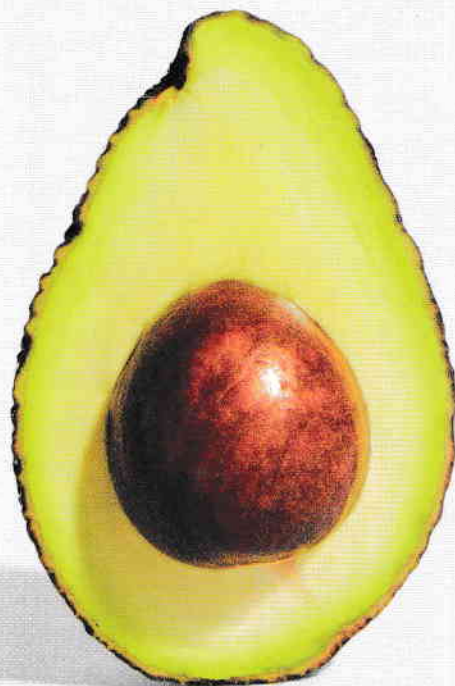


LBRIS

We know
books

RHIANNON LAMBERT

The
Science
of
Nutrition



CONTENTS

Introduction	6
What Is Nutrition?	8
How Can We Eat Well?	34
Should I Go On a Diet?	88
Should I Choose Plant-based Nutrition?	116
Can We Eat for Better Health Outcomes?	134
How Does Nutrition Affect Child Development?	176
Can We Eat to Support Mental Health?	200
Index	212
Acknowledgements	223
About the Author	224

WHAT IS NUTRITION?

What do we mean by nutrition?	10	Is hydration part of nutrition?	24
What are carbohydrates?	12	What is digestion?	26
What is protein?	14	How does the body absorb nutrients	
What is fat?	16	during digestion?	28
What is fibre?	18	What is metabolism?	30
What are vitamins?	20	Am I malnourished?	32
What are minerals?	22		

WHAT DO WE MEAN BY NUTRITION?

Nutrition is the process by which we provide the body with the nutrients necessary for good health and for growth. Essentially, nutrition is nourishment for the body via the foods you eat.

Eating nutritiously enables you to enjoy the sense of wellbeing that comes with good health. Adequate nutrition is vital if you want your body to be healthy, well maintained, and have the best chance at fighting disease and operating optimally.

We get our nourishment mostly from macronutrients, which are the dietary main players, but micronutrients are no less important. A balanced diet contains many different types of both.

MACRONUTRIENTS

There are three macronutrients: carbohydrates (see pp.12–13), protein (see pp.14–15), and fat (see pp.16–17). These three macronutrients give your body the energy it needs to operate.

There are many processes the body takes care of without our conscious control (such as breathing, temperature regulation, digestion, and cell repair) that require energy. And, of course, your body requires energy for movement. Each of the macronutrients is required in relatively large amounts every day to support many of your body's vital functions.

MICRONUTRIENTS

We need vitamins and minerals, known as micronutrients, in much smaller quantities than macronutrients, but they are vital for the body to carry out its functions. In children they are also essential for healthy growth and development.

Because we need macronutrients in much larger quantities than micronutrients, it's easy to underestimate the importance of the latter and focus more on including the former in the diet. But the absence of micronutrients can lead to severe consequences. The World Health Organization suggests that micronutrient deficiency is responsible for some of the most common nutritional deficiencies, such as anaemia (iron), and rickets and osteoporosis (Vitamin D), all of which can have a debilitating effect on the body's wellbeing and performance.

