions? We would like to answer them!

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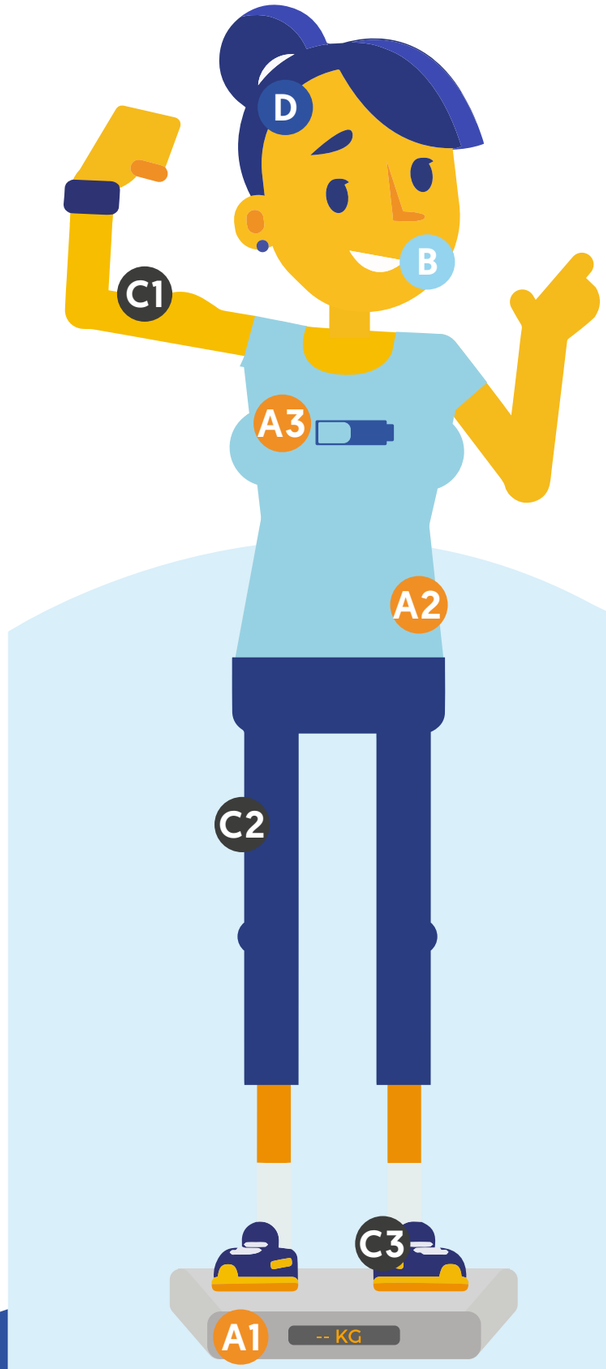
Your result overview.



A WEIGHT

A1 BMI

27.3

A2 OBESITY RISK

HIGH

A3 ENERGY BALANCE

- 2335 KCAL: WEIGHT MAINTENANCE
- 1835 KCAL: WEIGHT LOSS

B NUTRITION

B1 MACRONUTRIENT BALANCE

20% FAT
15% PROTEIN
65% CARBOHYDRATES

B2 SATURATED FAT SENSITIVITY

HIGH

B3 MICRONUTRIENTS

ELEVATED RISK

- VITAMIN D
- VITAMIN B11
- VITAMIN B12
- CALCIUM
- SODIUM

C EXERCISE

C1 STRENGTH OR ENDURANCE

ENDURANCE

C2 ACTIVE LIFESTYLE

POSITIVE INFLUENCE

C3 INJURY RISK

NORMAL

D MOTIVATION

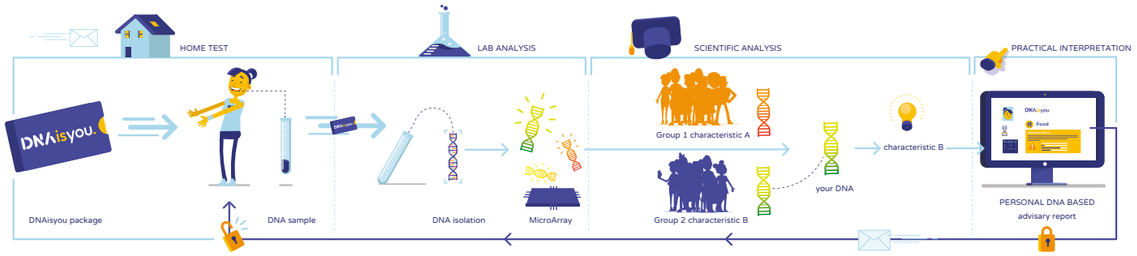
D WARRIOR VERSUS WORRIER

WORRIER

D SPORTS: LOVE IT OR HATE IT

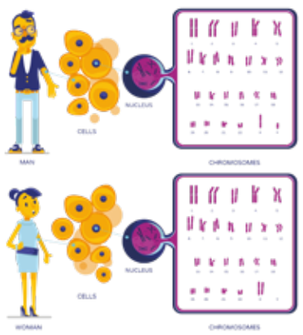
- GOOD FEELING
- LOW WILLINGNESS

What is genetics?



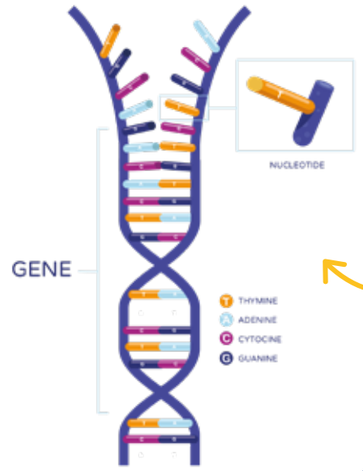
By linking your genotype to the scientific knowledge about the relationship between genotype and characteristic, we can prepare a personal recommendation for you. In doing so, we only make use of studies where large groups of people were tested, the results have a high statistical significance and scientists were always able to replicate the results in a second (independent) study. Your report includes an overview of all information that we were able to extract from your DNA. You will be given the information about the genes that are important to the goals that you have. We will tell you in a sports report, for example, how you can best train to become better on the basis of your genes, while a nutrition report tells you what you preferably should eat. We only tell you what you want to know! Information about any medical conditions or risks of becoming ill do not come up in the analysis. We give a clear overview of specific hereditary characteristics and the accompanying scientific recommendations in order to be able to make optimal use of this. If you are interested in how each gene works and how the genetic variant that you possess leads to a particular characteristic, we will also explain this in an easily understandable way.

What is DNA?
Every human is made up of thousands of billions of cells. Each cell of the body contains a cell nucleus in which the DNA is stored. The DNA is compactly folded up into chromosomes which, if they are unfolded, show the famous double DNA helix. We call each piece of DNA, which forms the genetic code for a characteristic, a gene.



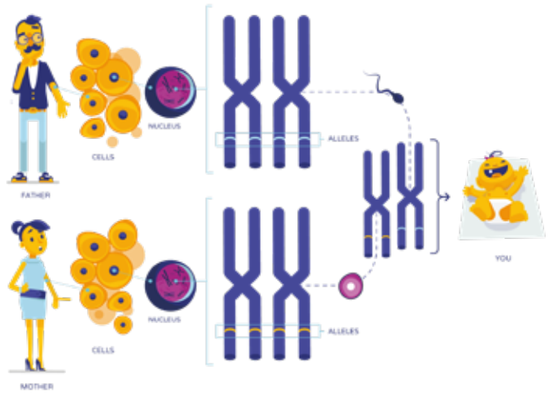
What are chromosomes?
Each human has 23 chromosome pairs. One chromosome of each pair comes from the father and one from the mother. Each individual is therefore a random mix of the parents' chromosomes. The 23rd chromosome pair determines somebody's sex. Two X chromosomes make you a woman, biologically speaking, and one X and one Y chromosome make you a man, biologically speaking.

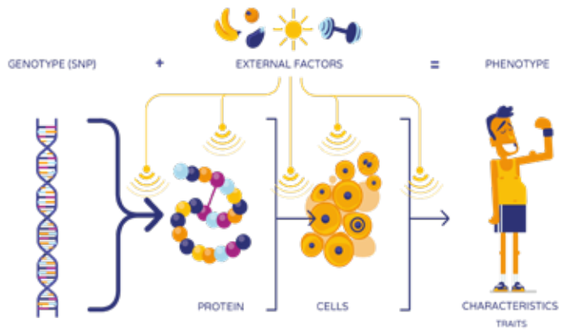
What is a DNA helix?
If you completely unfold a chromosome, you get to see the famous spiral-shaped structure of DNA. This is also called the double helix and consists of two strands that twist around each other. They are made up of totally separate links – nucleotides – which are connected with each other, thus forming a very long chain. A nucleotide consists of three parts: a deoxyribose (5-carbon sugar) group, a phosphate group and a base. The first two form the backbone of the chain and the base makes a connection with the complementary base of the other DNA strand. As a result of the connections of these bases –the so-called base pairs– DNA forms its characteristic double helix.



Can you tell me more about base pairs?
The four different bases (T, A, C and G) of the nucleotides of the two DNA strands bind to the bases of the opposite strand. The two strands can separate and reconnect like a zip. This happens in a fixed pattern, whereby a Guanine always binds with a Cytocine, and a Adenine always bind with a Thymine.

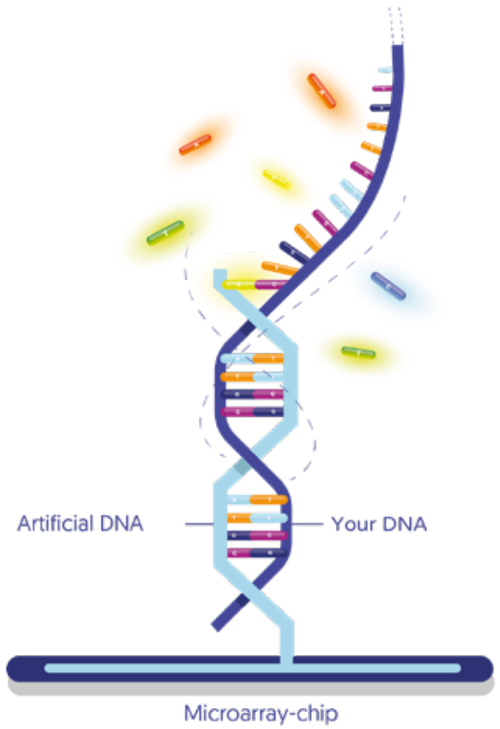
How many variants do you have of a gene?
During fertilisation, the 23 chromosomes in the sperm cell of the father end up with the 23 chromosomes of the mother in the egg cell. Each individual has two specimens of each chromosome (thus 46 in total). These pairs contain the same genes, but are not 100% identical. A person therefore has two variants of each gene. Such a variant is called an allele.





What is the difference between genotype and phenotype?
Everyone has two copies of each gene, one from each parent, that is: the above- mentioned alleles. The combination of two alleles from a particular gene form a genotype. When we speak about a genotype, therefore, we are talking about the hereditary part of a specific characteristic. How this characteristic ultimately manifests itself is partly determined by environmental factors. This is referred to as the phenotype. A phenotype is therefore a particular characteristic that is the sum of the genotypes and environmental factors. These can be visible characteristics, such as the hair colour of a person or the physical build, but also non-visible characteristics, such as oxygen uptake or the burning of fat.

What does SNP means?
Each person is unique. You are the sum of all small genetic variations that are present in your DNA. Different types of variation are possible, one of which is the Single Nucleotide Polymorphism (SNP). This means that not everyone has the same base at a specific location in a gene, but that different variants are possible. These small differences determine your characteristics, such as hair colour for example.



What happens in the laboratory?
First of all, your DNA is isolated from the sample. This process involves breaking open the cells in the sample, so that the DNA is released. We extract the separate DNA from the solution through precipitation. The DNA then forms long strings that we are able to extract from the solution and purified, so that it can be used for the genotyping.

We work with a technique that is called microarray for genotyping. Your DNA is cut into small pieces. These pieces attach to artificial pieces of DNA on the microarray chip specific for a certain part of your DNA. The DNA is then coloured with a fluorescent label. Every base (T, A, G or C) is given its own colour, as a result of which we can determine which genotype you possess for that piece of DNA.

Although the majority of your DNA is exactly the same as that of all humans, there are a number of places in the DNA where humans differ from each other. These locations have been mapped out by science and have been given their own unique number. These are numbers that start with the letters 'rs' followed by numbers. We call this an 'rsID' (Reference SNP cluster ID). Through this unique number, we know precisely where we need to look in the 3 billion base pairs that make up your genetic construction drawing. Each rsID stands for a specific SNP that we use in order to determine your personal characteristics. We also search for the rsIDs on the microarray whose influence on characteristics we know about.

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Icons used in the book.

This icon indicates a box that shows your **personal results.**

This icon indicates a box that shows your **personal advice.**

This icon indicates a box that shows your **personal information.**

This icon indicates a box that shows **tips and tricks** on how to use your genetic information.

This icon indicates that your have an **elevated risk.**

This icon indicates that you should **consult your general practitioner** to see if your genetic predisposition leads to actual health hazards.

This icon indicates additional **information pages**

How to read the gene panels.

Here you see the **gene name** and what its general **function** is.

Here you see the **frequencies** in which this polymophism occurs in the **general population**. This indicates if you might posess the common or rare variant of this gene.

ALPL - Causes reduced vitamin B6 concentrations in the blood.

CC 43% | CT 49% | TT 18%

Gene: ALPL (alkaline Phosphatase)
The ALPL gene provides instructions for making an enzyme called alkaline phosphatase. This enzyme acts as a phosphatase, which means that it removes clusters of oxygen and phosphorus atoms (phosphate groups) from other molecules. This process is essential for the transport of vitamin B6. Variants in the ALPL gene are therefore associated with vitamin B6 concentrations in the body.

SNP: rs4654748 (C/T)
Studies have shown that this polymorphism in the ALPL gene is significantly associated with decreased concentrations of vitamin B6 in the blood.

Your genotype: **TT**
This genotype does not allow any association with lower vitamin B6 levels in the blood.

Here you can read **what the gene does** and how it might influence traits.

Here you can read how a specific **SNP influences** a certain **trait.**

Tanaka T, Scheet P, Giusti B, et al. Genome-wide association study of vitamin B6, vitamin B12, folate, and homocysteine blood concentrations. Am J Hum Genet. 2009;84(4):477-82.

Here you see one of the **scientific sources** we use to base our conclusions on.

Here you see what **your genotype** is and what this means for you.

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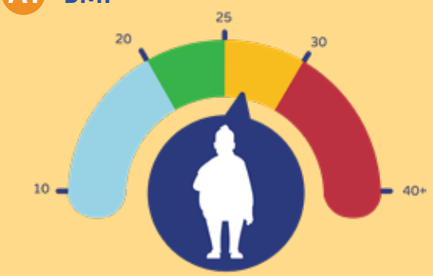
A. Weight
Overview

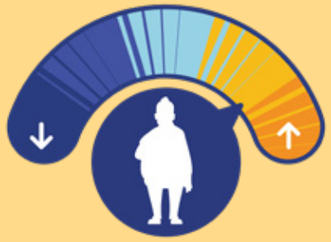
A WEIGHT

A1 BMI



Your BMI is 27.3

A2 OBESITY RISK



YOUR OBESITY RISK IS HIGH

A3 ENERGY BALANCE

- **2335 KCAL: WEIGHT MAINTENANCE**
- **1835 KCAL: WEIGHT LOSS**

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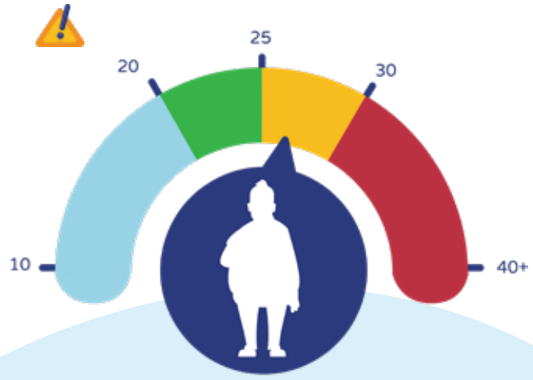
A1. Weight
BMI



You have a BMI of
27,3

Your BMI shows that you are currently overweight. It is advisable to lose weight.

Body Mass Index (BMI) is a measurement for determining a healthy weight. It shows if your weight is optimal for your height. BMI is calculated by dividing body weight (kg) by height (m) squared (thus height x height). **In your case: you are 83.5 kilos and 1.75 metres. This results in a BMI of 27.3.**

A BMI between 18.5 and 25 is considered a healthy weight. A BMI above 25 indicates overweight, above 30 obesity and above 40 morbid obesity.

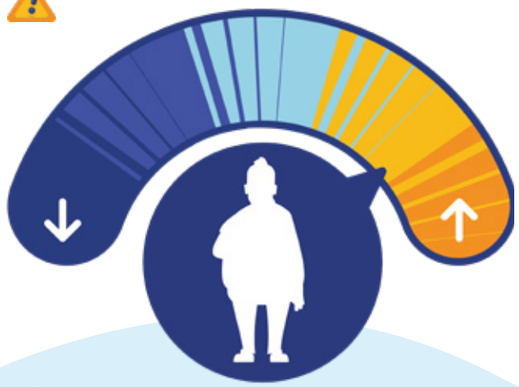
However, there are exceptions: when you exercise a lot (strength sports especially), you will have an above-average amount of muscle mass. As muscle tissue weighs more than fat, you can have an increased BMI without being overweight in its traditional sense. For those people it is therefore advisable to also estimate body fat percentage in addition to the BMI, to evaluate the physical condition accurately. The traditional BMI calculation is also not a reliable tool for determining a healthy weight for pregnant women and children.

When determining a healthy weight, we look at the Body Mass Index (BMI). This is a specific calculation that examines if your weight to height ratio is optimal.

You have a BMI of 27,3 which is considered overweight.

In order to prevent lifestyle diseases like diabetes, cardiovascular diseases and certain cancers, it is very important for you to lose weight. The advice in this report can help you to do this as effectively as possible.

A2. Weight
Obesity risk



Your genetic risk of obesity is
HIGH

Your lifestyle (eating and exercising) does not currently fit in well with the needs of your body. Unfortunately, your type of genotyping means that you have difficulty losing weight, in general, and gain weight reasonably quickly.

We have determined your genotype for 30 SNPs that play a role in being or becoming overweight. These genetic variations in your DNA influence your weight in various ways. This may include the psychological elements, such as your satiety (feeling of fullness after a meal) and whether or not you get a good feeling from food. But the metabolism of your body is also genetically determined. If you have a predisposition towards storing fats, for example, you are also at an increased risk of being overweight.

Your DNA shows that you have a high risk of being overweight. Your BMI shows that you are currently overweight. This means that your lifestyle (eating and exercising) does not currently fit in well with the needs of your body. Being overweight involves various health risks, which is why it is advisable to lose weight. You will need to make nutritional changes and possibly be more physically active and exercise more. Unfortunately, your type of genotyping means that you have difficulty losing weight, in general, and gain weight reasonably quickly. A radical change in your lifestyle is necessary in order to reach and maintain a healthy weight. Our advice about the ratio of macronutrients (fat, protein and carbohydrates) and the type of exercise that suit you, can help you to reach a healthy weight and maintain it.

A2. Weight
Your genotype

Gene	SNP	Your genotype	Risk score
BDNF	rs10767664	TA	0,19
CADM2	rs13078807	AA	0,00
ETV5	rs9816226	TT	0,28
FAIM2	rs7138803	GG	0,00
FLJ35779	rs2112347	GT	0,10
FTO	rs1558902	TA	0,39
GNPDA2	rs1093897	AG	0,18
GPRC5B	rs12444979	TT	0,00
KCTD15	rs29941	AG	0,06
LRP1B	rs2890652	TT	0,00
LRRN6C	rs10968576	AG	0,11
MAP2K5	rs2241423	AG	0,13
MC4R	rs571312	CC	0,00
MTCH2	rs3817334	TT	0,12
MTIF3	rs4771122	AA	0,00
NEGR1	rs2815752	GG	0,00
NRXN3	rs10150332	TC	0,13
NUDT3	rs206936	AG	0,06
PRKD1	rs11847697	CT	0,17
PTBP2	rs1555543	CC	0,12
QPCTL	rs2287019	CC	0,30
RBJ	rs713586	CC	0,28
RPL27A	rs4929949	CC	0,12
SEC16B	rs543874	AG	0,22
SH2B1	rs7359397	TT	0,30
SLC39A8	rs13107325	TT	0,38
TFAP2B	rs987237	AG	0,13
TNNI3K	rs1514175	GG	0,00
TMEM18	rs2867125	TC	0,31
TMEM160	rs3810291	GG	0,00
TOTAL			**4,08**

Obesity risk genes

It is not always easy for everyone to stay on a healthy weight. A lot has been written in the scientific literature about the genes that might cause this. Science tries to identify the genes that play a role in obesity by comparing the genotype of people with and without obesity. When a certain variant of a gene occurs significantly more in people with overweight than in people without overweight, this might therefore play a role in obesity.

Based on a number of scientific publications in the renowned journal Nature Genetics, the list of genes that is shown in the table has been selected. The role these genes play in the development of obesity differs a lot. For example, the MC4R gene plays a role in satiety (or, in the case of obesity, a lack thereof). BDNF is part of the "reward system" in the brain and therefore also plays a role in the mental reward in response to food. The most important and most abundantly described gene that plays a role in obesity is FTO (the abbreviation even stands for FaT mass and Obesity-associated protein) which is associated with obesity in many ways. Among other things, it plays a role in protein metabolism and influences weight loss as a result of exercise.

For all SNPs in the table it is determined how big their influence is on the BMI. Not every SNP has an equal influence on body weight. In addition, the specific genotype that someone possesses ultimately determines the degree of influence. Science has therefore determined per SNP how great the influence is per allele you possess. For example, if you own one of the risk alleles for one of the SNPs, the influence is only half that of if you possess two of the alleles. In the table you can see how much influence your genotype has on the risk of obesity for each of the 30 SNPs. The higher the overall score, the greater your risk of obesity. Of course, this does not mean that you are overweight by definition. This is largely due to your lifestyle.

Your risk score for excess weight is 4.08 of a total score of 8.46. Since a person will never possess all the risk alleles, this score means that you have a high predisposition for obesity.

Speliotes EK, Willer CJ, Berndt SI, et al. Association analyses of 249,796 individuals reveal 18 new loci associated with body mass index. Nat Genet. 2010;42(11):937-48.
Willer CJ, Speliotes EK, Loos RJ, et al. Six new loci associated with body mass index highlight a neuronal influence on body weight regulation. Nat Genet. 2009;41(1):25-34.
Thorleifsson G, Walters GB, Gudbjartsson DF, et al. Genome-wide association yields new sequence variants at seven loci that associate with measures of obesity. Nat Genet. 2009;41(1):18-24.

A3. Weight
Energy balance

Basal energy requirement:
1610 KCAL

Total energy requirement:
2335 KCAL

Energie intake for losing weight:
1835 kcal

Energy requirement

On the basis of your sex, height, weight and age we have determined that your basic daily energy requirement is **1610 calories.** This requirement increases depending on how physically active you are. The daily activity specified by you **(lightly active)** means that your total daily energy requirement is 2335 calories. This is the amount of calories that your body needs to carry out all processes at your current weight. This energy requirement must therefore be satisfied by eating sufficiently. However, if you eat more than **2335 calories**, it means that your body has an energy surplus. This extra energy will be stored by your body as fat in fat cells, or glycogen in muscles, for times when food is not readily available – an inherent process, which has helped humans survive throughout history, but is putting us at risk of overweight nowadays. If you then need more energy on a particular day than you get from food consumed, the body can use these stores as a source of energy. This can happen on a day when you eat less or a day when you exercise more. Maintaining a healthy weight is therefore about the balance between energy intake and energy requirement. Yet, although it is good to try to maintain that energy balance daily, it is the long-term balance, that determines if we lose or gain weight. Therefore, the adjustment of your daily energy intake to your physical activity on each day might be an unnecessary effort. Rather, focus on the weekly and monthly balance. For example, if you eat a lot of birthday cake on one day, simply try to be more active over the week, rather than limit your other meals on the same day.

More info on page 76

Weight loss

At the moment that you want to lose weight, you will need to shift the energy balance and use more energy than you consume. As a result of this, your body will have to draw on energy reserves (i.e.: burn fat). **In your case, this means that you will have to consume around 1835 calories per day for optimal weight loss.** This amount of calories will ensure that your body has to draw on the reserves, but that you will not run up any deficits in essential nutrients. It is important, however, to not only look at the total number of calories, but at the number of calories per macronutrient in particular. As the optimal ratio of fat, protein and carbohydrates is partly determined by your genes, it is very important that this ratio is suitable for you.

More info on page 76

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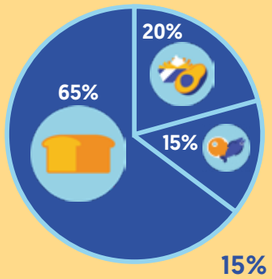
B. Nutrition

Overview

B NUTRITION

B1 MACRONUTRIENT BALANCE



20% FAT
15% PROTEIN
65% CARBOHYDRATES

B2 SATURATED FAT SENSITIVITY

YOU ARE SENSITIVE TO SATURATED FATS

B3 MICRONUTRIENTS

- VITAMIN D
- VITAMIN B11
- VITAMIN B12
- CALCIUM
- SODIUM

ELEVATED RISK

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B1. Nutrition

Macronutrient balance

Your diet provides your body with the building blocks and fuel that are necessary for all basic processes of the body. Take, for example, breathing, the beating of yoaur heart and all other processes that continue on a cellular and tissue level when your body is at rest. These 'simple' things also cost your body energy. You therefore need sufficient amount of nutrients in order to provide you with your daily energy needs.

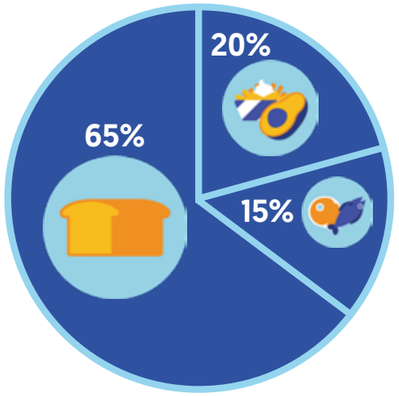
These nutrients are classified as micro- and macronutrients. Micronutrients are all vitamins and minerals, while macronutrients are fat, protein and carbohydrates. These enter our body as food and are subsequently absorbed by cells, providing us with necessary building blocks and fuel. All macronutrients are therefore a source of energy for the body. The energy that a nutrient contains is expressed in calories (or joules).

All processes of the body cost energy. Therefore, the cells of the body need energy in order to carry out their function. This applies, for example, for muscle cells that ensure that you can move, but also for brain cells that ensure that you can read this text. Every person has a basic energy requirement, also referred to as resting metabolism, which is necessary just to stay alive. How great this need is depends on your sex, height, weight and age. Your additional energy requirement, however, depends on how physically active you are.

Expected weight loss

For you to lose weight, we have estimated your total daily energy expenditure and decreased that by 500kcal/day. This reduction should result in a weight loss of ca 0.5-1 kg/week, while also being modest enough to be maintained over a longer period, resulting in healthy and maintainable weight loss. Although one might be tempted to increase the deficit to lose weight faster, there are several reasons why this is not recommended:

- It is difficult to obtain all necessary micronutrients at low energy intakes.
- Very low energy intake tends to make people feel constantly tired and unmotivated.
- The body breaks down its own muscles to gain the energy it needs – so you lose weight from muscle, not fat, which is bad in itself, but also decreases your resting energy expenditure because of decreased muscle mass.
- The body becomes extremely efficient at storing the energy whenever you eat, to increase its likelihood to 'survive' this period of food scarcity.
- At very low energy intakes, the body tries to account for the loss of isolation by fat for warmth and organ protection, by significantly increasing hair growth on arms, back and even face, so people with very low energy intakes start looking "hairy".



Macronutrient balance
Fat: 20%
Protein: 15%
Carbohydrates: 65%

Your calories per macronutrient normal:
Fat: 457 kcal
Protein: 350 kcal
Carbohydrates: 1518 kcal

Your calories per macronutrient to lose weight:
Fat: 367 kcal
Protein: 275 kcal
Carbohydrates: 1193 kcal

You are extra sensitive to saturated fats.

Make sure not to exceed the adviced 10% of your daily energy intake to be saturated fat.

By looking at your genotype of four SNPs, we can specify which ratio could provide the best result for you if you want to lose weight or want to stay at a healthy weight. As can be seen in the diagram, the following ratio of macronutrients suits your genotype:

Fat: We advise that **20 percent** of your daily energy intake consists of fat. This means that you should eat about 457 calories in fats to maintain or reduce your current weight. This is 52 grams of pure fat. If you want to lose weight, we advise you to reduce your daily intake of fat to 367 calories. This is equivalent to 41 grams. Please note that this includes the intake of saturated fat. p. 77

Saturated fat: A maximum of **10 percent** of your daily energy intake may consist of saturated fat. This means for you that you should maximally eat about 234 calories in saturated fats to maintain or reduce your current weight. This is 25 grams of pure saturated fat. If you want to lose weight, we advise you to reduce your daily intake of saturated fat to a maximum of 184 calories. This is equivalent to 20 grams of pure saturated fat. p. 79

Protein: We advise that **15 percent** of your daily energy intake consists of protein. This means that you should maximally eat about 350 calories in proteins to maintain or reduce your current weight. This is 88 grams of pure protein. If you want to lose weight, we advise you to reduce your daily intake of proteins to 275 calories. This is equivalent to 69 grams of pure protein. p. 80

Carbohydrates: We advise that **65 percent** of your daily energy intake consists of carbohydrates. This means that you should maximally eat about 1518 calories in carbohydrates to maintain or reduce your current weight. This is 380 grams of pure carbohydrates. If you want to lose weight, we advise you to reduce your daily intake of carbohydrates to 1193 calories. This is equivalent to 298 grams of pure carbohydrates. p. 82

For people with your genotype who want to lose weight, it works well to eat a relatively large amount of carbohydrates in relation to fats. It turns out that your body primarily reacts to the fats that enter your body with food. Therefore, try to limit the intake of fats as much as possible and/or to replace them with good carbohydrates. Please note: although you need to limit the amount of fat in your food, this does not mean that you have to completely avoid fats. You certainly need fats in your food, but a maximum of 10% of your energy intake may consist of saturated fats, the rest should be unsaturated fats.

Your genotype also shows that you are extra sensitive to saturated fats. It is therefore important for an optimal result that you do not exceed the limit of saturated fats.

Also protein is a necessary part of the diet. However, when you want to lose weight it works best for people with your genotype not to have a too high protein intake. Therefore, try to maintain it at around 15% of your total energy intake.

For example menu's see page 89 and 90

B1. Nutrition

Your genotype

Gene	SNP	Your genotype
APOA2	rs5082	CC
TCF7L2	rs7903146	TC
PPARG	rs1801282	CC
FTO	rs1558902	TT

Macronutrient genes

Based on four SNPs (as shown in the table) we can deduce what would be an optimal ratio for you to include the macronutrients in your diet. The four SNPs are all associated with a specific predisposition to a processes within your metabolism.

The genes APOA2 and PPARG both give an insight into how your body deals with fat and saturated fats in particular. These can therefore determine whether you will store more fat as a result of the consumption of fats. This also means that if you have this predisposition, you will be more sensitive to a diet that limits fats.

The TCF7L2 gene has been studied in relation to weight loss and specific diet types. These studies have shown that specific variants in this gene are associated with a response to certain macronutrients. It turned out that the participants in the study achieved optimal weight loss either on a low fat or low carbohydrate diet. The optimal diet was found to be related to their genotype of the TCF7L2 gene.

When determining the proportion of fats and carbohydrates in your diet, we take all three genes into account. This means that you will not always have the “high fat intake” genotype for all three genes. The genotypes may contradict each other in terms of outcome. However, if you have the same outcome for two of the three genes, this will determine your diet recommendation.

The SNP in the FTO gene we are looking at here plays a role in the interaction between protein consumption and weight loss. It turns out that certain people react better to a diet with a high protein content. Scientists have followed a group of people for a two-year period. They looked at how people react to a high protein diet. It turned out that people with a certain genotype were better able to hold on to the initial weight loss by retaining high protein consumption over the entire two year period.

APOA2 - Causes sensitivity to saturated fats

TT 59% | TC 34% | CC 7%

Gene: APOA2 (apolipoprotein A 2)
This gene is the blueprint for a protein that is part of HDL cholesterol particles (also known as “good” cholesterol). HDL (high-density lipoprotein) particles are important for fat transport in the body. APOA2 is the second most abundant protein of HDL cholesterol particles.

SNP: rs5082 (T/C)
This SNP in the APOA2 gene appears to pose an increased risk of obesity in combination with a large amount of saturated fats in the diet. Increasing or decreasing the intake of saturated fats has a big effect on your body weight. Certain variants in this gene provide an even greater sensitivity to saturated fats.

Your genotype: **CC**
Studies have shown that people with this genotype will gain weight rapidly from consuming saturated fats. Reducing the saturated fat intake has a significant effect on lowering the BMI, especially compared to people with the other genotypes.

Corella D, Arnett DK, Tsai MY, et al. The -256T>C polymorphism in the apolipoprotein A-II gene promoter is associated with body mass index and food intake in the genetics of lipid lowering drugs and diet network study. Clin Chem. 2007;53(6):1144-52.

PPARG - Increases the storage of fats

CC 86% | CG 13% | GG 1%

Gen: PPARG (Peroxisome proliferator-activated receptor gamma)
PPARG regulates fat storage and glucose metabolism. This gene stimulates the absorption of fats and the production of fat cells. The production and regulation of fat cells in turn depends on the amount of fat that enters the body through the diet. Research on mice, for example, shows that when the PPARG gene is “knocked-out” of their DNA, they fail to generate fat cells even when they are placed on a high-fat diet.

SNP ID: rs1801282 (C/G)
This variant in the PPARG gene shows a connection between fat intake and BMI. The body’s reaction to fat in the diet and the production of fat cells ensures a clear association of this SNP and a certain dietary pattern.

Your genotype: **CC**
People with this genotype show more weight gain in response to fat intake.

Deeb SS, Fajas L, Nemoto M, et al. A Pro12Ala substitution in PPARgamma2 associated with decreased receptor activity, lower body mass index and improved insulin sensitivity. Nat Genet. 1998;20(3):284-7.

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TCF7L2 - Cause sensitivity to a specific diet

CC 61% | CT 32% | TT 7%

Gen: TCF7L2 (transcription factor 7-like 2)
Among other things, TCF7L2 plays a role in the formation of glucagon. This hormone is important for the amount of glucose and fat in the bloodstream. The pancreas releases glucagon to the bloodstream when the amount of glucose in the blood becomes too low. This glucagon causes the liver to release stored glucose to the bloodstream, but it also induces the conversion of stored fatty acids (in for example fat cells) into glucose.

SNP: rs7903146 (T/C)
The TCF7L2 gene appears to contribute significantly to weight loss in response to a specific diet. Studies show that people with a particular genotype in the rs7903146 SNP are sensitive to a diet high in carbohydrates and low in fat. While the other genotypes show the opposite.

Your genotype: **CT**
This genotype has no influence on the response to a low fat or low carbohydrate diet. People with this genotype show adequate weight loss on both a low carbohydrate - high fat diet as vice versa.

Fisher E, Meidtner K, Angquist L, et al. Influence of dietary protein intake and glycemic index on the association between TCF7L2 HapA and weight gain. Am J Clin Nutr. 2012;95(6):1468-76.

FTO - Causes sensitivity to a high protein diet

TT 62% | AT 30% | AA 8%

Gen: FTO (Fat mass and obesity-associated protein)
FTO is an important genetic factor when it comes to obesity. Variants in the FTO gene are linked to a higher BMI score and an increased risk of obesity. A study with a functional MRI scan even showed that the risk variant of the FTO gene has a distinct effect in the brain when images of food are shown to the test subjects.

The FTO protein regulates the extent to which specific parts of the DNA are being utilised to produce other proteins (gene expression). Several polymorphisms in the FTO gene have been found that are associated with obesity and affect different processes responsible for weight gain.

SNP: rs1558902 (A/T)
Several studies show a relationship between different diets and variations in the FTO gene. The rs1558902 SNP is associated with a reaction to protein intake. People with a particular genotype achieve a better (weight loss) results with a high protein diet, while for others a low amount of protein in the diet induces the most weight loss. This study has also shown that protein intake in relation to genotype has a beneficial effect on the long-term maintenance of weight loss.

Your genotype: **TT**
For people with this genotype a low protein diet seem to be the best way to lose weight. This means that about 15% of the daily energy intake would come from proteins.

Zhang X, Qi Q, Zhang C, et al. FTO genotype and 2-year change in body composition and fat distribution in response to weight-loss diets: the POUNDS LOST Trial. Diabetes. 2012;61(11):3005-11.

B2. Nutrition

Micronutrients

Micronutrients

The table presents your recommendations for all micronutrients. It includes the official recommendations based on your gender and age (DRV), and highlights the micronutrients to which you should turn extra attention, based on your genotype (genetic risk), your genetically determined macronutrient ratio (dietary macronutrient ratio), your diet in general (vegan/vegetarian/ eat little or no dairy) and based on observed intakes in the general population (concern in general population). Each of these columns will have an exclamation mark (!) if extra attention to its intake is relevant for you for some reason.

For example, your genetics can put you at risk of low levels, by influencing the absorption or transportation of a micronutrient. Or your genetically determined macronutrient ratio, in combination with low amount of daily calories (for weight loss), might make it challenging to achieve sufficient intake of a certain nutrient.

Therefore, even one exclamation mark per micronutrient means that there is reason for you to turn special attention to the intake of this micronutrient. More exclamation marks per row, however, mean that there is more than one reason for turning special attention.

All the results are explained together with specific advice on the next pages. You will also find a short description of the role of each micronutrient and a list of good dietary sources.

Please note that an exclamation mark means that you should turn more attention to a micronutrient, but not that you necessarily have insufficient intake. We advise you to aim at intakes close to or at the value stated in the DRV and if needed, discuss these results with a doctor to determine whether you would need even higher intakes. It is important not to have too high intakes, because more is not always better.

More info on page 87 and 88

Micronutrient	Dietary reference value (DRV)	Genetic risk	Genetic macronutrient ratio 20% fat | 15% protein 65% carbs	Eat little or no dairy	Concern in general population	More information
Vitamin A	700 µg		!		!	p. 22
Vitamin D	10 µg	! !	!	!	!	p. 23
Vitamin E	8 mg		!		!	p. 26
Vitamin K	90 µg		!			p. 27
Vitamin B1	1.1 mg		!			p.28
Vitamin B2	1.1 mg					
Vitamin B3	13 mg					
Vitamin B5	5 mg					
Vitamin B6	1.5 mg					p. 29
Vitamin B8	40 µg					
Vitamin B11	300 µg	!			!	p. 31
Vitamin B12	2.8 µg	!				p. 34
Vitamin C	75 mg				!	p. 37
Calcium	1000 mg	! !	!	!		p. 39
Phosphorus	600 mg					
Potassium	3100 mg				!	p. 42
Magnesium	280 mg				!	p. 43
Iron	15/9 mg				!	p. 44
Zinc	7 mg		!		!	p. 48
Copper	0.9 mg					
Iodine	150 µg					p. 49
Selenium	50 µg				!	P. 50
Manganese	3 mg					
Molybdenum	65 µg					
Flouride	2.9 mg					
Chromium	25 µg					
Sodium	Max 2400 mg (6 g salt)	!			!	p. 51

The dietary reference values (DRV) included in this table are based on the guidance of the Health Council of the Netherlands, and thereby combine the recommendations from the Health Council of the Netherlands, Scandinavia's Nordic Council (NC), the European Food Safety Authority (EFSA) and the US Institute of Medicine (IOM), for the latest recommendations. You can find more information on these dietary reference values by visiting the website of Netherlands Nutrition Centre https://www.voedingscentrum.nl/nl/service/english.aspx, and selecting the English fact sheet on vitamins, minerals and trace elements.

B1. Nutrition
Vitamin A

Because your genetically determined diet includes only 20% energy from fat, you might run a risk of insufficient intake of fat-soluble vitamins, including vitamin A. Especially when you want to lose weight and reduce your total energy intake.

- **Consume a variety of vitamin A rich food products daily.**
- **To reach an optimal intake without compromising the amount of fat in your diet, choose plant-based products frequently.**
- **Track your intake with the help of an online application to confirm that your intake is sufficient.**

What is vitamin A?

Vitamin A is a general term for a group of compounds including retinol, retinal, retinoic acid, and provitamin A carotenoids. They are essential for good vision, immunity, skin health, reproduction, growth and the regulation of gene expression. In addition, they also have antioxidant properties. Vitamin A deficiency is the main cause of (night)blindness in developing countries, but insufficient intakes are also common in the developed countries. This is because the consumption of fruits, vegetables, nuts, seeds and fish is generally low in these countries.

Therefore, it is important that you turn attention to regularly consuming a variety of foods from these food groups, to meet your vitamin A needs.

In order not to exceed your daily percentage of energy from fat, it might be helpful to choose plant-based sources regularly.

Vitamin A

Food item	Portion	µg*	% DRV
Liver, cooked	1 liver	27665	3952%
Sweet potato, boiled	1 medium potato	930	133%
Carrots, boiled	1 medium carrot	551	79%
Kale	1 serving spoon	359	51%
Spinach, boiled	1 serving spoon	227	32%
Dried apricot	10 dried apricots	180	30%
Fruit juice, fortified	1 glass	100	14%
Red pepper	1 red pepper	57	8%
Butter	for 1 slice of bread	52	7%
Margarine, enriched	for 1 slice of bread	48	7%
Papaya	1 papaya	37	5%
Cheddar	1 slice	34	5%

*Vitamin A occurs in a variety of forms, so it is expressed as retinol equivalent (RE). 1 RE= 1 µg retinol or 12 µg ß-carotene.The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 700µg RE of vitamin A. The actual nutrient content of these products depends on the chosen product.

B1. Nutrition
Vitamin D

- **Your DNA shows that you have a risk of insufficient levels of vitamin D as well as calcium. As sufficient vitamin D levels are needed for calcium uptake, it is extra important that you turn attention to your vitamin D status.**
- **Because your genetically determined diet includes only 20% energy from fat, you might run a risk of insufficient intake of fat-soluble vitamins, including vitamin D. Especially when you want to lose weight and reduce your total energy intake.**
- **Because you do not habitually consume dairy products, you might be at increased risk of low calcium levels. Vitamin D is needed for optimal calcium intake, so it is important that your vitamin D intake is sufficient to decrease the likelihood of calcium deficiency.**

- **Eat fatty fish at least once a week, but preferably more frequently.**
- **Track your intake with the help of an online application to confirm that your intake is sufficient.**
- **If you have difficulty reaching the recommendation, consider consuming fortified products and/or supplementation.**

Visit your GP to measure your levels of vitamin D and calcium. If these are in the normal range, there is no need for concern, because your genotype affects the absorption but not function of vitamin D.

Gene	SNP	Your genotype
VDR	rs222857	TT

What is vitamin D?

Vitamin D is a fat-soluble vitamin, which has many important roles in human body. For example, it plays an essential role in the maintenance of bone health, since vitamin D is needed for the absorption of calcium. Therefore, sufficient vitamin D levels are important for the prevention of osteoporosis. Vitamin D is also important for immune function and hormonal balance, and has anti-inflammatory and antioxidant properties. Vitamin D also influences our cognitive capacity, mood and overall mental health, and its deficiency is associated with increased depression.

Vitamin D is naturally present in very few food items, and therefore, fortification of staple food products is common. Humans can also synthesize vitamin D when exposed to the sun. However, vitamin D deficiency is common in the developed world, due to the increasing amount of time spent indoors and suboptimal dietary quality.