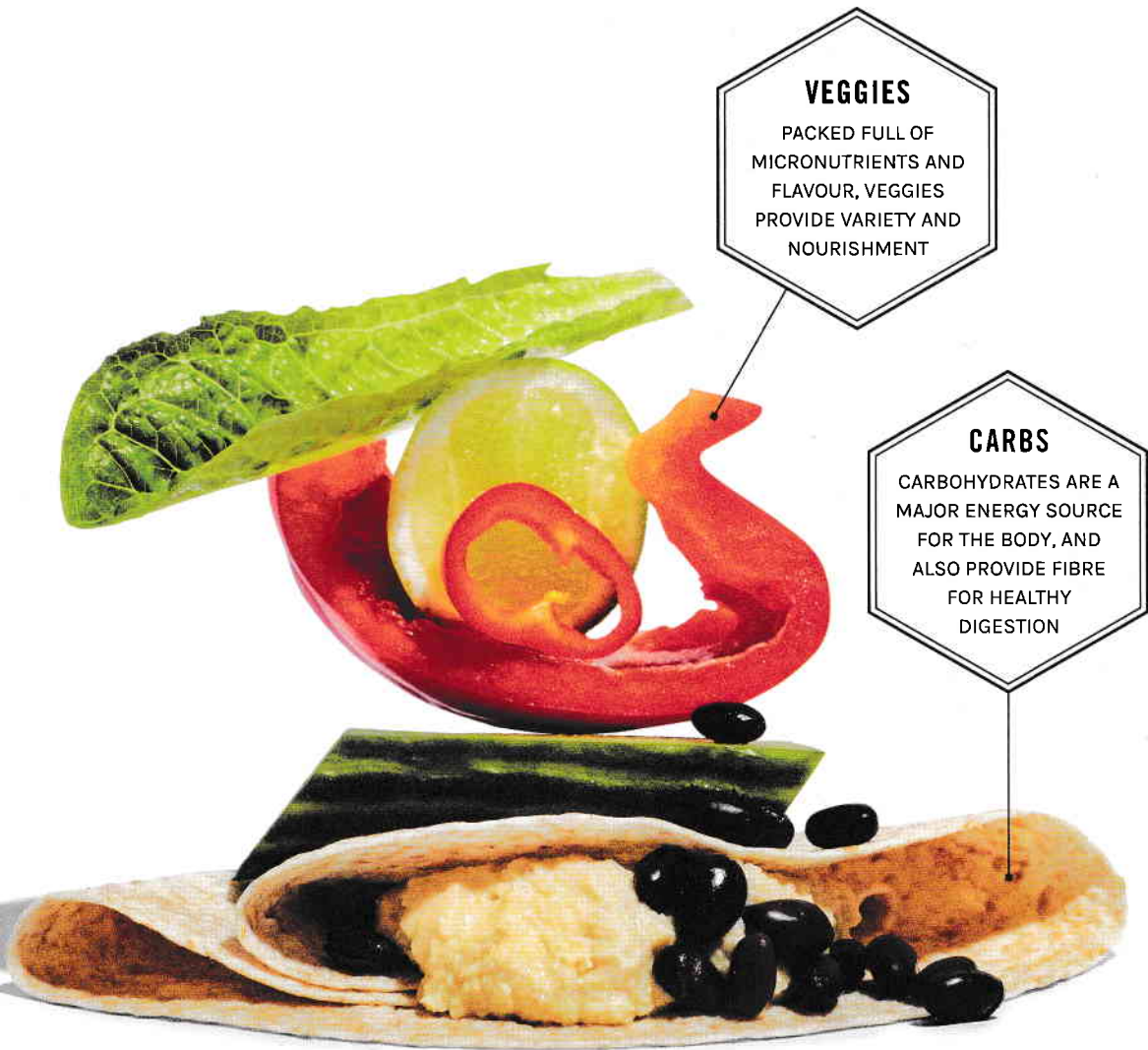
You can get most of your vitamins and minerals from plants. Plant foods come in various shades and colours, and their colour is linked to the nutrients they contain. For instance, orange often indicates the presence of Vitamin A; purples indicate antioxidants; greens contain Vitamin K and iron; and red vegetables contain lots of Vitamin C. So a colourful diet will give you a well-varied nutrient intake.

The daily requirement of each micronutrient varies between individuals, but if your diet is healthy and balanced, including foods from both plants and animal sources, you are likely to be ingesting all the micronutrients your body needs without the need for supplements. For those who don't eat animal products, a well thought through diet alongside targeted supplementation will provide the essential nutrients you need (see pp.128–131). However, do see a registered nutritionist or dietitian if you wish to enhance your diet for optimal performance.

Unique nutritional needs

THERE IS NO ONE-SIZE-FITS-ALL IN NUTRITION.

Your optimal intake of each macronutrient and micronutrient depends on numerous factors. Your age, gender, genetics, metabolism, level of physical activity, and personal preferences all have a part to play in establishing the best foods to keep working optimally. Learn to listen to your body and notice how you feel in response to your diet. See your GP if at all concerned.