The population groups with a highest risk of vitamin D deficiency are children and elderly (especially females due to a higher risk of osteoporosis than in males), people who rarely go outside, people with dark skin and people who do not consume fatty fish or vitamin D fortified food products or supplements regularly. Therefore, if you belong to any of these groups, it is even more important that you focus on your vitamin D intake.

To improve your vitamin D levels we advise you to consume fatty fish at least once a week, but preferably more frequently. In addition, and especially if you don't eat fish, you might consider choosing a fortified version of your staple foods, for example margarine or milk. To make sure that your vitamin D intake is sufficient, we advise you to track it with the help of an online application every once in a while. If you have difficulties in achieving the recommended intake, consider vitamin D supplementation.

We also advise to visit your GP for the assessment of vitamin D levels. Since people with your genotype have difficulties absorbing vitamin D, you might have lower than optimal levels. However, if your vitamin D levels are in the normal range, there is no need for concern, because your genotype only influences the absorption, but not the function of vitamin D.

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Vitamin D

Your genotype

Vitamin D

Food item	Portion	µg*	% DRV
Trout, cooked	1 steak	10,9	109%
Salmon, cooked	1 steak	8,3	83%
Tuna, cooked	1 steak	3,4	34%
Liver, cooked	1 liver	3,2	32%
Tuna, canned in oil	1 can	2,7	27%
Mackerel, steamed	for 1 slice of bread	1,7	17%
Mackerel, canned, in water	for 1 slice of bread	1,7	17%
Mackerel, canned in oil	for 1 slice of bread	1,7	17%
Egg, boiled	1 egg	0,9	9%
Margarine, enriched	for 1 slice of bread	0,4	4%
Tuna, canned in water	for 1 slice of bread	0,2	2%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age.
The %DRV is based on your DRV of 10ug of vitamin D. *The actual nutrient content of these products depends on the chosen product.

VDR - Causes increased calcium uptake by vitamin D

CC 47% | CT 40% | TT 13%

Gene: VDR (vitamin D receptor)

VDR is a so-called transcript regulator. This is a protein that stimulates the production of another protein. The vitamin D receptor thus stimulates the production of proteins that have an important function in the metabolism of minerals, including calcium. Bone formation depends to a large extent on the proper functioning of the vitamin D receptor to achieve a good calcium homeostasis (a stable balance of supply and discharge of substances). Bone formation and maintenance of pre-existing bones depends on both the presence of calcium in the diet as well as a sufficient amount of vitamin D. Variants in the vitamin D receptor can increase the need for both calcium and vitamin D through reduced efficiency.

SNP: rs2228570 (T/C)

This polymorphism in the VDR gene causes a difference in calcium intake related to the different genotypes. It appears that the calcium intake is related to which variant an individual has this SNP in the VDR gene. This absorption is directly linked to the bone density. The effects of this variant are linked to the presence of vitamin D in the

Your genotype: **TT**

This genotype is associated with a normal efficiency for converting calcium into bone.

Uitterlinden AG, Fang Y, Van meurs JB, Pols HA, Van leeuwen JP. Genetics and biology of vitamin D receptor polymorphisms. Gene. 2004;338(2):143-56.

B1. Nutrition

Vitamin E

Because your genetically determined diet includes only 20% energy from fat, you might run a risk of insufficient intake of fat-soluble vitamins, including vitamin E. Especially when you want to lose weight and reduce your total energy intake.

• Including a wider variety of fruits and vegetables and smaller amounts of nuts, seeds and oils can help you in reaching sufficient vitamin E without compromising your fat intake.
• Track your intake with the help of an online application to confirm that your intake is sufficient.

What is vitamin E?

Vitamin E is a fat-soluble vitamin with strong antioxidant properties. This means that it can protect us from cell damage, tissue aging and DNA damage, caused for example by air pollution, cigarette smoke and exposure to UV radiation. In addition, vitamin E is also involved in immune function and can help to prevent blood clotting and dilate blood vessels, thereby decreasing the risk of heart disease and stroke. It is also important for the health of skin and hair, as well as for hormonal balance. However, insufficient intakes of vitamin E are common in the developed world. This is because the consumption of fruits, vegetables, nuts, and seeds is generally low in these countries.

Therefore, it is important that you turn attention to regularly consuming a variety of foods from these food groups, to meet your vitamin E needs.

Vitamin E

Food item	Portion	Mg*	% DRV
Avocado	1 avocado	5,8	73%
Sunflower seeds	1 table spoon	5,7	71%
Sunflower oil	1 table spoon	4,9	61%
Almonds	10 almonds	4,4	55%
Mango	1 mango	3,1	39%
Hazelnuts	10 hazlenuts	2,5	31%
Spinach, boiled	1 serving spoon	2,4	30%
Peanut butter	for 1 slice of bread	1,8	23%
Kiwi	1 kiwi	1,0	13%
Margarine, enriched	for 1 slice of bread	1,0	13%
Pumpkin, boiled	1 serving spoon	0,6	8%
Broccoli, boiled	1 serving spoon	0,4	5%

The dietary reference value [DRV] is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 8 mg of vitamin E.*The actual nutrient content of these products depends on the chosen product.

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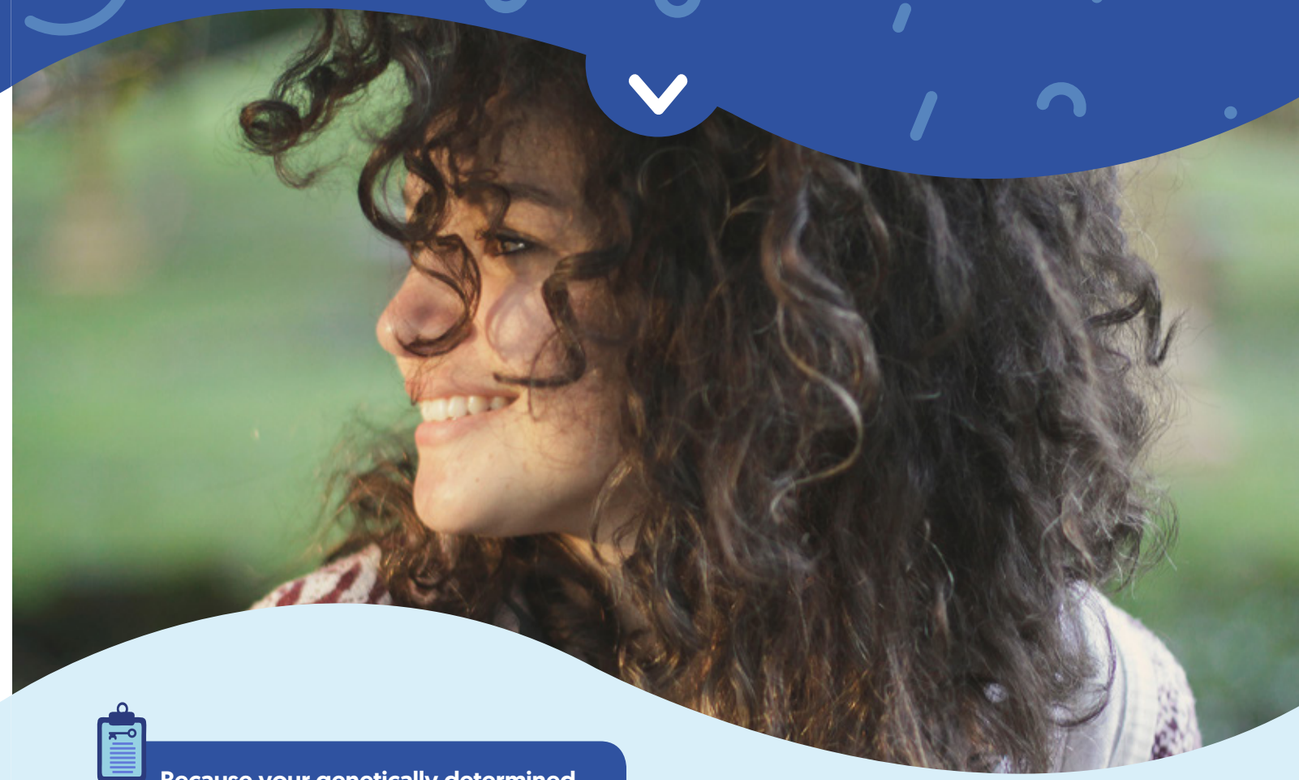
B1. Nutrition

Vitamin K



Because your genetically determined diet includes only 20% energy from fat, you might run a risk of insufficient intake of fat-soluble vitamins, including vitamin K. Especially when you want to lose weight and reduce your total energy intake.

• Consume foods rich in vitamin K daily.
• To reach an optimal intake without compromising the amount of fat in your diet, choose plant-based products frequently.
• Track your intake with the help of an online application to confirm that your intake is sufficient.

What is vitamin K?

Vitamin K is a fat-soluble vitamin that is important for blood clotting and the prevention of excessive bleeding. Without vitamin K, we would experience uncontrollable bleeding even as a result of a minor injury. In addition, vitamin K is necessary for binding of calcium in our bones and other tissues, as well as for optimal health of skin and nails, for example. As vitamin K is present in a variety of foods, deficiencies in vitamin K are uncommon in healthy populations of the developed world.

B1. Nutrition
Vitamin B1 (Thiamine)

When you want to lose weight and reduce your energy intake you might run a risk of insufficient intake of thiamine due to low energy intake.

• Since thiamine is present in all food groups, you can ensure sufficient thiamine intake by incorporating foods higher in thiamine from each group to your daily diet.
• Assess your thiamine intake with the help of an online application to ensure sufficient intakes.

What is thaimine?

Thiamine, also known as vitamin B1, is a water-soluble vitamin that plays a role in energy metabolism. Namely, it controls how our body converts carbohydrates to consumable energy. Therefore, sufficient intake is important for our ability to focus, as well as for our physical strength. Accordingly, the most common symptoms of thiamine deficiency are chronic fatigue, muscle wasting, neurological degeneration and gut problems. thiamine is also important for the health of our eyes and liver and for skin, hair and nails. Thiamine is in moderate amounts present in most foods. Therefore, deficiencies might occur when energy intake is limited, but are otherwise not very common in developed countries. Yet, even when you do limit your daily energy intake, you can achieve sufficient intake by choosing food items with higher content.

Vitamine B1 (Thiamine)

Food item	Portion	Mg*	% DRV
Pork, cooked	1 piece	0,22	20%
Liver, cooked	1 liver	0,16	15%
Almonds	10 almonds	0,14	13%
Lentils, boiled	1 serving spoon	0,11	10%
Pumpkin, boiled	1 serving spoon	0,07	6%
Sunflower seeds	1 table spoon	0,05	5%
Flax seeds	1 table spoon	0,05	5%
Beef, cooked	1 piece	0,04	4%
Egg, boiled	1 egg	0,04	4%
Potatoes, boiled	1 potato	0,04	4%
Cashews	10 cashews	0,03	3%
Porridge	1 table spoon	0,03	3%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age.
The %DRV is based on your DRV of 1.1 mg of vitamin B1. *The actual nutrient content of these products depends on the chosen product.

B1. Nutrition
Vitamin B6

It should not be especially difficult for you to maintain sufficient vitamin B6 intake.

• Consume foods rich in vitamin B6 regularly.
• Track your intake with the help of an online application to confirm that your intake is sufficient.

Gene	SNP	Your genotype
ALPL	rs4654748	TT

What is vitamin B6?

Vitamin B6 is a water-soluble vitamin that has a variety of roles in human body. For example, vitamin B6 is needed to make amino acids, which are important for optimal cellular functioning and which are also the building blocks of proteins. In addition, vitamin B6 is important for the regulation of blood sugar and the formation of hemoglobin – the carrier of oxygen in our body. Vitamin B6 is present in a variety of animal products but also in grains, vegetables and seeds, so B6 deficiencies are not too common among the populations of developed countries.

Vitamin B6

Food item	Portion	Mg*	% DRV
Tuna, canned, in oil	1 can	0,66	44%
Avocado	1 avocado	0,65	43%
Salmon, cooked	1 steak	0,54	36%
Tuna, canned, in water	1 can	0,40	27%
Beef, cooked	1 piece	0,36	24%
Chicken, cooked	1 fillet	0,30	20%
Pork, cooked	1 piece	0,24	16%
Pistachios	1 handful	0,23	15%
Sunflower seeds	1 tablespoon	0,20	13%
Potatoes, boiled	1 medium potato	0,14	9%
Lentils, boiled	1 serving spoon	0,08	5%
Chikpeas, boiled	1 serving spoon	0,08	5%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age.
The %DRV is based on your DRV of 1.5 mg of vitamin B6. *The actual nutrient content of these products depends on the chosen product.

Vitamin B6

Your genotype

ALPL - Causes reduced vitamin B6 concentrations in the blood.

CC 43% | CT 49% | TT 18%

Gene: ALPL (alkaline Phosphatase)

The ALPL gene provides instructions for making an enzyme called alkaline phosphatase. This enzyme acts as a phosphatase, which means that it removes clusters of oxygen and phosphorus atoms (phosphate groups) from other molecules. This process is essential for the transport of vitamin B6. Variants in the ALPL gene are therefore associated with vitamin B6 concentrations in the body.

SNP: rs4654748 (C/T)

Studies have shown that this polymorphism in the ALPL gene is significantly associated with decreased concentrations of vitamin B6 in the blood.

Your genotype: **TT**

This genotype does not allow any association with lower vitamin B6 levels in the blood.

Tanaka T, Scheet P, Giusti B, et al. Genome-wide association study of vitamin B6, vitamin B12, folate, and homocysteine blood concentrations. Am J Hum Genet. 2009;84(4):477-82.

B1. Nutrition

Vitamin B11

Your DNA shows that you have a risk for insufficient folate levels.

• Consume foods rich in folate regularly.
• Track your intake with the help of an online application to confirm that your intake is sufficient.
• If you have difficulty reaching the recommendation, consider consuming fortified products and/or supplementation.

Visit a GP to measure your folate levels. If these are in the normal range, there is no need for concern, since your genotype influences the absorption but not the functioning of folate in your body.

Gene	SNP	Your genotype
MTHFR	rs1801131	AC
MTHFR	rs1801133	CT

What is Folate?

Folate, is also known as vitamin B9 or B11. While the naturally occurring form is called folate, the chemically synthesized form (used in fortified products and supplements) is called folic acid. In the human body, folic acid is absorbed faster, but folate is utilized more easily. Nevertheless, the intake of either, or both of these compounds is essential for optimal health.

This is because folate plays an important role in copying and synthesizing DNA and is therefore essential for the formation of new cells. In addition, we need folate for proper functioning of amino acids, vitamin B12 and blood cell formation and immune function. Folate has also been shown to reduce blood levels of homocysteine, which has been linked to cardiovascular disease.

Folate is especially important for optimal fetus development, and insufficient stores in early pregnancy can lead to neural tube defects. These influence the development of spinal nerves and vertebrae. This is why folate supplementation (in the form of folic acid) is recommended to all females in childbearing age.

There are a few good dietary sources of folate, but these could easily fit into a healthy diet. Sadly, however, this is often not the case in developed countries and folate deficiencies, both in males and females, are relatively common. Yet, due to the serious consequences of deficiencies, fortified food products are relatively common, making sufficient dietary intake more achievable.

Your genetic results show that you have a genotype that has been associated with lower levels of folate and higher levels of homocysteine. Therefore, sufficient intakes of folate are especially important for you. We advise you to consume folate rich foods regularly and track your folate intake with the help of an online application to evaluate your levels of intake. We also recommend that you visit your GP to measure your folate levels.

We advise you to track your folate intake with the help of an online application to assess your intake. If these are insufficient, you can consider choosing fortified products. However, since also these are generally carbohydrate-rich products, consumption of supplements might be the optimal solution.

Folate/ vitamin B11

Food item	Portion	µg*	% DRV
Liver, cooked	1 liver	351	117%
Spinach, boiled	1 serving spoon	87	29%
Brussel sprouts, boiled	1 serving spoon	67	22%
Bok choy	2 serving spoons	66	22%
Cauliflower, boiled	1 bowl	47	16%
Kale, boiled	1 serving spoon	42	14%
Orange	1 medium orange	42	14%
Broccoli, boiled	1 serving spoon	38	13%
Papaya	1 papaya	37	12%
Kidney beans, boiled	1 serving spoon	31	10%
Lentils	1 serving spoon	20	7%
Avocado	1 avocado	20	7%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age.
The %DRV is based on your DRV of 300ug of folate. *The actual nutrient content of these products depends on the chosen product.

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Vitamin B11

Your genotype

MTHFR - Causes a reduced folic acid conversion rate

CC 57% | **AC 36%** | AA 7%

Gene: MTHFR (methylene tetrahydrofolate reductase)
MTHFR is the speed limiting enzyme in the methyl cycle. Folic acid is converted in this system. Variations in this gene reduce the speed of conversion, which means that the whole cycle will be slower.

SNP ID: rs1801131 (A/C)
This variant in the MTHFR gene is associated with a reduced absorption of folic acid and thus an increased risk of deficiency of this substance. This variant, in combination with another variant in the MTHFR gene (rs18001133), can show an even greater effect on folic acid metabolism.

Your genotype: **AC**
This genotype shows a lower conversion of folate. In combination with a CT (or the particularly rare TT) genotyping in MTHFR marker rs1801133, the effect is stronger than if someone vitamin B6 levels in the blood.

Tanaka T, Scheet P, Giusti B, et al. Genome-wide association study of vitamin B6, vitamin B12, folate, and homocysteine blood concentrations. Am J Hum Genet. 2009;84(4):477-82.

MTHFR - Causes a reduced folic acid conversion rate

CC 59% | **CT 33%** | TT 8%

Gene: MTHFR (methylene tetrahydrofolate reductase)
MTHFR is the speed limiting enzyme in the methyl cycle. Folic acid is converted in this system. Variations in this gene reduce the speed of conversion, which means that the whole cycle will be slower.

SNP ID: rs1801133 (T/C)
This variant in the MTHFR gene is associated with a reduced intake of folic acid and thus an increased risk of deficiency of this substance. This variant, in combination with another variant in the MTHFR gene (rs18001133), can show an even greater effect on folic acid metabolism.

Your genotype: **CT**
People with this genotype have seen a reduced conversion of folic acid. The MTHFR protein is 35% less active than the CC variant. In combination with an AC or CC genotyping in MTHFR marker rs1801131, the effect is stronger than if someone has a risk variant in only one of the markers.

Tanaka T, Scheet P, Giusti B, et al. Genome-wide association study of vitamin B6, vitamin B12, folate, and homocysteine blood concentrations. Am J Hum Genet. 2009;84(4):477-82.

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B1. Nutrition
Vitamin B12

Your DNA shows that you have a risk for insufficient levels of vitamin B12.

- Assess your B12 intake with the help of an online application.
- Decide accordingly whether you need to consume fortified products or supplementation to meet your daily needs.

Visit your GP to measure your levels of vitamin B12. If these are in the normal range, there is no need for concern, because your genotype affects the absorption but not the functioning of vitamin B12.

Gene	SNP	Your genotype
FUT2	rs602662	GG

What is vitamin B12?

Vitamin B12, also known as cobalamin, is a water-soluble vitamin with many highly important functions, including the formation of red blood cells, DNA synthesis and healthy brain and nerve function. Since vitamin B12 is present in considerable amounts only in animal products, vitamin B12 deficiencies are common. This is concerning, since even mild deficiencies can have noticeable impact on our (mental) health, owing to the various essential functions of vitamin B12. The symptoms might include general fatigue, weakness, confusion, poor memory, depression, loss of appetite, constipation, impaired balance and coordination, numbness and tingling in fingers and toes and many more.

Your DNA test shows that you have a genotype that has been associated with lower absorption of vitamin B12. Therefore, you are at increased risk of low levels and should turn extra attention to sufficient dietary intake. We advise you to monitor your intake with an online application and decide accordingly, whether you should also consume fortified food products or supplements. In addition, we advise you to visit your GP for the assessment of your B12 levels. However, if these are in the normal range, there is no need for concern, because your genotype only influences the absorption, but not the functioning of vitamin B12.

Due to these serious health effects, we advise you to assess your B12 intake with an online application to determine whether the consumption of fortified products, or even supplementation, would be needed to meet your B12 needs. However, if you eat meat and other animal-products regularly, B12 deficiency is very unlikely.

Vitamin B12

Food item	Portion	µg*	% DRV
Tuna, canned, in oil	1 can	6,5	232%
Tuna, canned, in water	1 can	4,4	158%
Salmon, grilled	1 steak	3,7	131%
Tuna, baked	1 piece	2,4	86%
Beef, cooked	1 piece	1,4	49%
Egg, boiled	1 piece	0,8	28%
Milk 1,5%	1 glass	0,7	24%
Pork, cooked	1 piece	0,5	19%
Turkey, cooked	1 fillet	0,5	18%
Cottage cheese	1 table spoon	0,4	14%
Chicken, cooked	1 fillet	0,3	10%
Feta	1 block/slice	0,2	5%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 2.8 ug of vitamin B12 *The actual nutrient content of these products depends on the chosen product.

Vitamin B12

Your genotype

FUT2 - Causes low vitamin B12 levels

GG 49% | AG 36% | AA 15%

Gene: FUT2 (fucosyltransferase 2)

This protein has several functions, the most important of which is that it is part of the group of enzymes that determine the blood groups. It also plays a role in the absorption of vitamin B12.

SNP: rs602662 (G/A)

This variant in the FUT2 gene is significantly associated with reduced vitamin B12 concentrations in various studies. A study comparing vegetarians with nonvegetarians shows that the risk of vitamin B12 deficiency is significantly higher when one possesses a negative gene variant and is vegetarian.

Your genotype: **GG**

This genotype is not associated with increased absorption of vitamin B12.

Tanaka T, Scheet P, Giusti B, et al. Genome-wide association study of vitamin B6, vitamin B12, folate, and homocysteine blood concentrations. Am J Hum Genet. 2009;84(4):477-82.

B1. Nutrition

Vitamin C

Because insufficient intakes of vitamin C are relatively common in developed countries, you should turn attention to achieving sufficient intake.

- **Consume a variety of fruits and vegetables daily.**
- **Assess your intake of vitamin C with the help of an online application and increase your intake of fruits and vegetables if needed.**

Gene	SNP	Your genotype
SLC23A1	rs33972313	CC
SLC23A2	rs6053005	CT

What is Vitamin C?

Vitamin C is a water-soluble vitamin, which might be best known as a home remedy against a common cold. However, research has shown that vitamin C does not actually help to prevent colds and also doesn't treat them when taken after the start of a cold. Yet, the good news is that sufficient long-term intake or supplementation might help to reduce the duration and the symptoms might be somewhat milder. In addition, vitamin C has many other essential roles in the human body. For example, it is necessary for the synthesis of collagen – an essential protein for healthy skin, blood vessels and tendons. Vitamin C also plays a role in tissue repair and wound healing, and the maintenance of teeth and bones. Importantly, vitamin C is also necessary for the absorption of iron in our body and has antioxidant properties. Although vitamin C is a well-known vitamin and present in many common fruits and vegetables; due to generally insufficient intake of fruits and vegetables in the typical diets in developed countries, low vitamin C intakes are not uncommon. Therefore, it is important to focus on regular intake of fruits and vegetables to ensure sufficient vitamin C intake.

Vitamine C

Food item	Portion	Mg*	% DRV
Guava	1 guava	205	273%
Red peppers	1 red pepper	202	269%
Black currants	1 bowl	150	200%
Black currants	1 bowl	150	200%
Green peppers	1 green pepper	96	128%
Brussels sprouts, boiled	1 serving spoon	92	123%
Kale, boiled	2 serving spoons	68	91%
Orange	1 orange	66	88%
Mango	1 mango	64	85%
Papaya	1 papaya	61	81%
Grapefruit	1 grapefruit	60	80%
Strawberries	1 bowl	60	80%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 75 mg of vitamin C. *The actual nutrient content of these products depends on the chosen product.

Vitamin C

Your genotype

SLC23A1 - Causes reduced concentrations of vitamin C in the body

CC 93% | CT 6% | TT 1%

Gene: SLC23A1 (solute carrier family 23 member 1)

Vitamin C absorption through the intestine and reabsorption through the kidney system takes place by active transport into the cell. Two transport proteins are active in the so-called sodium-dependent ascorbic acid family (vitamin C) namely SLC23A1 and SLC23A2. The SLC23A1 gene encodes SVCT1 which is mainly involved in homeostasis (balance) of vitamin C in the whole body and circulating (by blood) vitamin C levels.

SNP: rs33972313 (T/C)

This polymorphism in the SLC23A1 gene results in reduced vitamin C transport. This causes lower levels of vitamin C in the blood. This can be harmful for processes that depend on vitamin C. Think of the growth and repair of tissues in all parts of your body. Vitamin C also helps the body make collagen, an important protein that is used to make skin, cartilage, tendons, ligaments and blood vessels. Vitamin C is therefore needed to heal wounds and to repair and maintain bones and teeth.

Your genotype: **CC**

This genotype is not associated with a reduced vitamin C absorption and therefore there is no increased risk of vitamin C deficiency.

Michels AJ, Hagen TM, Frei B. Human genetic variation influences vitamin C homeostasis by altering vitamin C transport and antioxidant enzyme function. Annu Rev Nutr. 2013;33:45-70.

SLC23A2 - Causes increased concentrations of vitamin C in the body

CC 51% | CT 35% | TT 14%

Gene: SLC23A2 (solute carrier family 23 member 2)

Vitamin C absorption by the intestine and reabsorption by the kidney system takes place by active transport into the cell. Two transport proteins are active in the so-called sodium-dependent ascorbic acid family (vitamin C) namely SLC23A1 and SLC23A2. SVCT2 encoded by the SLC23A2 gene is involved in vitamin C regulation within active metabolic metabolism tissue.

SNP: rs6053005 (T/C)

This variant in the vitamin C transporter gene is associated with an increased absorption of vitamin C. The variant more effectively absorbs vitamin C and thus ensures that the concentrations of vitamin C in the body are higher.

Your genotype: **CT**

This genotype is not associated with increased uptake of vitamin C in the body.

Duell EJ, Lujan-barroso L, Llivina C, et al. Vitamin C transporter gene (SLC23A1 and SLC23A2) polymorphisms, plasma vitamin C levels, and gastric cancer risk in the EPIC cohort. Genes Nutr. 2013;8(6):549-60.

B1. Nutrition

Calcium

• Your DNA shows that you have a risk for insufficient levels of calcium as well as of vitamin D. As sufficient vitamin D levels are needed for calcium uptake, it is extra important that you turn attention to your vitamin D status.

• Calcium absorption is determined by vitamin D levels. Since your genetically determined macronutrient ratio might put you at risk for low vitamin D levels, you might also have lower levels of calcium.

• If you do not consume dairy products as a part of your regular diet, you might be at risk of calcium insufficiency. Even more so, if you also have low levels of vitamin D, which is needed for calcium absorption.

• Consume calcium-rich foods daily.
• Assess your calcium intake with the help of an online application.
• Decide accordingly whether you need to consume fortified products or supplementation to meet your daily needs.
• Make sure to have sufficient vitamin D intake.

Visit your GP to measure your levels of calcium and vitamin D. If these are in the normal range, there is no need for concern, because your genotype affects the absorption but not function of these micronutrients

Gene	SNP	Your genotype
VDR	rs4516035	CC

What is calcium?

Calcium is the most abundant mineral in human body. This is due to its function as a component of bones and teeth. Calcium also plays a role in muscle functioning, nerve signaling, blood clotting, cardiovascular health and also regulates the pH of blood. Calcium levels are highly controlled in the body, so that the blood can “borrow” calcium from bones when needed. Sufficient calcium intake is therefore important throughout our life. Calcium is present in high amounts in dairy products and some types of fish, but also in many vegetables, legumes and seeds.

Therefore, even if one does not consume dairy, the recom-mended intake can be achieved relatively easily, by consuming fruits, vegetables and seeds that contain calcium.

You have a genotype that has been associated with lower rates of calcium absorption. This means that to have sufficient calcium levels in your body, you probably need to have higher calcium intake than someone with another genotype. Your genotype has also been associated with lower absorption of vitamin D. As vitamin D is needed for calcium absorption, you might be at even higher risk of calcium insufficiency. We therefore recommend you to consume a variety of calcium sources daily and visit your GP to discuss this result.

Calcium

Food item	Portion	Mg*	% DRV
Sardines, canned, in oil	for 1 slice of bread	200	20%
Yoghurt	1 serving	190	19%
Milk, 1.5%	1 glass	184	18%
Kale, boiled	1 table spoon	153	15%
Dried figs	4 dried figs	128	13%
Bok choy	1 bok choy	105	11%
Cheddar	1 block/slice	72	7%
Sesame seeds	1 table spoon	67	7%
Spinach, boiled	1 table spoon	59	6%
Almonds	10 almonds	57	6%
Brazil nuts	10 Brazil nuts	52	5%
Feta	1 block	45	5%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 1000 mg of calcium. *The actual nutrient content of these products depends on the chosen product.

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Calcium

Your genotype

VDR - Promotes absorption of calcium in the body

TT 70% | CT 24% | CC 6%

Gene: VDR (vitamin D receptor)

VDR is a so-called transcript regulator. This is a protein that stimulates the production of another protein. The vitamin D receptor thus stimulates the production of proteins that have an important function in the metabolism of minerals, including calcium. Bone formation is largely dependent on the proper functioning of the vitamin D receptor to achieve a good calcium homeostasis (a stable balance of intake and discharge of substances). Bone formation and maintenance of pre-existing bones depends on both the presence of calcium in the diet as well as a sufficient amount of vitamin D. Variants in the vitamin D receptor can increase the need for both calcium and vitamin D through reduced efficiency.

SNP: rs4516035 (T/C)

This variant in the VDR gene is essential for the absorption of calcium in the body. This variant has been associated with a reduced bone density (this leads to brittle bones). There is also a link between body length and insufficient calcium in the diet during growth. People with the risk variant of this SNP should pay attention to the amount of calcium in their diet.

Your genotype: **CC**

People with this genotype show a lower absorption of calcium.

Esterle L, Jehan F, Sabatier JP, Garabedian M. Higher milk requirements for bone mineral accrual in adolescent girls bearing specific caucasian genotypes in the VDR promoter. J Bone Miner Res. 2009;24(8):1389-97.

B1. Nutrition
Potassium

Because insufficient potassium intakes are common in developed countries, you should turn attention to consuming sufficient daily amounts of potassium.

Consume at least two portions of fruits and two portions of vegetables daily (one portion is one piece, one handful or 100 grams).

What is potassium?

Potassium is the third most abundant mineral in the body and plays an important role in our metabolism, nerve signalling and muscle contraction, for example. Importantly, potassium works together with sodium in the regulation of fluid balance in our body, but has almost the opposite effects. While high sodium intake promotes high blood pressure and stiffening of our blood vessels, potassium promotes relaxation of the blood vessels, excretion of sodium and thereby normalization of the blood pressure. Concerningly, however, the intake of fruits and vegetables, which are the main source of potassium is very low in the majority of people in developed countries, while the consumption of sodium is concerningly high.

Therefore, we recommend increasing your consumption of fruits and vegetables and reducing the consumption of table salt as well as processed, ready-made and restaurant foods (which are normally the major source of sodium), to everyone.

Potassium

Food item	Portion	Mg*	% DRV
Courgette	1 courgette	810	26%
Avocado	1 avocado	679	22%
Trout, cooked	1 steak	579	19%
Banana	1 medium banana	486	16%
Turkey, raw	1 fillet, raw	481	16%
Salmon, cooked	1 steak	474	15%
Beef, cooked	1 piece	449	14%
Red pepper	1 red pepper	404	13%
Mango	1 mango	400	13%
Broccoli	2 serving spoons	399	13%
Lentils, boiled	1 serving spoon	392	13%
Sweet potatoes, boiled	1 sweet potato	390	13%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 3100 mg of potassium. *The actual nutrient content of these products depends on the chosen product.

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B1. Nutrition
Magnesium

Because insufficient magnesium intakes are common in developed countries, you should turn attention to consuming sufficient daily consumption of magnesium.

• Consume a variety of foods high in magnesium daily.
• Track your intake with the help of an online application to confirm that your intake is sufficient.

What is Magnesium?

Magnesium is a highly abundant mineral in the human body, especially in the bones and muscles. It plays an important role in cellular metabolism and is needed for the conversion of dietary macronutrients to usable energy. In addition, magnesium also plays a role in DNA synthesis. Although there are several good dietary magnesium sources, magnesium deficiencies are common in the developed countries.

Magnesium

Food item	Portion	Mg*	% DRV
Pumpkin seeds	1 serving spoon	80	29%
Almonds	10 almonds	61	22%
Dried figs	4 dried figs	56	20%
Spinach, boiled	1 serving spoon	54	19%
Avocado	1 avocado	45	16%
Peanuts	1 table spoon	43	15%
Seasame seeds	1 table spoon	37	13%
Bananas	1 medium banana	36	13%
Kindeybeans, boiled	1 serving spoon	36	13%
Quinoa, boiled	1 serving spoon	32	11%
Kindeybeans, canned, drained	1 serving spoon	18	6%
Spinach, raw	1 bowl	14	5%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 280 mg of magnesium. *The actual nutrient content of these products depends on the chosen product.

B1. Nutrition
Iron

Because insufficient iron intakes are relatively common in developed countries, you should turn attention to consuming sufficient daily amounts of iron.

- Consume a variety of iron rich products from plant and animal sources daily.
- Combine the consumption of plant-based iron sources with vitamin C (for example citrus fruits).
- Track your intake with the help of an online application to confirm that your intake is sufficient.
- If you have difficulty reaching the recommendation, consider consuming fortified products and/or supplementation.

Gene	SNP	Your genotype
TMPRSS6	rs7385804	AA
TFR2	rs1799945	CG
HFE	rs1799945	CG

What is Iron?

Iron is an essential mineral to the body, with several important roles. Most well-known of them is probably the transportation of oxygen in the blood (as hemoglobin), but iron is also necessary for the synthesis of a variety of enzymes and has many cellular functions.

In our diet, iron is present in two different forms, known as heme iron and non-heme iron. Heme iron is derived from hemoglobin and therefore present in animal products (although also non-heme iron can be present in these foods). Plant sources of iron only contain non-heme iron. The absorption of the latter is relatively low in the body, while heme iron is more readily absorbed. Sufficient iron intake is important, since it is needed for hemoglobin production to eventually carry oxygen to your tissues. Therefore, the symptoms of iron deficiency include tiredness, irritability and weakness. Iron deficiency is the most common deficiency worldwide.

This is partly due to the low rate of absorption and due to many interactions with other nutrients. For example, calcium, phosphates (highly present in dairy products) magnesium, polyphenols and phytate (for example from coffee and tea) have been observed to reduce the rate of absorption of non-heme iron. However, there are also nutrients that increase iron absorption if consumed on the same time, most importantly, vitamin C, but also vitamin A.

Importantly, these interactions only occur when consumed on the same time with non-heme iron. This means that it is beneficial to combine plant sources of iron with the intake of foods rich in vitamin C, such as citrus fruits, broccoli, kale, peas or green peppers for example, but to avoid combinations with coffee and tea. Habitually high dietary intake of calcium, magnesium or polyphenols do not seem to have an impact on the absorption of iron.

Another common reason for iron deficiency is the loss of iron with blood. Therefore, low levels of iron are especially common in premenopausal women, for whom also the daily recommendation is higher.

Iron

Food item	Portion	Mg*	% DRV
Liver, cooked	1 liver	6,1	41%
Lentils, boiled	1 serving spoon	1,7	11%
Dried figs	4 dried figs	1,6	11%
Cashews	10 cashews	1,3	9%
Green peas, dried	1 serving spoon	1,2	8%
Pumpkin seeds	1 tablespoon	1,2	8%
Brazil nuts	10 Brazil nuts	1,2	8%
Kidneybeans, canned, drained	1 serving spoon	1,2	8%
Brown beans	1 serving spoon	1,2	8%
Pistachios	1 handful	0,9	6%
Quinoa, boiled	1 serving spoon	0,8	5%
Dark chocolate	4 pieces	0,8	5%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 15 mg of iron. *The actual nutrient content of these products depends on the chosen product.

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Iron

Your genotype

TMPRSS6 - Causes lower iron values in the blood

AA 31% | AG 47% | GG 22%

Gene: TMPRSS6 (transmembrane protease, serine 6)

TMPRSS6 is a so-called transmembrane protein. This means that this protein passes through the cell membrane (the membrane that forms the outside of a cell). Transmembrane proteins can have various functions, such as bonding (and possibly processing) substances on the outside of the cell, transmitting signals into the cell or transporting substances into the cell. TMPRSS6 is an enzyme that promotes iron absorption and recycling. Variants of this gene appear to affect the blood values of iron and also the haemoglobin values (oxygen binding protein in red blood cells).

SNP: rs4820268 (A/G)

This variant in the TMPRSS6 gene appears to have a significant effect on the iron values in the blood. These lower values in iron levels due to the polymorphism in this gene therefore cause an increased risk of (mild) anaemia.

Your genotype: **AA**

This genotype is not associated with lower iron levels in the blood.

Benyamin B, Mcrae AF, Zhu G, et al. Variants in TF and HFE explain approximately 40% of genetic variation in serum-transferrin levels. Am J Hum Genet. 2009;84(1):60-5. Pichler I, Minelli C, Sanna S, et al. Identification of a common variant in the TFR2 gene implicated in the physiological regulation of serum iron levels. Hum Mol Genet. 2011;20(6):1232-40.

TFR2 - Causes lower iron values in the blood

AA 48% | AC 41% | CC 11%

Gene: TFR2 (transferrin receptor 2)

The TFR2 protein is the receptor (protein that binds other protein to the cell) for transferrin. Transferrine is a protein that ensures the transport of iron through the bloodstream. All the iron in the blood is under normal conditions bound to transferrin. It is therefore also used to determine the iron concentration in the blood. TFR2 ensures the cellular uptake of transferrin-bound iron. Variants in the TFR2 gene therefore appear to have an influence on the amount of iron in the blood.

SNP: rs7385804 (A/C)

This polymorphism in the TFR2 gene leads to lower levels of iron in the blood. Carriers of these genetic variants will therefore have to ensure that they have sufficient iron in their diet to maintain sufficient iron levels.

Your genotype: **AC**

This genotype is associated with slightly decreased iron levels in the blood.

Benyamin B, Mcrae AF, Zhu G, et al. Variants in TF and HFE explain approximately 40% of genetic variation in serum-transferrin levels. Am J Hum Genet. 2009;84(1):60-5. Pichler I, Minelli C, Sanna S, et al. Identification of a common variant in the TFR2 gene implicated in the physiological regulation of serum iron levels. Hum Mol Genet. 2011;20(6):1232-40.

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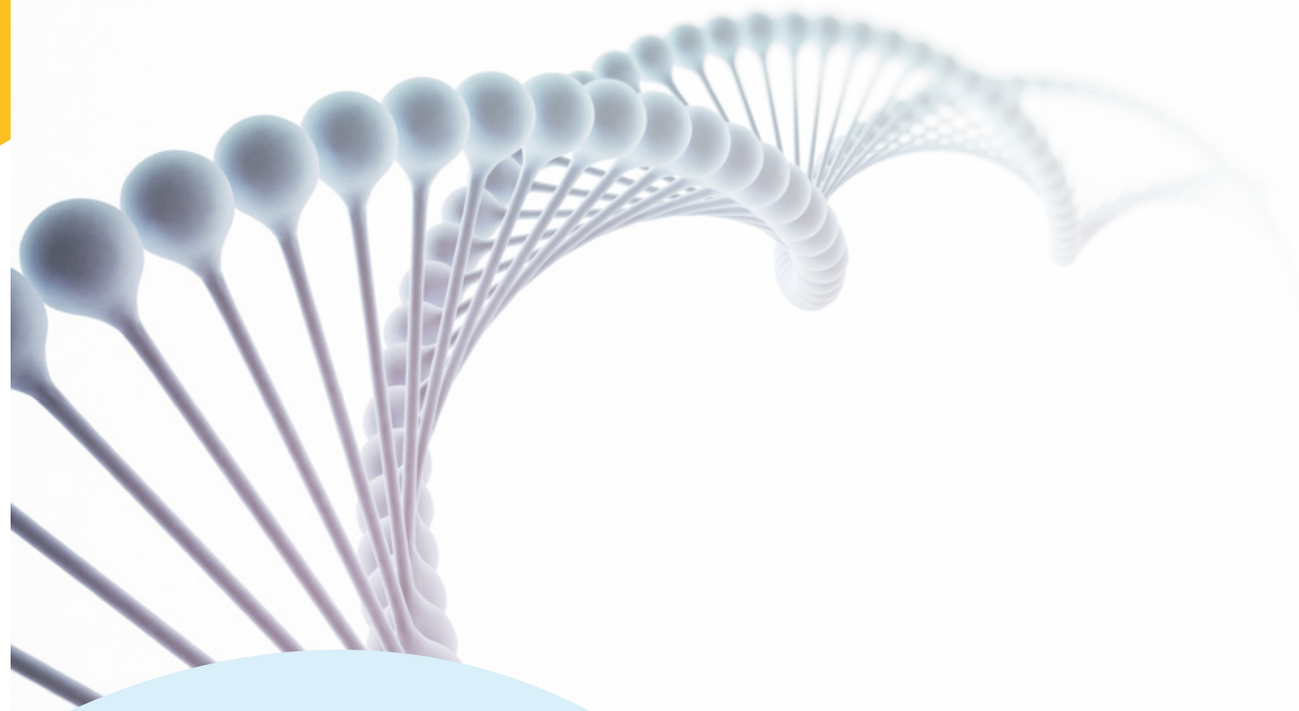

HFE - Causes higher iron values in the blood

CC 87% | CG 12% | GG 1%

Gene: HFE (human hemochromatosis protein)

HFE is a protein that regulates the circulating iron intake by regulating the interaction of the transferrin receptor (protein that binds other protein to the cell) with transferrin. Transferrin is a protein that ensures the transport of iron through the blood-stream. All the iron in the blood is under normal conditions bound to transferrin. It is therefore also used to determine the iron concentrations in the blood. The transferrin receptor ensures cellular absorption of the transferrin-bound iron.

SNP: rs1799945 (C/G)

This variation in the HFE gene is associated with increased iron values in the blood. By directly influencing the absorption of iron by cells, this variant shows significant differences in the concentrations of iron.

Your genotype: **CG**

This genotype is associated with slightly increased iron levels in the blood.

Benyamin B, Mcrae AF, Zhu G, et al. Variants in TF and HFE explain approximately 40% of genetic variation in serum-transferrin levels. Am J Hum Genet. 2009;84(1):60-5. Pichler I, Minelli C, Sanna S, et al. Identification of a common variant in the TFR2 gene implicated in the physiological regulation of serum iron levels. Hum Mol Genet. 2011;20(6):1232-40.

B1. Nutrition

Zinc

Because your genetically determined diet is relatively low in fats and high in carbohydrates, you might need to turn extra attention to achieving sufficient zinc intake.

• Choosing plant-based zinc sources, especially legumes and wholegrains regularly can help to reach sufficient zinc intake without compromising the proportion of protein and fat in your diet.
• Eat lentils, beans, peas, wholegrains, nuts and seeds frequently.
• Track your intake with the help of an online application to confirm that your intake is sufficient.

What is zinc?

Zinc is an essential element for normal growth and metabolism of human body. It plays a role in protein and DNA synthesis, cell division, enzymatic reactions and wound healing. In addition, zinc is needed for optimal hormonal development (production of testosterone, for example), it plays a role in our sense of taste and smell, and acts as a antioxidant in the body. Due to these essential roles, children, adolescence and pregnant and lactating women are at the highest risk of zinc deficiency, which is sadly common both in the developed and developing countries. Many good dietary sources of zinc are animal products and plant-based foods often contain only minor levels of zinc, which also contributes to increased risk of deficiencies. Therefore, it is important to everyone to turn extra attention to dietary zinc consumption.