VEGGIES

PACKED FULL OF
MICRONUTRIENTS AND
FLAVOUR, VEGGIES
PROVIDE VARIETY AND
NOURISHMENT

CARBS

CARBOHYDRATES ARE A
MAJOR ENERGY SOURCE
FOR THE BODY, AND
ALSO PROVIDE FIBRE
FOR HEALTHY
DIGESTION

WHAT ARE CARBOHYDRATES?

Carbohydrates are the body's greatest energy source. They provide the body with glucose to use for energy, which can also be stored (as glycogen) for future use. Carbs also play a valuable role in gut health, by providing useful fibre to the digestive tract.

Glucose is the preferred energy source for muscles during strenuous exercise. It is only when the body's glucose supply is depleted that it turns to fat for energy. The body also requires glucose to fuel multiple unconscious biological processes.

Glucose is essential fuel for the brain, aiding in concentration. Carbohydrates play an important role in generating the brain's serotonin supply. This mood-regulating hormone is made with tryptophan, an amino acid (see p.15) obtained through protein in the diet. Carbs help to convert tryptophan into serotonin, so eating carbs may help to enhance mood. This might explain why carbs and sweet foods are often treated as comfort foods.

There isn't enough research to show that

consuming higher quantities of carbs or protein-rich foods containing tryptophan supports mood improvement in humans. However, it may be the case that low carbohydrate consumption causes low mood.

If you've ever been on a diet that involves avoiding carbs, you may have experienced mood swings and found it hard to concentrate. You may have also felt fatigue. Serotonin is converted to melatonin, a hormone that helps to regulate circadian rhythm.

DIGESTING CARBS

In the small intestine (see p.28), the less starchy complex carbs are broken down into simple carbs (see below). All non-glucose monosaccharides are converted into glucose in the liver, which is released

Simple and complex carbs

Monosaccharides (sugar in its simplest molecular form) and disaccharides are simple carbohydrates. Complex carbs comprise many monosaccharides, and also contain starch in varying levels. Less starchy complex carbs include broccoli, courgette, tomato, and aubergine. Examples of starchier complex carbs are potatoes, beans, corn, and chickpeas.

SINGLE MOLECULE

Monosaccharides
"Mono" means "one"; "saccharide" means "sugar". These are carbs in their most basic form.


GLUCOSE
grains, pasta


FRUCTOSE
fruit, veg, honey


GALACTOSE
dairy

TWO MOLECULES

Disaccharides
When two monosaccharides bond chemically they form a disaccharide.

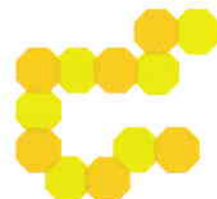

LACTOSE
dairy


SUCROSE
sugar beet, cane sugar


MALTOSE
molasses, beer

MULTIPLE MOLECULES

Polysaccharide
Carbs can be made up of hundreds, even thousands of monosaccharides. These are called complex carbs.



many vegetables, beans, pulses, and whole grains

into the bloodstream. It is either used immediately, or converted into glycogen (a polysaccharide of glucose), which is stored in the liver and muscles for later use (see pp.110–111).

Fibre (see pp.18–19) refers to any complex carbohydrates that cannot be broken down by the digestive enzymes in the small intestine (see pp.28–29). This fibrous matter moves into the large intestine, where it helps to produce highly useful short-chain fatty acids and nourishes the lining of the gut.

"GOOD" AND "BAD" CARBS

There is no such thing as an inherently good or bad carb. All foods have a place – it's about finding the right balance for your own body. As a general rule, carbohydrates in their natural, fibre-rich form are more nutritious than those that have been stripped of their fibre content. Fruits and vegetables are excellent sources of carbohydrates.

There's a strong case for reducing refined carbs like white bread, and opting for complex carbs like whole grains (see p.45), which release energy slowly. While refined carbs are great for providing energy quickly, they usually lack essential nutrients. White flour has one benefit, though – UK law requires it is fortified with iron, thiamine, and niacin.

What does GI mean?

GLUCOSE FROM SIMPLE CARBS IS ABSORBED INTO THE BLOODSTREAM QUICKLY, WHILE COMPLEX CARBS TAKE LONGER TO BREAK DOWN.