Since your genetically determined diet is relatively high in carbohydrates and lower in fats, you might feel like it is difficult to accommodate regular consumption of meat and fish. Especially when you want to lose weight and reduce your total energy intake. This might reduce your daily zinc intake. Due to this, we recommend you to assess your zinc intake with the help of an online application and make adjustments in the diet accordingly. Choosing higher carbohydrate lower fat plant-based zinc sources regularly might be a helpful solution. This includes for example legumes and wholegrains.

‘Zinc

Food item	Portion	Mg*	% DRV
Oysters, cooked	1 oyster	5,9	84%
Beef, cooked	1 piece	4,4	63%
Pork, cooked	1 piece	2,7	39%
Tuna, canned, in oil	1 can	1,4	20%
Brazil nuts	10 Brazil nuts	1,3	19%
Tuna, canned, in water	1 can	1,2	17%
Crab, cooked	1 crab	1,2	17%
Pumpkin seeds	1 tablespoon	1,2	17%
Cashews	10 cashews	1,2	17%
Lentils, boiled	1 seving spoon	0,8	11%
Sunflower seeds	1 tablespoon	0,8	11%
Peanuts	1 tablespoon	0,7	10%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 7 mg of zinc. *The actual nutrient content of these products depends on the chosen product.

B1. Nutrition

Iodine

Since table salt is fortified with iodine in most countries, iodine deficiencies are generally rare, meaning that you should not be at risk for low iodine levels.

• Decrease the amount of iodine derived from salt intake and increase your consumption of natural iodine sources, including seaweed and plant sources.
• Assess your intake with the help of an online application to confirm that your intake is sufficient.

What is Iodine?

Iodine is the main component of thyroid hormones, which in turn control our metabolism, and regulate protein synthesis and enzymatic activity in the body. Thyroid hormones are also essential for optimal skeletal and neural development in fetuses and young children. There are large differences in the iodine-content of foods depending on where they were grown. However, often the soil is too poor in iodine to result in sufficient amounts in plants to meet the human requirement. Therefore, fortifying table salt with iodine is widely practiced. In addition, seafood is a good source of iodine.

Iodine

Food item	Portion	µg*	% DRV
Seaweed, dried	1 leaf (3 grams)	1231	821%
Cod, cooked	1 steak	292	195%
Tuna, steamed	1 steak	292	195%
Shellfish, cooked	1 shellfish	292	195%
Lobster	100 grams	139	93%
Ciabatta bun, made with salt	2 buns	83	55%
Mackerel, canned, in water	1 can	69	46%
Wholegrain bun, made with salt	2 buns	63	42%
Iodized salt	1 teaspoon	42	28%
Fish sticks, cooked	1 fish stick	30	20%
Salmon, cooked	1 steak	25	17%
Brown bread, made with salt	1 slice	24	16%

* The actual iodine content of these food items is highly dependent on their geographic origin. The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 150ug iodine. *The actual nutrient content of these products depends on the chosen product.

B1. Nutrition
Selenium

Because your genetically determined diet is relatively low in fats and high in carbohydrates, you might need to turn extra attention to achieving sufficient selenium intake.

• Frequent consumption of plant-based selenium sources, especially those low in fat, such as legumes, wholegrains and mushrooms, for example, can help you to reach sufficient selenium intake without compromising the proportion of protein and fat in your diet.
• Track your intake with the help of an online application to confirm that your intake is sufficient.

What is selenium?

Selenium is a trace element that plays an important role in the synthesis of proteins and DNA, in reproduction, immune function, quality of blood flow and in thyroid hormone regulation. In addition, selenium also has antioxidant and anti-inflammatory properties. Although selenium is present in many food sources, especially in animal products, but also in several plant-based foods, insufficient intakes of selenium are common in the developed countries. Therefore, it is important to turn more attention to daily consumption of selenium-rich foods.

Since your genetically determined diet is relatively high in carbohydrates and lower in fats, you might feel like it is difficult to accommodate regular consumption of meat and fish. Especially when you want to lose weight and reduce your total energy intake. This might reduce your daily zinc intake. Due to this, we recommend you to assess your zinc intake with the help of an online application and make adjustments in the diet accordingly. Choosing higher carbohydrate lower fat plant-based zinc sources regularly might be a helpful solution. This includes for example legumes and whole grains.

Selenium

Food item	Portion	µg*	%DRV
Brazil nuts	10 Brazil nuts	575	1150%
Tuna, canned, in water	1 can	90	180%
Cod, cooked	1 steak	44	88%
Salmon, cooked	1 steak	32	64%
Liver, cooked	1 liver	29	58%
Sardines, canned, in oil	for 1 slice of bread	20	40%
Pork, cooked	1 piece	14	28%
Beef, cooked	1 piece	11	22%
Egg, boiled	1 egg	10	20%
Sunlower seeds	1 tablespoon	7	14%
Cashews	10 cashews	7	14%
Shrimp, canned, in water	1 leaf (3 grams)	5	10%

The dietary reference value (DRV) is the official recommendation for daily micronutrient intakes, determined based on your gender and age. The %DRV is based on your DRV of 50ug of selenium. *The actual nutrient content of these products depends on the chosen product.

B1. Nutrition
Sodium

Your DNA shows that you have an increased risk of hypertension as a result of high sodium consumption.

• It is extremely important for your health to keep the sodium consumption as low as possible.
• Keep your consumption of ready-made, processed and restaurant meals minimal.
• Consume plenty of fruits, vegetables and legumes that are rich in potassium, to reduce the negative health effects of sodium.

Gene	SNP	Your genotype
ACE	rs4343	AA
SLC4A5	rs10177833	CC

What is sodium?

Sodium is an essential mineral in the body, that plays a role in nerve signal transmission, muscle contraction and the maintenance of fluid balance. Especially the latter function can have serious effects on health if our sodium intake is too high. Sadly, this is the case for the majority of the population of developed countries, as sodium is the main component of salt.

The negative effects of excessive sodium intake occur because our body retains water to counteract the high sodium levels and maintain a steady concentration of sodium in the blood. This is a very effective mechanism for short term fluctuations, but when continued over a longer period, the increased blood volume can damage our blood vessels, make them stiffer and thereby lead to hypertension and eventually cardiovascular diseases.

Based on your DNA test, you have an increased risk of developing hypertension as a result of too high sodium intake. Therefore, it is extremely important for your health that you reduce your sodium intake.

A good strategy for reducing sodium intake and counteracting the negative health effects that excessive intake might cause, is to increase your potassium intake. Potassium in the body has opposite effects from sodium - it can help to relax the blood vessels, excrete sodium and decrease blood pressure.

However, this alone cannot compensate for excessive sodium intakes, so cutting down on sodium intake is also necessary. Rather surprisingly, it has been estimated that only about 10-20% of the daily sodium intakes in developed countries comes from the salt that is added while cooking and eating. Instead, majority of the sodium derives from ready-made, processed and restaurant foods. Therefore, the most effective strategy for reducing sodium intake and the associated health risks, is replacing processed and ready-made meals with frequent fruit and vegetable consumption. Of course, cutting down on the salt added during cooking and eating is also still a good idea!

Sodium

Food item	Portion	Mg*	% DRV
Pizza, frozen, prepared	1 pizza	1390	58%
Ciabatta	1 bun ciabatta	287	12%
Bacon	for 1 slice of bread	229	10%
Cold cuts, salami	for 1 slice of bread	204	9%
Lasagne, frozen, prepared	1 frozen lasagne	203	8%
Mixed coated nuts	1 handful	191	8%
Omlet	of 2 eggs	160	7%
Brown bread	1 slice	154	6%
Cold cuts, chicken filet	for 1 slice of bread	143	6%
Cake, generic	1 slice	139	6%
Smoked salmon	for 1 slice of bread	132	6%
Cold cuts, pork	for 1 slice of bread	132	6%

The maximal daily sodium intake is set at 2400mg in the offical recommendations. The % daily maximum is based on this value. *The actual nutrient content of these products depends on the chosen product.

Sodium

Your genotype

ACE - Causes high blood pressure due to salt sensitivity

AA 44% | AG 41% | GG 15%

Gene: ACE (angiotensin converting enzyme)

The ACE gene has an effect on blood pressure, fluid balance and water salt balance in the blood. ACE ensures the conversion of anginotensin I (the inactive form of anginotensin) to anginotensin II (the active form). This active form increases blood pressure by influencing the heartbeat, by contraction of the blood vessels (vasoconstriction) and by reducing the release of water from the bloodstream. ACE inhibitors are therefore widely used as medicines for the treatment of cardiovascular diseases. Due to the role of anginotensin on the salt balance (amount of sodium in the blood) variants of ACE also play a role in the effect that salt in the diet has on blood pressure.

SNP ID: rs4343* (A/G)

Variants in the ACE gene appear to be associated with high blood pressure. This association goes together with salt intake. With a low salt intake there are almost no differences between the different genotypes. When salt intake increases, one of the variants turns out to lead to a greater increase in blood pressure than the other genotypes.

Your genotype: **AA**

This genotype shows an increased risk of high blood pressure in response to salt intake.

** In our analysis we use a microarray. This method determines the genotype of SNPs, being single base pair differences in the DNA. The ACE I/D-polymorphism is not an SNP, because this is actually the presence or absence of a 287 base pair sequence in the ACE gene. Because the microarray does not measure this, we use a SNP in so-called linkage disequilibrium (LD). This means that two SNPs (or in this case a SNP with a insertion/deletion) are inextricably linked. In practice this often means that the SNPs are quite close together on a chromosome. Studies have shown that the rs4343 SNP is in 100% LD with I/D polymorphism in ACE. This means that when an A-allele is present in the genotype of rs4343, we are sure that the insertion variant is present. This in contrast to a G-allele. When we see this, we know that there is the deletion variant.*

Yamagishi K, Tanigawa T, Cui R, et al. High sodium intake strengthens the association of ACE I/D polymorphism with blood pressure in a community. Am J Hypertens. 2007;20(7):751-7.

SLC4A5 - Causes high blood pressure due to salt sensitivity

AA 28% | AC 48% | CC 24%

Gene: SLC4A5 (electrogenic sodium bicarbonate cotransporter 4)

The SLC4A5 gene encodes a protein that transports Na+ (sodium) electrostatically over the membranes (outer membrane of a cell) across many cell types, including kidney cells, into interstitial fluid (liquid outside cells) and ultimately into the bloodstream. Sodium is an important part of the fluid balance. Too much sodium in the bloodstream disturbs the balance of the so-called osmotic pressure (pressure differential due to differences in concentrations of certain substances). This causes too much fluid to remain in the bloodstream and therefore increases blood pressure. SLC4A5 is therefore very important to maintain the balance, because variations in this gene have an effect on blood pressure and certainly in relation to salt intake (kitchen salt consists of sodium chloride (NaCl)).

SNP: rs10177833 (A/C)

Studies have shown that variants in the SLC4A5 gene show differences in blood pressure in people with certain genotypes. It appears that this effect is related to salt intake. People with the unfavourable genotype will see a greater increase in blood pressure as an effect of eating (too much) salt.

Your genotype: **CC**

This genotype is not associated with high blood pressure due to salt intake.

Carey RM, Schoeffel CD, Gildea JJ, et al. Salt sensitivity of blood pressure is associated with polymorphisms in the sodium-bicarbonate cotransporter. Hypertension. 2012;60(5):1359-66.

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C. Exercise

Overview

C EXERCISE

C1 STRENGTH OR ENDURANCE

YOU HAVE AN APTITUDE FOR ENDURANCE SPORTS

C2 ACTIVE LIFESTYLE

POSITIVE INFLUENCE

C3 INJURY RISK

NORMAL RISK

DNAisyou.

C1. Exercise

Strength or endurance

Genetically speaking, you have a predisposition for endurance sport.

Jogging, swimming or cycling could be a good way to lose weight.

Gene	SNP	Your genotype
ACE	rs4343	AA
ACTN3	rs1815739	CT
ADRB2	rs1042713	GG
AGT	rs699	TT
AMPD1	rs17602729	GG
HIF1A	rs11549465	CT
IL6	rs1800795	GG
NAT2	rs1208	AA
NRF2	rs7181866	AG
PPARA	rs4253778	GG
PPARGC1A	rs8192678	AG
SOD2	rs4880	CC

Strength versus endurance sports

In order to shift the balance between energy intake and energy requirement in such a way that you use more energy than you consume, exercising may be a good method. However, exercising can take up a lot of time and effort. Certainly in the case of people who only exercise in order to stay healthy and lose weight, it is nice if this happens in the most effective way possible. In order to get the most out of your sport time, we have looked at your predisposition for endurance and/or strength sports.

You have a genetic predisposition for endurance sports. This means that you will get more out of endurance training, than strength training. You will find it easier to sustain a long training. Good to know, because this can work to your advantage in order to lose weight.

In the case of endurance sports, you are exerting yourself at a relatively low intensity for a longer period of time. You will sustain this longer than someone who has more predisposition for strength sports. You will also see that you will probably become better at endurance sports quicker than other people.

Endurance sports may include: jogging, swimming or cycling. These are sports you can easily do alone, but it may be fun to do this in a group. Not only will this motivate you, but it is also good for learning the techniques, as a result of which exercising becomes more fun and injuries are prevented. Moreover, working towards a competition or particular achievement may also make it easier to continue exercising regularly.

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Strength or endurance

Your genotype

ACE - Causes better oxygen uptake and increased performance.

AA 44% | AG 41 % | GG 15%

Gene: ACE (Angiotensin converting enzyme)

The ACE gene has an effect on blood pressure, fluid balance and water-salt balance in the blood. ACE ensures the conversion of anginotensin I (the inactive form of anginotensin) to anginotensin II (the active form). This active form increases blood pressure by influencing the heartbeat, contraction of the blood vessels (vasoconstriction) and by inducing water retention in the bloodstream.

Variants in the ACE gene appear to play a role in the extent to which oxygen can be absorbed by the body. Variants of ACE also show differences in maximum heart rate under the influence of exercise. Of course, these effects have a major impact on the performance of athletes. Due to the role of anginotensin on the salt balance (amount of sodium in the blood) variants of ACE also play a role in the effect that salt in the diet has on blood pressure.

SNP: rs4343 (A/G)(I/D*)

Studies have shown that different genotypes of angiotensin converting enzyme affect athletic performance. The ACE I/D-polymorphism consists of an insertion (presence) or deletion (absence) of a specific part of the gene. People with the I-allele usually have lower ACE values, while people with the D-allele have higher ACE levels.

People carrying the D-allele are associated with higher ACE levels that cause higher levels of angiotensin II. During physical exertion, the blood pressure of D-allel carriers will therefore rise more quickly than that of I-allel carriers. This results in a lower maximum heart rate and lower maximum oxygen uptake (VO2max). In addition, the D-allele is associated with a greater increase in the left ventricle response to training compared to the I-allele. On the other hand, I-allel carriers usually exhibit an increased maximum heart rate due to lower ACE levels and higher maximum oxygen uptake. As a result, they therefore exhibit improved endurance performance.

The I-allele is more often seen among top athletes in long-distance runners, rowers and cyclists. On the other hand, the D-allele is more often seen in athletes who excel in the power-oriented sports, such as the long jump, ball punches or weight lifting.

Your genotype: **AA**

People with this genotype have the complete sequence of the ACE gene for both alleles. This genotype is more often seen in elite endurance athletes. This is because this genotype shows a higher oxygen uptake. People with this genotype also seem to respond better to exertion and training. They also seem to tire less quickly. Finally, this variant of ACE offers advantages in low oxygen environments, such as alpine sports.

** In our analysis we use a microarray. This method determines the genotype of SNPs, being single base pair differences in the DNA. The ACE I/D-polymorphism is not an SNP, because this is actually the presence or absence of a 287 base pair sequence in the ACE gene. Because the microarray does not measure this, we use a SNP in so-called linkage disequilibrium (LD). This means that two SNPs (or in this case a SNP with a insertion/deletion) are inextricably linked. In practice this often means that the SNPs are quite close together on a chromosome. Studies have shown that the rs4343 SNP is in 100% LD with I/D polymorphism in ACE. This means that when an A-allele is present in the genotype of rs4343, we are sure that the insertion variant is present. This in contrast to a G-allele. When we see this, we know that there is the deletion variant.*

Myerson S, Hemingway H, Budget R, Martin J, Humphries S, Montgomery H. Human angiotensin I-converting enzyme gene and endurance performance. J Appl Physiol. 1999;87(4):1313-6.
Glenn KL, Du ZQ, Eisenmann JC, Rothschild MF. An alternative method for genotyping of the ACE I/D polymorphism. Mol Biol Rep. 2009;36(6):1305-10.

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ACTN3 - Influences the ratio of fast and slow twitch muscle fibers

CC 39% | CT 43% | TT 18%

Gene: ACTN3 (actin alpha 3)

The skeletal muscle is composed of long cylindrical cells which are called muscle fibers. There are two types of muscle fibres: slow (type I, slow twitch) and fast (type II, fast twitch). Slow muscle fibers are more efficient in the use of oxygen to generate energy, while fast fibers are less efficient. However, fast fibers can contract faster and generate more power. Fast and slow muscle fibres are also often called (respectively) white muscle fibres and red muscle fibres.

Each muscle fiber is composed of long strands called myofibrils, which in turn consist of filaments. There are two kinds of filaments: actin (thin filaments) and myosin (thick filaments) arranged in parallel. During a muscle contraction these filaments slide along each other.

SNP: rs1815739 (C/T) (via LD rs1671064 (C/T) + rs540874 (C/T))*

This variation in the ACTN3 gene is one of the most important genes associated with athletic performance. A study in which Olympic power athletes were compared to non athletes showed that a specific genotype of this gene was more common among strength athletes. It even showed that another genotype did not occur at all in the group of power athletes. Follow-up research has shown that the association of the different genotypes with sporting performances is very clear. It turns out that this SNP leads to a non-functional protein, which reduces the possibility of fast and powerful contraction of muscle fibers. This means that the ratio of fast and slow muscle fibers in a muscle bundle shifts to more slow fibers.

Your genotype: **CT**

This genotype is more often seen in strength oriented athletes.

*The microarray we use does not contain rs1815739. To determine the genotype for the ACTN3 gene we use two other SNPs that are present on the array. These two SNPs are both in so-called linkage disequilibrium (LD) with rs1815739. LD means that two SNPs are inextricably linked. In practice this often means that the SNPs are quite close together on a chromosome. Although these SNPs are connected to each other to a very large extent, this is (almost) never 100%. That is why we use two SNPs that are in LD with rs1815739, in order to guarantee the accuracy (with 99.96% certainty).

Roth SM, Walsh S, Liu D, Metter EJ, Ferrucci L, Hurley BF. The ACTN3 R577X nonsense allele is under-represented in elite-level strength athletes. Eur J Hum Genet. 2008;16(3):391-4.
Pimenta EM, Coelho DB, Veneroso CE, et al. Effect of ACTN3 gene on strength and endurance in soccer players. J Strength Cond Res. 2013;27(12):3286-92.

ADRB2 - Increases oxygen uptake and stimulates fat metabolisman

Gene: ADRB2 (beta-2 adrenergic receptor)

The beta-2 adrenergic receptor is a protein in the cell membrane of the cell. It binds adrenaline that spreads via the bloodstream through the body. If adrenaline binds to ADRB2, a signal is transmitted to the inside of the cell, where a reaction takes place. The physiological reactions that take place as a result of binding adrenaline are for example the relaxation of smooth muscles and bronchodilation (expansion of the lungs). These reactions are important for physical exertion and can affect maximum performance. ADRB2 is also involved in energy balance regulation by stimulating both thermogenesis (keeping your body warm) and lipid mobilization in fat tissue (release of stored fats into the blood) and lipolysis in muscle tissue (use of fat as an energy source).

SNP: rs1042714 (G/C)

Studies on different populations living at high altitudes for many generations have revealed genetic variants that play a role in oxygen uptake. For example Himalayan residents living more than 3000 kilometres above sea level are more resistant to low oxygen pressure. Natural selection has selected genetic variants that have a positive influence on oxygen uptake. From this research, for example, rs1042714 emerged in the ADRB2 gene. This population had a much higher frequency of a certain variant of this gene. Follow-up studies show that this genetic variant occurs in more populations.

On average, people with the favourable variant have a higher oxygen uptake and are therefore able to perform better in endurance sports. Research has shown that this variant is also more common among Olympic endurance athletes than among strength athletes. In addition, the variant offers an advantage when one has to perform at high altitude, such as mountaineers and skiers / cross-country skiers.

Your genotype: **GG**

This variant shows no association with increased oxygen uptake. This variant is therefore seen more often in strength athletes.

Tomar A, Malhotra S, Sarkar S. Polymorphism profiling of nine high altitude relevant candidate gene loci in acclimatized sojourners and adapted natives. BMC Genet. 2015;16:112.

AGT - Improves the blood circulation in muscles

Gene: AGT (Angiotensinogen)

Angiotensin is a hormone that causes vasoconstriction and an increases the blood pressure. Angiotensin is converted by renin (an enzyme) into anginotensin I, which itself is converted by the ACE enzyme to the active form of the blood protein. This active form causes an increase in blood pressure by influencing the heart rate, by contraction of the blood vessels (vasoconstriction) and by lowering the release of water from the bloodstream. Angiotensin is a peptide (a very small protein). It has a hormonal function and is a powerful dipsinogen (induces thirst).

SNP: rs699 (C/T)

The rs699 polymorphism has an influence on the muscle growth and circulation of active muscles and heart muscle. Studies show, for example, that a certain genotype under the influence of physical exertion shows an increased growth of the heart muscle compared to people with the other genotypes. This study was carried out in non-athletes. Studies comparing elite athletes showed that the frequency of a certain allele was higher among athletes practising strength sports than among athletes practising endurance sports.

Your genotype: **TT**

This genotype is not associated with improved blood flow. It does not give a specific aptitude for improved performance in power sports.

Zarębska A, Sawczyn S, Kaczmarczyk M, et al. Association of rs699 (M235T) polymorphism in the AGT gene with power but not endurance athlete status. J Strength Cond Res. 2013;27(10):2898-903.

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AMPD1 - Increases endurance at high altitudes

Gene: AMPD1 (Adenosine monophosphate deaminase 1)

Adenosine monophosphate deaminase is an important regulator of muscle metabolism. AMPD1 is part of the energy system of the muscle and promotes the production of substances necessary for supplying energy to the cell. This energy system is very important during extreme efforts.

SNP: rs17602729 (T/C)

This polymorphism in the AMPD1 gene is associated with improved endurance in low oxygen pressure conditions, as occurs in sports at high altitudes. It also appears that this SNP is related to the problem of fatigue and cramp resulting from exertion. There are also indications that this variant of the AMPD1 gene will improve muscle strength.

Your genotype: **CC**

This genotyping is associated with strong oxygen uptake. People with this variant will therefore have peaks in the so-called aerobic area. This means that people with this genotyping will perform better if high oxygen absorption is required for a long time, such as in endurance sports such as cycling or long distance running..

Ginevičienė V, Jakaitienė A, Pranculis A, Milašius K, Tubelis L, Utkus A. AMPD1 rs17602729 is associated with physical performance of sprint and power in elite Lithuanian athletes. BMC Genet. 2014;15:58.

HIF1A - Increases performance at extreme effort

Gene: HIF1A (Hypoxia inducible factor 1-alpha)

HIF-1 is a so-called transcription factor (a protein that binds to a specific piece of DNA which stimulates the production of another specific protein). HIF-1 plays an important role in the cellular response (that is, the reaction of a cell to external influences, such as the production of specific proteins) to the oxygen level in mammals. HIF-1 is known to induce the transcription of more than 60 genes involved in biological processes such as the formation of blood vessels and red blood cells that help to promote and increase oxygen distribution to low oxygenated areas in the body.

SNP: rs11549465 (T/C)

This polymorphism in the HIF1A gene is associated with the effectiveness of uptake, consumption and transport of oxygen through the body. Particular for this SNP is that it is associated with improved performance when athletes make extreme efforts over a long period of time. This exertion requires a lot of oxygen in the muscles.

Your genotype: **CT**

This combination gives a slight predisposition for improved oxygen uptake and is seen more often in endurance athletes than in strength athletes.

Döring F, Onur S, Fischer A, et al. A common haplotype and the Pro582Ser polymorphism of the hypoxia-inducible factor-1alpha (HIF1A) gene in elite endurance athletes. J Appl Physiol. 2010;108(6):1497-500.

IL6 - Regulates the immune response in muscle

GG 76% | CG 19% | CC 5%

Gene: IL6 (Interleukin 6)

Interleukin 6 is a cytokine (a small protein) that is important in the function of the immune system. Cytokines are signal substances with which cells communicate with each other. IL6 acts as both as pro-inflammatory cytokine (produced from muscle tissue) and anti-inflammatory myokine (a cytokine produced from muscle tissue that is increased in response to muscle contraction). During exercise, the concentration of IL6 increases, thus regulating the metabolic processes. IL6 is linked to the regulation of glucose during exercise and plays a role in muscle growth.

SNP: rs1800795 (C/G)

This SNP in the IL6 gene is associated with a difference in concentration in IL6 that is present in the muscle cells in response to exertion. Studies show that certain genotypes are more common among strength athletes compared to endurance athletes or control groups (non-athletes). A higher concentration of IL6 in response to exertion turns out to have a positive effect on the performance at extreme exterion.

Your genotype: **GG**

This genotype is more often seen in strength athletes compared to endurance athletes. IL6 concentrations are higher than those of people with the CC or CG variant.

Ruiz JR, Buxens A, Artieda M, et al. The -174 G/C polymorphism of the IL6 gene is associated with elite power performance. J Sci Med Sport. 2010;13(5):549-53.

NAT2 - Ensures the removal of waste from the muscles

AA 49% | AG 37% | GG 14%

Gene: NAT2 (N-acetyltransferase 2)

Acetyltransferases play an important role in the removal of bioactive substances from the body. These can either be endogenous or external, like for instance medicines. Genetic variants of acetyl transferases therefore cause a difference to how people react to certain medicines. The genotypes for NAT2 can be classified as fast, medium or slow acetylated.

SNP: rs1208 (A/G)

Variants of the rs1208 polymorphism in the NAT2 gene have been associated with athletes who excel in a particular sport. One allele appears to be more common among strength athletes compared to endurance athletes.

Your genotype: **AA**

This genotype is associated with endurance athletes.

Buxens A, Ruiz JR, Arteta D, et al. Can we predict top-level sports performance in power vs endurance events? A genetic approach. Scand J Med Sci Sports. 2011;21(4):570-9.

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NRF2 - Improves the running economy

AA 79% | AG 19% | GG 2%

Gene: NRF2 (nuclear respiratory factor 2)

NRF2 is a transcription regulator (it manages how much protein is produced) of genes that are involved in the mitochondrial function, among other things. Mitochondria are the energy factories of the cell. Muscles need a lot of energy to perform their function, contract and relax. An increase of NRF2 is an important part of stimulating mitochondrial biogenesis (production of new mitochondria) through training.

SNP: rs7181866 (A/G)

Several studies show an association with certain genotypes in relation to endurance sports. This polymorphism shows a connection with the so-called running economy (RE). The latter is usually defined as the energy requirement for a given velocity of submaximal running speed and is determined by measuring the oxygen consumption (VO2 and CO2). Taking into account the body mass (BMI), runners with a good RE consume less energy and thus less oxygen than athletes with a low RE at the same speed. There is a strong association between RE and running performance, where RE is a better predictor of performance than the maximum oxygen uptake (VO2max).

Your genotype: **AG**

This genotype is more frequently seen among endurance athletes. People with this genotype show a greater response in the running economy as a response to training than people with the AA genotype.

He Z, Hu Y, Feng L, et al. NRF2 genotype improves endurance capacity in response to training. Int J Sports Med. 2007;28(9):717-21.

PPARA - Ensures higher efficiency of Type I muscle fibers.

GG 61% | CG 23% | CC 16%

Gene: PPARA (Peroxisome proliferator-activated receptor alpha)

PPARA is a transcription factor (a protein that binds to a specific piece of DNA that in turn stimulates the production of another specific protein) that regulates the balance of lipids (fat), glucose and energy and also plays a role in regulating body weight. Higher concentrations of PPAR are seen in type I (slow-twitch) compared to type II (fast-twitch) muscle fibres. PPAR regulates the transcription of different genes that are important for the use of fatty acids as a source of energy in the muscles.

SNP: rs4253778 (C/G)

Several studies show an association between this polymorphism in the PPARA gene and endurance performance. Because the concentrations of PPARA in type I muscle fibre are high, the effects of variations in the PPARA gene mainly affect the endurance performance.

Your genotype: **GG**

This genotype is more frequently seen in professional endurance athletes.

Ahmetov II, Williams AG, Popov DV, et al. The combined impact of metabolic gene polymorphisms on elite endurance athlete status and related phenotypes. Hum Genet. 2009;126(6):751-61.

PPARGC1A - Causes an increase of the anaerobic threshold by training

GG 57% | AG 33% | AA 10%

Gene: PPARGC1A (Peroxisome proliferator-activated receptor gamma coactivator 1-alpha)

PPARGC1A is a so-called transcription factor (a protein that binds to a specific piece of DNA that in turn stimulates the production of another specific protein). It is involved in mitochondrial biogenesis (the production of new mitochondria - the energy factories of the cell), fatty acid oxidation (use of fat as an energy source), glucose use, thermogenesis (keeping the body warm), angiogenesis (growth of new blood vessels) and the conversion of muscle fiber type towards slow-twitch type I fibers.

SNP: rs8192678 (A/G)

This polymorphism in the PPARGGC1A gene is associated with lower concentrations of PPARGC1A. Moreover, one of the alleles also shows a connection with a lower increase in the anaerobic threshold after nine months training. The aerobic capacity (the possibility of making a great effort without switching to anaerobic metabolism) is related to certain genotypes in this SNP.

Your genotype: **AG**

This genotype is more often seen in strength athletes compared to endurance athletes. IL6 concentrations are higher than those of people with the CC or CG variant.

Lucia A, Gómez-gallego F, Barroso I, et al. PPARGC1A genotype (Gly482Ser) predicts exceptional endurance capacity in European men. J Appl Physiol. 2005;99(1):344-8.

SOD2 - Provides aptitude for high intensity sports

CC 20% | TC 43% | TT 37%

Gene: SOD2 (Superoxide dismutase 2)

When you play sports, and especially with intense exertion, so-called oxygen radicals develop in your muscles. These are substances that are produced as a by-product sugar metabolism as an energy source in the muscles. These oxygen radicals affect the performance of the muscles and can also cause damage to the muscles. It is therefore important that the body discharges the oxygen radicals as quickly as possible. The body therefore has its own antioxidants to do this, such as the enzyme SOD2.

SNP: rs4880 (T/C)

The common polymorphism of SOD2 rs4880 reduces the effectiveness of the SOD2 protein. This means that during intense exercise, oxygen radicals will accumulate in the mitochondria (energy factories) of the muscle cells. This results in a loss of muscle performance.

Your genotype: **CC**

Individuals with this variant have a good functioning of SOD2. This genotype is therefore more often seen in people with short, high-intensive performances, such as sprinters or decathletes.

Ahmetov II, Naumov VA, Donnikov AE, et al. SOD2 gene polymorphism and muscle damage markers in elite athletes. Free Radic Res. 2014;48(8):948-55.

C2. Exercise

Active lifestyle

An active lifestyle will have a positive influence on your body weight.

Make sure you engage in light physical exertion on a daily basis.

Gene	SNP	Your genotype
FTO	rs1121980	CT

Active lifestyle

If you want to lose weight, it is also wise to exercise (more) in addition to adjusting your diet. In order to reach and maintain a healthy weight, a good balance between the energy intake (the calories in our food) and the energy requirement (the calories that your body uses) is very important. If you consume more energy than your use, your body will store (part of) this surplus as energy reserves (fat in fat cells) for later. Not handy if you actually want to lose weight and you will therefore have to ensure that you use more energy than you consume. This is possible through eating less, but also by ramping up your energy requirement through moving and exercising more. Exercising more will always increase the body's energy requirement. If you also reduce the calorie intake, the balance will therefore shift and you will probably lose weight. The extent to which this happens differs per person.

By looking at your genes, we can give an indication of the extent to which a more active lifestyle will contribute to reaching and maintaining a healthy weight. By mapping out your genotype for a number of genes, we can determine if you have a predisposition for endurance sport or whether you are more of a strength athlete. On the basis of this information, we will give you advice on what type of exercise is most suitable for you to achieve maximum weight loss.

Active lifestyle

In the case of an active lifestyle, you probably think of people who you see running past your window in the morning or who work up a sweat in the gym in the evening. Of course, these people are very active, but we already call a lifestyle active if you have a few moments during the day when you have to lightly exert yourself. Take, for example, a brisk walk, climbing stairs or cycling to work.

Your genotype shows that an active lifestyle will be more helpful for you in weight loss than to people with a different genotype. This means that if you want to lose weight and you currently have a mainly inactive lifestyle, you can already see weight loss by increasing your level of physical activity. Take, for example, sitting down less (long), walking more, climbing stairs more and exercising now and again. However, your genotype also shows something else, namely a slightly greater risk of being overweight. Therefore, if you are not physically active and do not follow a healthy diet, you can easily gain weight. Sufficient exercise is therefore very important for you. Moreover, being physically active will keep your joints, bones and muscles healthy, aid digestion, increase the production of endorphins (the 'happiness hormones'), reduce stress and the risk of depression, as well as improve your insulin sensitivity, thereby helping to prevent diabetes, cardiovascular diseases and several other lifestyle diseases.

DNAisyou.

Active lifestyle

Your genotype

CC 41% | CT 43% | TT 16%

FTO - Increase the risk of obesity with an inactive lifestyle

Gene: FTO (Fat mass and obesity-associated protein)

FTO is an important genetic factor when it comes to obesity. Variants in the FTO gene are linked to a higher BMI score and an increased risk of obesity. A study with a functional MRI scan even showed that the risk variant of the FTO gene has a distinct effect in the brain when images of food are shown to the test subjects.

The FTO protein regulates the extent to which specific parts of the DNA are being utilised to produce other proteins (gene expression). Several polymorphisms in the FTO gene have been found that are associated with obesity and affect different processes responsible for weight gain.

SNP: rs1121980 (T/C)

Several variants of the FTO gene are associated with obesity. The SNP rs1121980 shows an association between genotype and active lifestyle in relation to BMI. Research shows that there is a relationship between the risk allele of this SNP and an increase in BMI (and thus the risk of obesity). This increase appears to be greater for people with an inactive lifestyle. A carrier of one or two of the risk alleles is therefore more likely to be overweight if he or she does not play sports or is very inactive during the day. A change in lifestyle can have a major impact on reducing body weight for these people.

Your genotype: **CT**

People with this genotype have a slightly increased risk of obesity compared to the CC genotype. However, it appears that the risk and degree of obesity can be reduced by adequate exercise. Think of sitting less, taking the stairs more often and occasional sport activities. The effect of an active lifestyle is greater than for people with the CC genotype, but not as strong as for those with the TT genotype.

Vimaleswaran KS, Li S, Zhao JH, et al. Physical activity attenuates the body mass index-increasing influence of genetic variation in the FTO gene. Am J Clin Nutr. 2009;90(2):425-8.

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C3. Exercise

Injury risk

You have a normal risk of tendon injuries

- **You can build up your exercise regimen in a normal pace.**
- **Vary the type of training occasionally.**

Gene	SNP	Your genotype
COL1A1	rs1800012	GT
MMP3	rs679620	AG
GDF	rs143383	CC

Injury risk

If you are going to exercise for weight loss, it is important to do this wisely. It is important that your training schedule and exercises are designed well, so that they help you to strengthen your tendons and prevent injuries. This can ensure that you don't have to stop or reduce your workouts due to injuries.

The risk of tendon injuries is linked to specific genes. Being careful in your trainings may therefore be even more important for people with an increased genetic risk

According to your genetic profile, you have a normal risk of tendon injuries. Tendons do not grow as fast as muscles and therefore also need more time for recovery. You don't need to take extra time to build up your exercise regimen. However, it is always wise to build it up carefully, especially if you go from a few activities to intensive sports. Although you don't have an increased risk for tendon injuries, it may therefore be wise to vary different types of training to avoid overloading certain muscle groups and tendons. For example, switch between running, cycling or swimming, or make use of the different cardio equipment in the gym. In this way you don't burden the same tendons each time, so they have more time to recover for the next training. Strength exercises, for example squats, lunges and planks are also very important for stronger tendons and for good posture. In addition, proper technique is also essential, whether it is "just" running or weight training in the gym. Make sure you know the technique before you start and keep on working on improvements. If possible, have yourself coached by a good (personal) trainer.

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Injury risk

Your genotype

COL1A1 - Causes an increased risk of tendon injuries

GG 83% | GT 15% | TT 2%

Gene: COL1A1A1 (collagen type I, alpha 1)

Collagen type I is the most common type of collagen. It is a form of connective tissue and gives strength to certain structures in the body. Collagen is a protein that strengthens and supports many tissues in the body, including cartilage, bone, tendon, skin and the white part of the eye (sclera). The COL1A1-gene encodes the main component of type I collagen, the fibrillar collagen, found in most connective tissues.

SNP: rs1800012 (G/T)

This polymorphism in the COL1A1 gene produces a protein that is slightly less strong than the normal form. Carriers of the risk allele are more likely to suffer from tendon injuries because the collagen in the tendons is less firm. Studies show that carriers of the risk allele are indeed more likely to suffer from the knee ligaments, for example.

Your genotype: **GT**

This genotype causes the abnormal form of collagen. This therefore increases the risk of tendon injuries.

Posthumus M, September AV, Keegan M, et al. Genetic risk factors for anterior cruciate ligament ruptures: COL1A1 gene variant. Br J Sports Med. 2009;43(5):352-6.

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MMP3 - Reduces the risk of tendon injuries

GG 43% | AG 44% | AA 13%

Gene: MMP3 (matrix metalloproteinase-3)

Proteins of the matrix metalloproteinase family (MMP) are involved in the degradation of extracellular matrix proteins (the solid structures around and between the cells) and during tissue building in normal physiological processes, such as embryonic development (growth of the baby in the uterus). The breakdown of extracellular matrix proteins is a natural process that is important for the proper formation of tissues. This scaffolding, as it were, is used for the construction of tissues that will have to be broken down again later. This process is particularly important for the shape and function of tissues and organs. MMP3 is essential for the so-called remodelling of connective tissues in the body.

SNP: rs679620 (A/G)

Studies in which several SNPs in the MMP3 gene were analysed for their involvement in Achilles tendon injuries, the rs679620 variant has emerged as a significant marker. It turns out that carriers of the favourable allele are less likely to suffer from tendon injuries. In turn, carriers of the unfavourable allele have a higher risk of, for example, Achilles tendon injuries.

Your genotype: **AG**

This genotyping is associated with a slightly reduced risk of tendon injuries.

Raleigh SM, Van der merwe L, Ribbans WJ, Smith RK, Schwellnus MP, Collins M. Variants within the MMP3 gene are associated with Achilles tendinopathy: possible interaction with the COL5A1 gene. Br J Sports Med. 2009;43(7):514-20.

GDF5 - Reduces the risk of tendon injuries

CC 38% | CT 33% | TT 29%

Gene: GDF5 (growth differentiation factor 5)

GDF5 is one of the so-called growth differentiation factors. These factors modulate the growth of the body's structures. This happens a lot during the growth before birth, but also later in life these factors play an important role in the recovery of tissues. Among other things, GDF5 plays a role in the formation of the skeleton and joints.

SNP: rs143383 (C/T)

This polymorphism in the GDF5 gene is associated with tendon injuries. Among other things, this SNP has emerged from studies into Achilles tendon injuries among athletes. One of the alleles of GDF5 appears to be more common among athletes who dealt with this injury.

Your genotype: **CC**

This form of gene is seen less often in people suffering from tendon injuries. This form of the GDF5 gene therefore seems to have a protective effect for Achilles tendon injuries, for example.

Posthumus M, Collins M, Cook J, et al. Components of the transforming growth factor-beta family and the pathogenesis of human Achilles tendon pathology--a genetic association study. Rheumatology (Oxford). 2010;49(11):2090-7.

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D. Motivation

Overview

D MOTIVATION

D1 WARRIOR VERSUS WORRIER

YOU ARE A WORRIER

D2 SPORTS: LOVE IT OR HATE IT

• GOOD FEELING
• LOW WILLINGNESS

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D1. Motivation

Worrier versus Warrior

You are a worrier

Setting realistic goals might be a good way prevent giving up.

Gene	SNP	Your genotype
COMT	rs4680	AA

Injury risk

Reaching a healthy weight if you are overweight or maintaining a healthy weight is often not easy. It requires a lot of perseverance and it can be hard work. However, you have taken the first step by doing a DNA scan in order to lose the excess kilos as efficiently as possible.

You are therefore definitely motivated to lose weight and you want to tackle it as effectively and sensibly as possible. However: then comes the next step; a change in your lifestyle. You will need to change your diet and eat less (reducing the energy intake) if you want to lose weight. Something, which can be a wearing aspect for most people. However, it doesn't have to be this way with the right guidance. The same applies for more physical activity. Although a professional can definitely help you to achieve your goals on the basis of this analysis, you determine to a large extent whether or not you will succeed. Or, that is, your genetic predisposition does...

Genetic differences in how someone tackles a challenge like losing weight have been investigated in various studies. We can therefore see from your DNA analysis whether you are a 'worrier' or a 'warrior' and evaluate your willingness to exercise. Based on that, we can give you tips on how to best use these characteristics to achieve your goal.

The variation in the so-called 'Worrier vs Warrior' gene ensures that people deal with, and experience, problems and stressful times differently. Your genotype for this gene makes you a 'worrier'. If we look at what this could mean for you in terms of weight loss, a number of things emerge. You are probably inquisitive by nature. In terms of losing weight, this means that you would like to see what the possibilities are for doing this optimally. Being well prepared is what gives you a good feeling and what can help you to achieve the best results. However, you should watch out not to delay your lifestyle change. Based on this test, you can be likely to dwell too long on the search of the best method, rather than actually starting. Therefore, be alert to prevent this!

Unfortunately, people with this variant are also more sensitive to stress. A period in which you try to lose weight is inherently stressful. Moreover, after you have lost the first kilos relatively easily, you will always have a period during which the weight loss becomes more slow. This can cause stress and frustration, to which you are extra sensitive. Therefore, try to remember that this it is normal for you to sense the stress and try not to lose your motivation. Luckily, physical activity and healthy eating both improve how energetic you feel, as well as reduce stress, so they can actually help you to start enjoying your new lifestyle and to stress less.

Worrier versus Warrior

Your genotype

COMT - Causes the "Worrier versus Warrior" effect

Gene: COMT (Catechol-O-methyl transferase)

The COMT protein is involved in the inactivation of so-called catecholamine neurotransmitters. Important examples of catecholamines are dopamine (involved in the experience of pleasure, happiness and well-being) and adrenaline (is released in large quantities in conditions perceived by the body as possibly threatening for survival and therefore causing stress). A balance in the production and release of neuro-transmitters and degradation (e.g. by COMT) is essential for the processes in the brain. A shift in this balance, for example by variants in COMT that cause delayed degradation, have a direct impact on brain functions.

SNP: rs4680 (A/G)

This is probably the most important and best researched genetic marker related to stress. This variant in the COMT gene cause the so-called "worrier versus warrior" effects. Due to a difference in the activity of COMT in the prefrontal cortex of the brain (the piece of brain directly behind your forehead) this variant has an effect on certain behavioural properties. The prefrontal cortex is involved in cognitive and emotional functions such as making decisions, planning, social behaviour and impulse control. By analysing this marker, a difference in stress sensitivity can be determined.