Glycaemic index (GI) is a measure of how quickly a carbohydrate food will make your blood glucose levels rise after ingesting it. The higher the GI, the faster the impact. Glycaemic load (GL) is a slightly different unit of measurement. It takes into account both the GI and the amount of carbohydrate in the food. So, pasta has a lower GI than watermelon, yet pasta has more carbs and, therefore, a higher GL. If you eat similar amounts of both, the pasta will have the greater effect on your blood sugar levels.

QUICK ENERGY

CONSISTING MOSTLY OF WHITE RICE AND AIR, RICE CAKES PROVIDE A LITTLE BIT OF ENERGY QUICKLY

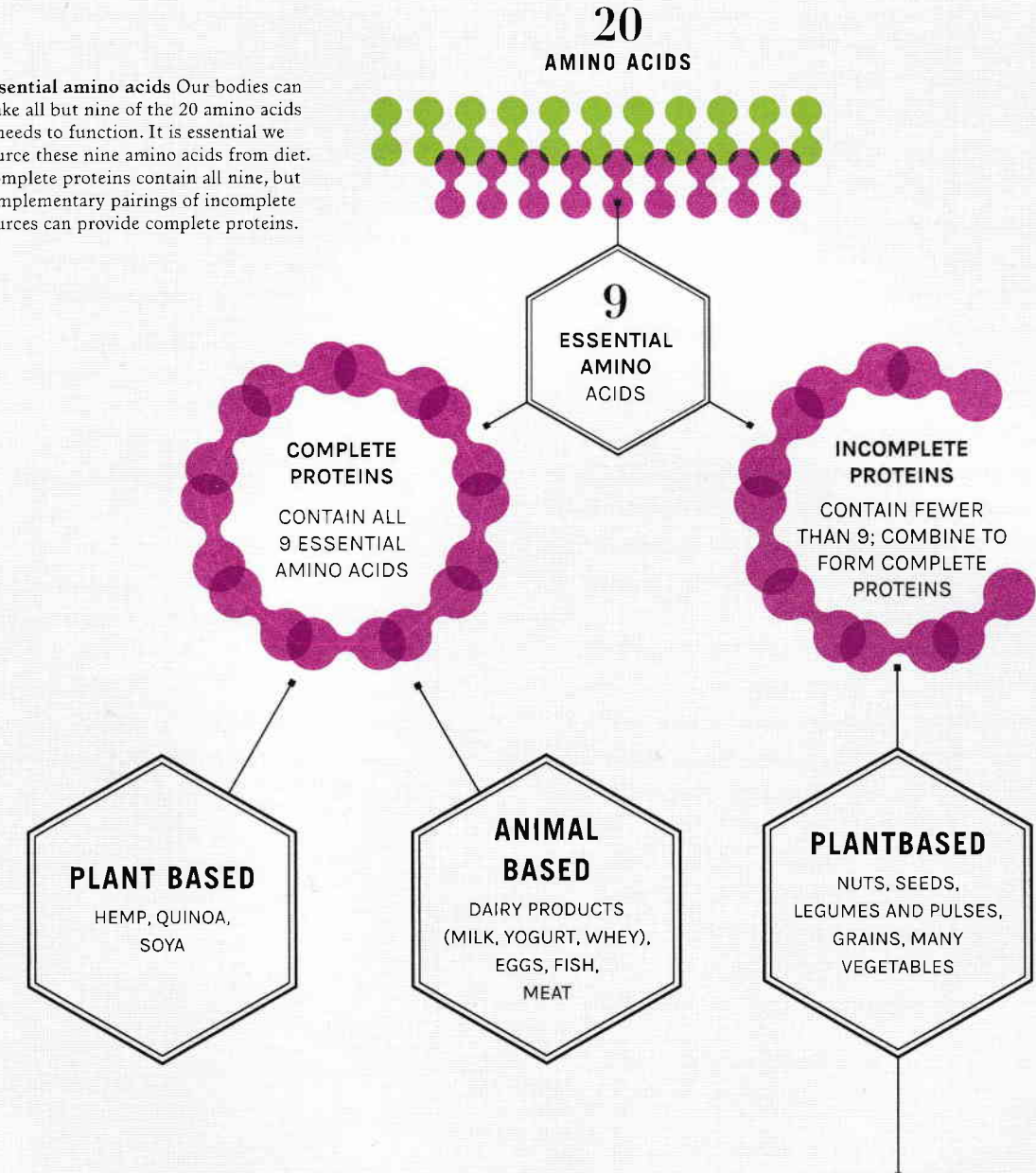
NUTRIENT-LITE

FOR A MORE NUTRIENT-RICH OPTION, CHOOSE BROWN RICE CAKES OR WHOLE GRAIN CRACKERS



Rice cakes Many people presume these popular low-calorie snacks are healthy when, in fact, they are also low in nutrients.