Your genotype: **AA**

This is the so-called "worrier" variant. This genotype is associated with increased concentration and memory. People with this variant are often more inquisitive in nature and are well able to process information under all circumstances. They react more emotionally to situations than people with the other genotypes. This means, for example, that positive events are perceived by them as happier. Unfortunately, this also applies to negative events; they will be felt more intense. This gives this variant an increased stress sensitivity. People therefore perform less well under pressure than people with the other genotypes and are more prone to, for example, burn-out. People with this genotype are better at processing information properly.

Stein DJ, Newman TK, Savitz J, Ramesar R. Warriors versus worriers: the role of COMT gene variants. CNS Spectr. 2006;11(10):745-8.

D2. Motivation

Sports: love it or hate it

You do get a good feeling of exercise although you might have a low degree of willingness to exercise

- **Work hard**
- **Group lessons**
- **Look for a fun sport**
- **Set goals**

Gene	SNP	Your genotype
BDNF	rs6265	AG
PAPSS2	rs10887741	CC

Sports: love it or hate it

The way in which you experience sport and your motivation for physical exercise can help you a lot with losing the excess kilos. On the basis of your genotype, you will probably have a good feeling after exercising. The physical exertion provides a reward, which comes from the brain. Unfortunately, you don't possess the variant that makes you more willing to exercise. This means that you may not look forward to exercising, but that it will leave you with a good feeling once you have pushed yourself to do it. Working hard during the training session can also encourage this good feeling. Group lessons might give you the right motivation. A fixed time and having an appointment with other people will prevent you from failing to show up too easily. You should also look for an activity/sport that you enjoy doing. Finally, it can help to set goals that motivate you to continue exercising. Buy a nice outfit, for example, that is one size too small, so that you really have something to motivate you to keep doing your best.

Sports: love it or hate it

Your genotype

BDNF - Ensures that you get a good feeling of sports

GG 67% | AG 26% | AA 7%

Gene: BDNF (brain-derived neurotrophic factor)

BDNF influences certain neurons (nerves) of the central nervous system. It helps the survival of existing neurons and stimulates the growth of new neurons and synapses (connections between neurons). In the brain, BDNF plays a role in the hippocampus, cortex and basal forebrain that are vital to learning, memory and higher thinking.

BDNF also appears to have an important effect on the so-called dopaminergic system in the brain. The dopamine system plays a major role in experiencing pleasure, joy and well-being. Through this interaction, variants in the BDNF gene have an influence on emotional processes and the experience of happiness under the influence of external factors.

SNP: rs6265 (A/G)

Looking forward to exercise depends on the feeling you have during and after your workout. A good feeling at the end of the exercise provides motivation to exercise again. The feeling that you are able to keep up with the exercise regime can contribute to the desire to exercise. The BDNF gene is associated with this positive feeling toward exercise and sports.

Your genotype: **AG**

This variant shows an association with an increased sense of satisfaction after exercise. People with this genotype also seem to experience a certain effort as less strenuous than people with the GG variant.

Bryan A, Hutchison KE, Seals DR, Allen DL. A transdisciplinary model integrating genetic, physiological, and psychological correlates of voluntary exercise. Health Psychol. 2007;26(1):30-9.

PAPSS2 - Increases motivation to exercise

TT 48% | CT 40% | CC 12%

Gene: PAPSS2 (3' -phosphoadenosene 5' -phosphosulfate synthase 2)

The PAPSS2 protein conducts so-called protein sulphation. Sulphation plays a role in strengthening protein-protein interactions. Proteins, for example, can transmit signals by binding to each other and this binding can be enhanced by sulphation.

SNP: rs10887741 (T/C)

Research has shown that the willingness to and duration of exercise is (for a small part) genetically predisposed. Scientist have looked at individuals who exercise regularly on their own initiative and how long they did this on average. A variant in PAPSS2 appeared to be significantly related to these two aspects.

Your genotype: **CC**

This variant gives an average motivation to practise sports.

De moor MH, Liu YJ, Boomsma DI, et al. Genome-wide association study of exercise behavior in Dutch and American adults. Med Sci Sports Exerc. 2009;41(10):1887-95.

More information

Energy requirement

In order to determine how many calories you have to eat every day, we first have to determine how much energy your body needs.
This is determined by two aspects:
1) your basal metabolic rate, i.e.: how much energy does your body need for all basic processes at rest.
2) your activity level: the more you exercise, the more energy you need.

Basal metabolic rate (BMR)
The basal metabolic rate is determined by four factors: sex, height, weight and age. If one of these aspects changes, your energy requirement, expressed in calories, changes too. In order to calculate this, we make use of the Harris-Benedict equation (revised by Roza and Shizgal in 1984) for people aged 18 or older, and the Schofield equation for children aged between 10 and 17.

Harris-Benedict (18+)
♂ calories = 88.362 + (13.397 x weight [kg]) + (4.799 x height [cm]) - (5.677 x age [in years])
♀ calories = 447.593 + (9.247 x weight [kg]) + (3.098 x height [cm]) - (4.33 x age [in years])

Schofield (10-17)
♂ calories = 515.3 + (16.2 x weight [kg]) + (137.1 x height [m])
♀ calories = 200.0 + (8.4 x weight [kg]) + (465.4 x height [m])

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Activity level

The more you physically active you are, the more energy you need. Therefore, the amount of energy you need is determined by your basal metabolic rate and level of activity. We make use of a division into five categories. Each category has a PAL (Physical Activity Level) score. For adult men and adult non-pregnant, non-lactating women, multiplying the basal metabolic rate by the PAL score determines the daily energy requirement (BMR x PAL).

PAL categories
Inactive: Bed rest
→ 1.2

Lightly active: Seated work and light physical activity (e.g. household chores, walking without load, watching TV, driving to work) and/or exercising once or twice times a week.
→ 1.45

Averagely active: Standing work and light physical activity (e.g. household chores, walking without load, watching TV, driving to work); or seated work and moderate physical activity of 2 or more hours a day (e.g. including walking with load, jogging, biking) and/or exercising three to four times a week.
→ 1.65

Active: Standing work and moderate physical activity two or more hours a day (e.g. including walking with load, jogging, biking); or seated work and heavy physical activity of two or more hours a day (e.g. endurance/ strength training at high intensity five to seven days per week).
→ 1.85

Very active: Standing work and/or heavy physical activity (exercise numerous times per day)
→ 2.2

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More information

Energy content per macronutrient and alcohol intake

In terms of energy contained in 1 gram, fat is the most energy dense nutrient and provides us with 9 kcal/gram. Also alcohol is energy dense and contains 7 kcal/gram. Due to general health reasons as well as for optimal weight loss and macronutrient balance, we therefore recommend you to limit your alcohol intake as much as possible. Carbohydrates and protein both provide us with 4 kcal/gram. Additionally, carbohydrates contain fibre, which humans cannot digest, and which therefore, passes our body without providing any energy. Especially whole grain products and fruits and vegetables are rich in fibre, hence their relatively low energy content.

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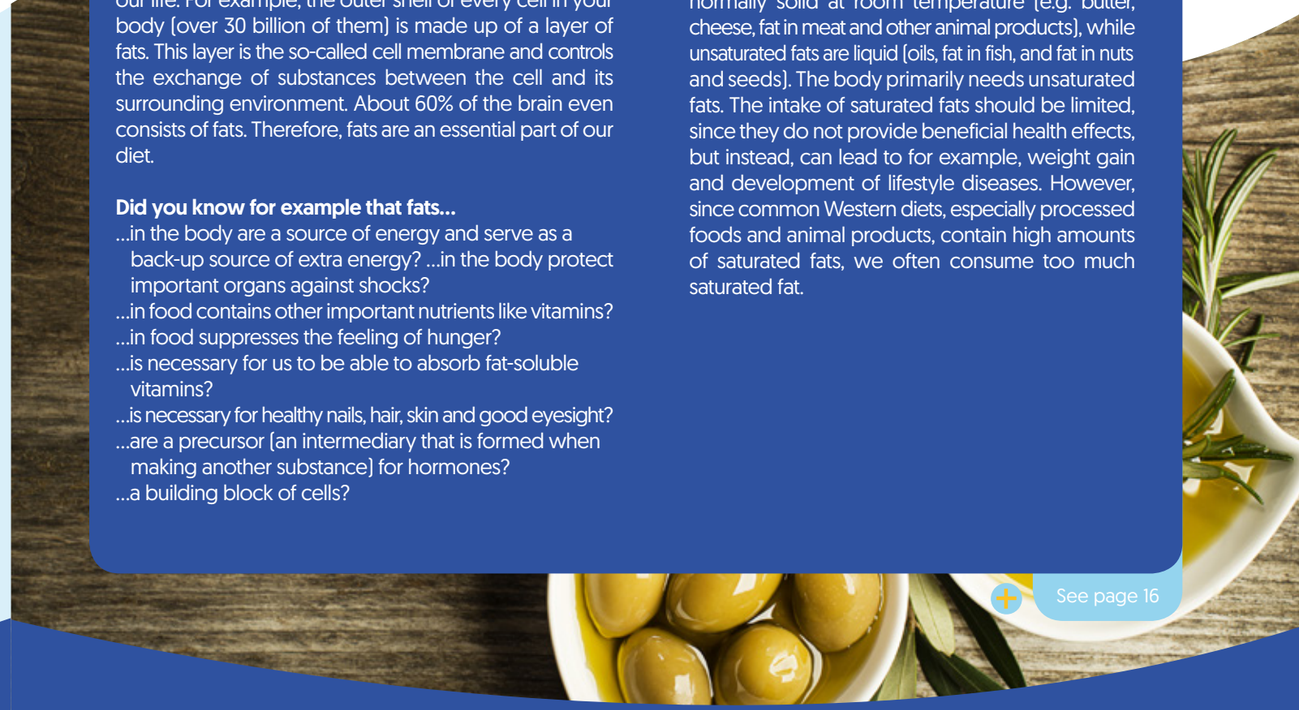
Fat

Fat
Fat in our diet is often seen as the main reason for being overweight and other ailments. This is not completely right. The fats in our diet are of essential importance to our life. For example, the outer shell of every cell in your body (over 30 billion of them) is made up of a layer of fats. This layer is the so-called cell membrane and controls the exchange of substances between the cell and its surrounding environment. About 60% of the brain even consists of fats. Therefore, fats are an essential part of our diet.

Did you know for example that fats...
...in the body are a source of energy and serve as a back-up source of extra energy? ...in the body protect important organs against shocks?
...in food contains other important nutrients like vitamins?
...in food suppresses the feeling of hunger?
...is necessary for us to be able to absorb fat-soluble vitamins?
...is necessary for healthy nails, hair, skin and good eyesight?
...are a precursor (an intermediary that is formed when making another substance) for hormones?
...a building block of cells?

Fat in our diet
The fats in our diet can be divided into two important categories, namely saturated and unsaturated fats. It is easy to recognise saturated fats, since they are normally solid at room temperature (e.g. butter, cheese, fat in meat and other animal products), while unsaturated fats are liquid (oils, fat in fish, and fat in nuts and seeds). The body primarily needs unsaturated fats. The intake of saturated fats should be limited, since they do not provide beneficial health effects, but instead, can lead to for example, weight gain and development of lifestyle diseases. However, since common Western diets, especially processed foods and animal products, contain high amounts of saturated fats, we often consume too much saturated fat.



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More information

Examples of unsaturated fat sources

Source	Protein per 100 grams	Carbohydrates per 100 grams	Of which sugars	Fat per 100 grams	Of which saturated fat	Calories per 100 gram
Flax seed oil	100	8	0	0	0	873
Walnut oil	100	11	0	0	0	857
Sunflower oil	100	12	0	0	0	900
Hemp oil	100	13	0	0	0	900
Olive oil	100	14	0	0	0	900
Mayonaise	79	6	0	0	0	721
Macadamia nuts	76	12	5	4	8	752
Walnuts	65	6	14	3	15	654
Hazelnuts	61	4	17	4	15	628
Almonds	50	0	20	3	1	580
Sesame seeds	50	0	23	0	18	578
Peanut butter	57	10	10	3	22,5	660
Pistachios	54	7	16	0	22	655
Sunlower seeds	51	4	20	3	21	584
Nuts	54	8	13	5	20	607
Pine nuts	50	5,5	14	4	24	611
Pumpkin seeds	43	10	7	3	27	533
Low-fat margarine	39	10	0	0	0	360
Eel, raw	33	8	0	0	18	367
Avocado	21	3	12	1	3	234
Herring, raw	15	3	0	0	16	172
Mackerel, raw	14	3	0	0	19	205
Olives	11	1,5	0,5	0	1	113
Trout, raw	11	2	0	0	22	187
Salmon, raw	11	2,5	0	0	20	179
Salmon pate	11	4	1	1	18	168

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More information

Examples of saturated fat sources

Source	Protein per 100 grams	Carbohydrates per 100 grams	Of which sugars	Fat per 100 grams	Of which saturated fat	Calories per 100 gram
Coconut fat	99	82	0	0	0	892
Butter	81	51	0	0	0	717
Palm oil	100	50	0	0	0	900
Banana chips	30	25	61	15	2	524
Whipping cream	38	23	3	0	2	264
Full-fat cheese	32	21	4	0	25	393
Crème fraiche(18%)	30	19	3	3	3	294
Blue cheese	29	19	2	1	21	353
Cake	23	14	48	32	7,1	425
Bacon	33	14	0	0	33	444
Candy bar	24	14	65	49	5	494
Puff pastry, frozen	24	12	34	1	6	376
Cookies	22	11	67	40	4	489
Salami	27	10	2	2	31	385
Cheesecake	23	10	26	0	6	321
Ice cream	15	10	21	21	4	235
Sausage	28	9	1	1	12	309
Muesli bar	17	8	60	1	8	408
Beef patty, ready-made, frozen	18	7	0	0	19	241
Cacao powder	11	7	64	0	21	429
Milk chocolate	6	6	46	23	3	257
Chicken nuggets	23	5	14	0	16	326
Potato chips	35	5	53	4	7	564
Deep-fried fish	13	4	2	2	22	211
French fries	14	4	43	0	6	316
Whole milk	3	2	5	5	3	60

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More information

Protein

Proteins are an essential part of the diet. They are an important building block of the body, but can also function as a source of energy. Approximately 15% of your body weight is protein. We know proteins under different names when they have a specific function, such as enzymes, hormones, antibodies. Proteins are responsible for many processes in the body, such as:

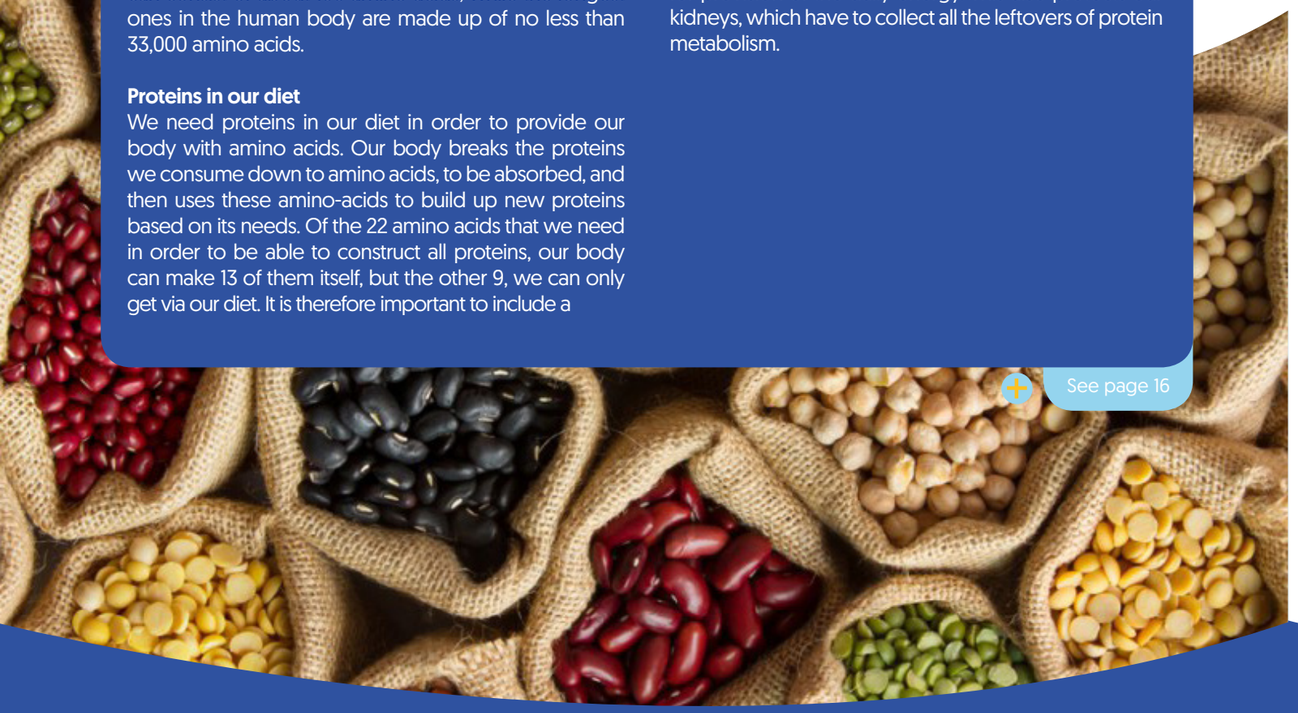
- transport (the protein haemoglobin is responsible for the transport of oxygen in the body)
- growth (many cells largely consist of proteins, such as muscle cells)
- defence/immune system (antibodies are proteins)

Proteins are made up of long chains of amino acids (polymers). An average protein consists of about 400 amino acids that are linked to each other. Smaller proteins can consist of about 100 amino acids, while the longest ones in the human body are made up of no less than 33,000 amino acids.

Proteins in our diet

We need proteins in our diet in order to provide our body with amino acids. Our body breaks the proteins we consume down to amino acids, to be absorbed, and then uses these amino-acids to build up new proteins based on its needs. Of the 22 amino acids that we need in order to be able to construct all proteins, our body can make 13 of them itself, but the other 9, we can only get via our diet. It is therefore important to include a variety of protein sources (such as nuts, seeds, pulses, wholegrain products, fish) in our diet, to make sure that the body has sufficient amounts of amino acids available. Also animal products are a very good source of protein, but because they tend to also contain a lot of saturated fats, their consumption should be limited.

Since the main function of proteins is to provide the body with building blocks, growing children, pregnant and breastfeeding women and people who train for significant muscle growth need extra protein. In addition, sufficient protein intake is important for postmenopausal women and elderly in order to avoid muscle loss and loss of bodyweight. However, protein intake should not be too high since it is not an optimal source of energy for the body. Therefore, fats or carbohydrates are needed for provision of the daily energy. This also protects our kidneys, which have to collect all the leftovers of protein metabolism.



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DNAisyou.

More information

Examples of protein sources

Source	Protein per 100 grams	Carbohydrates per 100 grams	Of which sugars	Fat per 100 grams	Of which saturated fat	Calories per 100 gram
Lupine seeds	36	40	6	10	1	371
Pumpkin seeds	27	7	3	43	10	533
Full-fat cheese	25	4	0	32	21	393
Ham, sliced	25	4	0	4	4	106
Steak, raw	24	0	0	16	6	247
Legumes	24	61	1	2	0,5	339
Chicken breast,	23	0	0	1	0	110
Tuna, raw	23	0	0	5	1	145
Peanut butter	22,5	10	3	57	10	660
Trout, raw	22	0	0	11	2	187
Mixed nuts	20	13	5	54	8,1	607
Salmon, raw	20	0	0	11	2,5	179
Salmon pate	18	1	1	11	4	168
Chicken fillet, sliced	18	4	2	6	2	135
Meat substitute	14	12	2	0	0	106
Egg	13	1	0	10	3	128
Muesli, plain, raw	13	70	0	5	0	367
Wheat flour	13	72	0	3	0	340
Quark	12	4	4	0	0	67
Goji berries,	11	68	51	1	0	330
Cream cheese	7	8	7	10	7	153
Chickpeas	7	15	1	3	0	127
Garlic	6	33	1	1	0	149
Popcorn	6	74	10	13	2	449
Black beans	5	17	1	0	0	85
Kindey beans	5	16	1	0	0	77
Hummus	5	23	0	3	0	138
Yoghurt, plain	5	15	14	4	3	118
Skim milk	4	5	5	0	0	35
Dried apricots	4	63	53	0	0	247
Sundried tomatoes	3	28	16	0	0	140
Broccoli	3	7	2	0	0	34
Dried blueberries	3	78	70	0	0	325
Champignons, raw	1	0	0	0	0	5

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More information

Carbohydrates

Carbohydrates are an important source of energy for the body, but are also used as a building block. The most important functions of carbohydrates are:

- Source of energy (the muscles and brain, among others, use glucose as their main energy source)
- Building block (carbohydrates are a basic component, for example, of DNA)
- Preventing the breakdown of protein (if there are no carbohydrates, the body breaks down protein from our muscles in order to use it as energy)

Carbohydrates in our diet

We can distinguish between three forms of carbohydrates, namely: sugars, starch and fibres. The first two form a source of energy for the body. The body cannot get energy (calories) from fibres, but they promote satiation and are important for bowel movement- optimal fibre intake aids bowel movement, while excessive intake results in constipation. Good sources of fibre are vegetables, whole grain products and fruits. People often talk about simple carbohydrates (the sugars that consist of monosaccharides and disaccharides) and complex carbohydrates (starch and fibres).

If we look at carbohydrates as a source of energy, we can consume them as sugars or starch. The cells of our body use monosaccharides (simple carbohydrates) as energy. Therefore disaccharides and complex carbohydrates vegetables and (wholegrain) bread, pasta and rice for example, are broken down into monosaccharides, mainly glucose, in our intestines. This glucose is also known as blood sugar and it can only be taken up by the cells, if our body also produces insulin in proportional amounts to the blood glucose rise. When we consume simple sugars, such as sweets and sodas, this step is not needed. Thus, they are broken down quickly, resulting in rapid increases in blood glucose and insulin, which, in turn, have been associated with negative health outcomes. These simple sugars are also often referred to as “fast” or “high glycaemic index” carbohydrates. When we consume more complex carbohydrates, this process is slower. Therefore, these carbohydrates are also sometimes called “slow” or “low glycaemic index” carbohydrates. It is therefore wise to primarily include complex carbohydrates in your diet instead of fast sugars.

If you do eat fast sugars, it is good to see if these foods actually have any extra nutritional value, such as fibres or vitamins and minerals. You should therefore try to limit foods with lots of ‘empty calories’ - lots of fast sugars and few additional nutrients. Examples of this are soft drinks and sweet snacks. This also includes fruit juice, because it contains a relatively large amount of sugar compared to vitamin C, for example, and certainly when the fibre in the pulp is filtered out.

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Carbohydrates and physical exertion

When you move, from waking up and fetching coffee to running a marathon, your body uses energy. When you are physically active, you therefore need more energy than at other times. The source of energy that the body prefers to use in the event of physical exertion are carbohydrates. It is therefore good to eat more carbohydrates before and after you exercise . The macronutrient balance based on your genetic profile might therefore shift slightly on exercise and rest days.

Pre-workout:

Exercising requires energy, so it is always wise to eat something that provides energy before exercising (pre-workout). Up to 1 hour before exercising, you can eat an easily digestible source of energy with carbohydrates, such as fruit (for example a banana or apple, possibly in combination with some low-fat yoghurt), a smoothie, a wholemeal bread sandwich or a slice of ginger bread. It is important that you find foods which you can easily digest and which do not make you feel uncomfortable when exercising. Many people, for example, do not tolerate fruits other than banana (or even banana) before a workout. However, a small meal before workout is important, since if we exercise without having eaten, the body will have to break down proteins (our muscles) to gain the necessary energy, which mean that our workout does not have as much benefits as it could have. Mid-workout: While exercising (mid-workout) it is important to keep drinking water. If you are going to exercise for a longer length of time (more than an hour), you can opt to drink a sports drink with carbohydrates or to eat a banana, for example, to avoid the feeling of lightheadedness.

Post-workout:

After exercising (post-workout), your body especially needs protein to restore and build your muscles, and carbohydrates, vitamins and minerals to recover. Always try to eat at least a small meal within one hour after exercising, but the sooner the better. Your body badly needs the nutrients at that moment. If you don’t do this, you will not give your body the chance to recover properly. So, even if you are not hungry after exercising: eat, even if only a small meal. Some examples of what you can eat after exercising:

- quark/yoghurt with pieces of apple/banana or muesli (variety without sugar)
- porridge with milk and fruit
- wholewheat sandwich with egg/salmon/chicken
- omelette with stir-fried vegetables

In addition, try to have a regular meal (breakfast/lunch/dinner within an hour or two after your exercise session. Although especially when you are exercising to lose weight, it might seem counterintuitive to eat before and after you work out, but it is necessary to do in order to protect our muscles and feel good before, during and after exercising. Therefore, a daily and weekly energy balance is important, rather than the amount of energy used and consumed during the exercise session. You can think of it like this: had you not been exercising, you would have probably had a meal anyway. Now you eat before and after exercise, but have also used energy in the training session. In addition, it is useful for the body, and consumes extra energy, to have to use its energy storages and build them up again, rather than for example eating very little and not exercising at all. This exercise-induced cellular activity keeps our tissues metabolically active and at optimal health.

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Glycemic Index

The glycemic index (GI) is the measurement for the effect of a source of carbohydrates on the blood sugar level. Carbohydrates that are broken down quickly in the digestion have a high glycemic index, while carbohydrates that are broken down slowly have a low glycemic index. Carbohydrates are broken down by the intestines into monosaccharides, of which glucose is the most important. We refer to the amount of glucose in the blood as the blood sugar level. A food item with a high GI therefore causes a rapid increase of glucose in the blood, while a low GI shows a slow glucose response. These changes in blood glucose levels will be mirrored by our insulin levels. This is the reason that people talk about ‘fast’ and ‘slow’ carbohydrates.

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Carbohydrates

Source	Carbohydrates per 100 grams	Of which sugars	Protein per 100 grams	Fat per 100 grams	Of which saturated fat	Calories per 100 gram
Sugar	100	100	0	0	0	400
Buckwheat, raw	84	0	8	2	0	364
Honey	82	81	1	1	0	329
White rice, raw	80	0	7	1	0	365
Raisins	79	59	3	0	0	299
Rice cakes	78	0	11	4	0	389
Brown rice, raw	77	2	8	3	1	356
Winegums	77	55	4	0	0	330
Bulgur, raw	76	0	12	1	0	342
Wholegrain crakers	73	5	13	7	3	433
White pasta, raw	73	0	11	1	0	349
Muesli, plain, raw	70	0	13	5	0	367
Porridge, raw	67	1	11	6	1	375
Cruesli, raw	65	20	10	4	0	420
Wholegrain pasta	61	1	13	3	0	340
Jam	61	34	0	0	0	247
Quinoa, raw	60	0	15	6	0	335
Brinta instant wheat cereal, raw	60	1	13	7	1	354
Pita bread, white	56	1	9	1	0	275
Tortilla wraps	50	2	8	5	2	281
Rye bread	48	0	11	3	1	259
Milk chocolate	46	23	3	6	6	257
Wholegrain bread	38	0	11	3	1	235
White bread	38	13	13	8	2	274
Banana	23	12	1	0	0	90
Grapes	17	16	1	0	0	67
Potatoes, raw	17	1	2	0	0	77
Fruit yoghurt	15	13	5	5	3	124
Yoghurt, plain	15	14	5	4	3	118
Apple	14	10	0	0	0	52
Fruit juice	13	0	0	0	0	51
Oranges, raw	12	9	1	0	0	47
Coca-cola	11	11	0	0	0	39
Carrots	10	5	1	0	0	41
Watermelon	8	6	1	0	0	30
Red peppers	6	4	1	0	0	31
Aubergine, raw	6	0	1	0	0	28
Milk 1.5% fat	5	5	3	2	1	45
Celery, raw	3	0	3	0	0	24

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Dietary patterns and physical health

It is important to understand that none of the three macronutrients can be classified as healthy or unhealthy on their own and that it is their ratio, type and amounts of intake, that can have positive or negative influence on our health.

For example, the pathway for development of almost all lifestyle diseases starts with high intake of 'simple' or 'fast' carbohydrates and saturated fats. As mentioned, intake of fast sugars results in rapid increases in insulin levels. Insulin, in turn, is a signal for general growth for the body, and therefore promotes cell division, and lipid production. Therefore, constant high insulin levels, as resulting from high amounts of fast sugars or constant snacking/eating, can lead to chronic inflammation. Further, constant high insulin can lead our body to become insulin resistant – a state where there is enough glucose available, but the cells 'starve because they are insensitive to insulin and thereby unable to take up the glucose that they need. This situation has a tendency to worsen over time, since the body's first response is to produce more insulin, which only increases the insulin resistance, but after a while, the body exhausts itself and cannot maintain insulin production. This condition is known as type 2 diabetes. Further, high insulin levels also stiffen and narrow our blood vessels, especially in combination with smoking or high saturated fat intake. This, in turn, can lead to reduced blood, nutrient and oxygen flow to our organs and cause heart disease and stroke or injure organs that depend on smaller blood vessels, causing problems with eye sight or impotence, for example, and at worst cases, even lead to amputations.

On the other hand, consuming sufficient amounts of unsaturated fatty acids, makes our blood thinner, our blood vessels more flexible, as well as helps our joints and the absorption of fat-soluble vitamins, that are essential for good mental and physical health. As mentioned, consuming more of complex carbohydrates, like whole grain products, fruits and vegetables, improve or maintain our insulin sensitivity, provide our body with essential vitamins and minerals, aid digestion and help to prevent weight gain. Also physical activity is known to improve our insulin sensitivity and keep our tissues active, making sure that our energy stores are used and rebuilt constantly, rather than only expanding. In addition, physical activity helps to build muscle tissue, which needs energy also when not exercising, thereby increasing our energy expenditure and "burning fat" even when we rest.

Since all these changes, both positive and negative, occur after a longer period and not after one-time consumption, it is important to focus on the long-term meal patterns. Therefore, weekly energy balance is more important than daily, as well as optimal macronutrient ratio is more important per month and week, rather than per day or per mealtime. Therefore, if your macronutrient ratio shifts for a day or two, or if you eat a high fat meal although you should be careful about your fat intake, it does not significantly influence your overall progress. However, turning attention to daily energy balance and macronutrient ratio is still useful, as it helps to also achieve the balance over longer term.

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General recommendations for healthy lifestyle patterns

For any genotype and corresponding macronutrient ratio, there are countless ways to meet the requirement. A day of consuming only fast food, for example, could end up perfectly fitting your macronutrient ratio and maybe even daily calorie allowance, but yet, it would not be an optimal daily diet. This section, will therefore, provide some general recommendations on what your daily diet should look like.

Fat- and sugar free products
For example, reduced fat or sugar products might seem a simple way to meet your daily macronutrient ratio, while not giving up food items that you like. However, frequent consumption of these products might not be good for your health. Namely, these products promote increased insulin production. With low fat products, this happens because when some of the fat is removed, then the remaining product will have a relatively higher proportion of sugar than the original product. As insulin is secreted proportionally to the sugar content in the product, then also the amount of insulin produced will be higher. This will lead to larger spikes in insulin levels and, if consumed over a longer period, could therefore lead to insulin resistance and the development of lifestyle diseases. The consumption of sugar-free products can cause unnecessary production of insulin. This is because even though sugar-free products do not increase our blood glucose levels and therefore the production of insulin is not actually needed, our body will produce insulin upon sensing the sweet taste. When the body understands that it is producing insulin, but the cells are still not taking up any sugar, insulin production might even be initially increased to try to counteract for this 'problem'. Therefore, although sugar-free products do not actually cause a rise in our blood glucose, they still increase insulin levels, which, as explained, can over time lead to insulin resistance and the development of diabetes and cardiovascular diseases, for example.

We therefore recommend to choose products with regular fat and sugar content (or at least not fat-free and sugar-free products), whenever possible, and rather modify the portion size and frequency of consumption. Also, as mentioned, minor shifts in the daily macronutrient ratio are not detrimental to the progress and it is rather the longer term balance that should be achieved.

Daily menu
It is in general recommended to consume three main meals (breakfast, lunch and dinner) and two to three smaller snacks in a day. However, optimal meal frequency also depends on personal preference and daily routine, and should therefore be adjusted to fit an individual's lifestyle.

Independent of the optimal macronutrient ratio, there are certain food items, that should be consumed daily for optimal health, and which can fit into any dietary macronutrient ratio. The Health Council of the Netherlands, similarly to official health authorities all over the world, recommends that an adult would consume a mainly plant-based diet, containing about 200g of fruits, 200g of vegetables, 15 grams of nuts, 90 grams of wholegrain products a few servings of dairy products and about 3 cups of tea daily (Health Council of the Netherlands. Dutch dietary guidelines 2015. The Hague: Health Council of the Netherlands, 2015; publication no. 2015/24E). In addition, weekly consumption of fish and legumes is encouraged, while the consumption of red meat, especially processed meat, salt, sugar and alcohol, should be kept as low as possible. Finally, refined cereal products are recommended to be replaced by whole grain products; cooking fats and butter by liquid oils, and unfiltered coffee by filtered coffee. While these recommendations give a relatively good overview of the general eating patterns, it can still be very difficult to evaluate the ratio of macronutrients and daily caloric intake.

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App

In addition, you might find it helpful to use an online tool/app to evaluate and plan your daily diet. You are of course welcome to choose one according to your own preference, but we would recommend MyFitnessPal as an easy-to-use app to help you along the way. In this app you can count per day the calories you take in and you might notice that after a short period of using the app, you already know by yourself how your daily diet should look like. Therefore, it is up to you, whether you choose to use the application for a longer period of time, or only until you are "learning".

In addition to the app, you might also consider visiting suitable health professionals for help with nutrition, exercise, or psychological aspects like motivation and behaviour change.

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Vitamins and minerals

What are vitamins and minerals?
Vitamins and minerals are small compounds, also known as micronutrients, that are needed for normal functioning of any living organism. There is one clear difference between vitamins and minerals. Namely, vitamins are produced by living organisms such as plants, animals and humans, while minerals are compounds present in soil and water, which make their way to living organisms from there. Minerals are relatively stable compounds and can therefore easily reach our bodies through water and foods. Vitamins, on the other hand, can be degraded during storing, cutting or cooking of foods.

Yet, it is important that we obtain sufficient amounts of all vitamins through our diet, because our body either cannot synthesise some vitamins in sufficient amounts and others, it cannot synthesise at all. The vitamins that we cannot produce are called essential vitamins and we solely rely on our diet to get them. These include vitamin A, E and K, as well as the B-vitamins, including B1 (thiamine), B2 (riboflavin), B5 (pantothenic acid), B6 (pyridoxine), B7 (biotin), B11 (folate) and B12 (cobalamin). In addition, some vitamins can be essential under specific circumstances. This includes vitamin D when there is not enough sunlight for vitamin D synthesis in our body, as well as vitamin B3 (niacin) when there are not enough essential amino acids and other micronutrients present for its synthesis in the body. Therefore, sufficient intakes of all vitamins, as well as minerals, is important for maintenance of good health.

Why do we need them?
We need micronutrients for nearly all physiological processes, including metabolism, reproduction, immunity and growth, to list a few. In addition, our micronutrient balance can also influence our mental health. Therefore, when we do not have sufficient micronutrient intake from our diet, we can develop serious health concerns, but the same is also true for too high intakes.

How much micronutrients do we need and what does it depend on?
The amounts of micronutrients that we need, depend on the physiological functions that our body is undertaking at a certain period of time. Therefore, growing children often need similar or even higher absolute amounts of micronutrients as grownups. In addition, the needs differ between males and females, adults and elderly, pre-and postmenopausal women, as well as for pregnant and lactating women. Official recommendations for each of these population groups, for all micronutrients, are normally provided by local health authorities. However, our individual needs can differ and are dependent on our genes, dietary patterns and lifestyle choices.

Genes
Our genes can influence our individual needs for specific micronutrients. For example, genes can influence the efficiency of absorption, transportation, and the amount that needs to be absorbed for optimal functioning of the body.

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Dietary patterns

Water- and fat soluble vitamins
Vitamins can be categorised to two groups: water- and fat soluble vitamins. Fat soluble vitamins are vitamins A, D, E and K, while the remaining vitamins are water soluble. Because of this, a higher proportion of fat soluble vitamins can be found in food items that contain fat, such as oils, nuts, seeds, animal and dairy products. Water soluble vitamins are present in higher proportions in fruits, vegetables and (whole)grain foods. Therefore, the proportion of these different foods also determines our risk of deficiency for certain vitamins. While we can store fat-soluble vitamins in our fat tissue and use the stores when our dietary intake is insufficient (for example when dieting), excess water-soluble vitamins cannot be stored and will be excreted.

Therefore, it is essential that we consume water-soluble vitamins daily, but on the other hand we are at smaller risk of too high levels of these vitamins. Because fat-soluble vitamins are stored in our tissues, excessive intakes can have much more serious health outcomes.

Bioavailability and interactions
In addition, the amount of a micronutrient that we can absorb, depends on its food source. A good example is iron. Although there are many plant sources of iron, for example green leafy vegetables or legumes, this iron (known as non-heme iron), is not absorbed as well as iron from animal sources (known as heme iron). Therefore, one might consume sufficient amounts of iron, but the absorption is inadequate, leading to insufficient tissue stores.

In addition, the micronutrients in food items can often interact with each other during their absorption to the body. This can be either in concert, in situations where the presence of one micronutrient increases the absorption of another, such as calcium and vitamin D, or iron and vitamin C, but there are also instances where the presence of one micronutrient inhibits the absorption of other, such as calcium for iron, for example.

The best way to counteract these factors, is to maintain a diet including a variety of fruits, vegetables, grains and other plant-based foods, as well as animal and fish products. In this case, the consumption of dietary supplements or fortified foods is not necessary for the majority of people.

However, due to ethical or health reasons, because of following a specific dietary pattern, or simply not turning sufficient attention to their diet, many people do not consume all these food groups, and are therefore at risk of micro-nutrient deficiencies. For example, vegans and vegetarians can be at risk for insufficient intakes of vitamin D and vitamin B12 for example, that are only present in animal sources. On the other hand, due to the high intake of fruits and vegetables and general awareness of their diet, they often have higher intakes of vitamins C, E, folate, magnesium, iron and copper, intakes of which are known to be low in the general population.

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Sample menu

Breakfast
2 slices wholegrain bread (70g)
1 slice cheese (12g, max. 30% fat)
2 slices chicken/turkey ham (12g)
1 medium tomato (140g)
Water/tea/coffee with or without milk and sugar

Snack
2 pieces of fruit
(e.g. 2 bananas/2 apples/2 pears/ 4 mandarins/4 kiwis/2 handfuls of berries)

Lunch
4 slices wholegrain bread (140g)
2 slices cheese (24g, max. 30% fat)
1 tbs. jam (20g)
1 piece of fruit
(e.g. banana/apple/pear/ 2 mandarins/ 2 kiwis/ handful of berries)

Snack
200g raw vegetables
(e.g. 1 red pepper/ 3-4 sticks of celery/ 3 carrots)
10 almonds (12g)

Dinner
3-4 boiled/baked potatoes (200g raw)
4-5 serving spoons of baked/boiled/ steamed vegetables (200g raw)
Fried/baked chicken fillet (100g raw)
1 tbs. oil for cooking (10g)
Salad with ½ cucumber (200g raw), handful of dill (10g), 1 tbs. vinegar (10g)
Salt/pepper/chilli/lemon/spices for taste

Kcal: 1603

Carbohydrates:	62%
Fat:	20%
Protein:	18%

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Sample menu

Breakfast
3 slices wholegrain bread (105g)
2 slices cheese (24g, max. 30% fat)
2 slices chicken/turkey ham (12g)
1 medium tomato (140g)
5 slices cucumber (20g)
Water/tea/coffee with or without milk and sugar

Snack
2 pieces of fruit
(e.g. 2 bananas/2 apples/2 pears/
4 mandarins/4 kiwis/2 handfuls of berries)

Kcal: 1977

Carbohydrates:	**64%**
Fat:	**19%**
Protein:	**17%**

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Lunch
4 slices wholegrain bread (140g)
2 slices cheese (24g, max. 30% fat)
1 large tbs. jam (20g)
1 piece of fruit
(e.g. banana/apple/pear/
2 mandarins/2 kiwis/handful of berries)

Snack
200g raw vegetables
(e.g. 1 large red pepper/6-7 sticks of celery/3-4 carrots)
10 almonds (12g)

Dinner
3-4 boiled medium potatoes (200g raw)
4-5 serving spoons of baked/boiled/
steamed vegetables (200g raw)
Fried/baked chicken fillet (100g raw)
1 tbs. oil for cooking (10g)
Salad with ½ cucumber (200g raw), handful
of dill (10g), 1 tbs. vinegar (10g)
Salt/pepper/chilli/lemon/spices for taste

With or after dinner
1 piece of fruit

What to do with your results?

Now that you know how to lose weight in a responsible way, it's simple to use the right tools. Of course we can help you with this.

Especially for you we've selected the following products that can help you lose weight:

PRODUCT NAME
Product description

PRODUCT NAME
Product description

PRODUCT NAME
Product description

PRODUCT NAME
Product description

Terms and Conditions.

The advisory report of DNAisyou contains the results of your genetic test. The DNA kit that you sent has been analysed by us and the results have been processed by systems of Omnigen BV and its licensee DNAisyou. We collect the results in a clearly laid out report, arranged into categories.

All results that you will find in the report relate to the product that you have ordered. They are intended to help you in the optimisation of your goal. When interpreting this report, you should take the following assumptions into account that may influence the application for you.

If you have received advice not to exercise from your GP or doctor, we would advise you to follow this advice. Our report cannot change anything about this. When putting together this report, we assumed that you did not have any medical indications, as a result of which exercising is not wise for you, and that you are in good health and condition.

There may be various reasons why you can better not follow the advice in this report. If you are not sure at any moment what is best for you, please consult a GP, sport or training expert, or a dietician.

Responsibility & liability.

The report has been put together by experts with the utmost care. However, you always remain responsible for your own actions and the consequences thereof. Furthermore, we did not assume in this report that you have been frequently ill in the last period of 12 to 18 months. Given that we cannot ascertain this from your DNA results, you will have to take this into account yourself. Never put your safety at risk during exercise. If you cannot exercise safely due to use of medicines, for example, we would definitely not advise you to do this.

Our advice has a limited scope. If you have allergies, we would advise you to take this into account yourself, should you want to adjust your diet on the basis of your DNA analysis. We cannot determine which allergies you have on the basis of your DNA. If in doubt, please consult your GP or medical specialist.

Omnigen BV and its licensee DNAisyou B.V., its employees or representatives accept no liability for damages or costs that arise from following the advice below.

This exemption from liability includes, but is not limited to:

- damage as a result of loss of personal data;
- personal consequential damage;
- injury;
- direct or indirect damage to third parties or the property of third parties;
- liability towards third parties.

Please remember that DNA functions as a blueprint for many of the processes in your body. However, they are also influenced by many other factors. Always consider your environmental factors in the choices that you make. This DNA analysis is exclusively intended to support you in learning to understand your body and can never be used in isolation to make important choices.

The above statement does not affect your rights as consumer in any way. And none of the above reduces liability in the case of deliberate fraud.

Check out our other products.

Running
On the basis of your DNA, we can determine if you have a predisposition for increased oxygen intake and if you have an increased risk of injuries. In addition, we will advise you on what the best balance is for you in terms of macronutrients. Finally, we will also give you advice on how you can adapt your training in order to get the best out of yourself?

Skin care
On the basis of your DNA, we can offer insight into the UV sensitivity of your skin. We can also determine the extent to which you have an increase predisposition to skin ageing and acne. We will advise you which products are best suited to your skin type, so that you can get the best out of yourself!

www.dnaisyou.com

Personal notes

DNAisyou. Become your best self.

Personal notes