Essential amino acids Our bodies can make all but nine of the 20 amino acids it needs to function. It is essential we source these nine amino acids from diet. Complete proteins contain all nine, but complementary pairings of incomplete sources can provide complete proteins.



POPULAR COMPLEMENTARY PAIRINGS OF INCOMPLETE PROTEINS:

LENTILS + RICE

OATS + NUTS

BROWN RICE + BLACK BEANS

PEANUT BUTTER + WHOLE GRAIN BREAD

HUMMUS + BREAD OR CRACKERS

BAKED BEANS ON WHOLE GRAIN TOAST

NOODLES IN A PEANUT SAUCE

BEAN BURGERS IN A BREAD ROLL

LENTILS OR BEANS WITH PASTA

WHAT IS PROTEIN?

The macronutrient protein is a major player in the diet. It is the body's building block, used to form and repair muscles, skin, hair, and nails, for instance.

Protein also enables many of the body's vital metabolic functions.

Every single cell in the body contains protein, and there are thousands of types found in the body. Proteins form the structure of tissues. They also carry molecules around the body to where they are needed, playing an important role in many chemical reactions that take place, including immune response and the production and deployment of hormones.

Proteins are made up of amino acids. Short chains of amino acids are called peptides (they connect to each other with peptide bonds) while longer chains are called polypeptides or proteins. Protein chains can become complex in structure as more and more chains join and fold in on themselves. The body breaks down protein chains into peptides to use for specific purposes as required. For instance, the hormone insulin (see pp.172–173) is a peptide.

The body can produce many of the amino acids it needs to make peptides and proteins, but nine of them, known as essential amino acids, must be sourced from the diet (see opposite). Because the body doesn't store proteins in the same way it does other macronutrients, it needs to consume proteins every day. Numerous studies demonstrate that a diet with adequate protein has major health benefits.

FOOD SOURCES

Food sources containing all nine essential amino acids in sufficient quantities are known as complete proteins. They are found in animal products and a few plant sources.

Incomplete proteins are plant-based sources of protein that don't contain all nine essential amino acids, or don't have sufficient quantities of them to meet the body's daily requirements. Although

"incomplete", they are no less valuable than complete proteins as they can be combined in complementary pairings to produce complete proteins.

Vegans and vegetarians are advised to eat a wide variety of protein-rich and fortified foods to ensure they consume all nine of the essential amino acids each day from both complete and incomplete sources (see pp.128–129).

PROTEIN INTAKE

Scientists agree that age, gender, and level of physical activity all determine how much protein to consume. In the UK, adults are advised to consume 0.75g protein per kilogram of bodyweight per day. (Particularly active people should increase this intake to 1g.) Based on average weights and activity levels, daily intake should be 55g for men and 45g for women. That's about two palm-sized portions of meat, fish, tofu, nuts, or pulses. Elderly people need up to 50 per cent more than the recommended daily intake. As we grow older, our bodies become less efficient at using protein. Increasing protein intake makes it more likely we'll meet daily requirements.

I advise my clients to get as many complete protein sources in as possible throughout the day and/or focus on those complementary pairings of incomplete sources.

When choosing what protein to eat, ensure the foods you pick give you the best all-round nutrition possible. Consider what other nutrients you are receiving with your protein sources.

And don't worry about getting everything in at one sitting – your protein input can add up throughout the day.

WHAT IS FAT?

Fat is a macronutrient found in many food sources. Consuming fats is vital to the body's function, including processes such as brain activity, hormone production, and the body's absorption of other nutrients from the diet.

We should aim to get one-third of our calories from fat. The fat we eat is broken down into triglycerides (fatty acid cells combined with glycerol, a type of glucose) that travel in the blood to wherever they will be used or stored.

There are two main types of dietary fats: saturated and unsaturated fats. Unsaturated fats are either monounsaturated or polyunsaturated. Most foods containing fat naturally contain a mixture of different types of fats, so it's difficult to exclude one type in favour of another. However, we should aim to cut down on saturated fats and opt for more monounsaturated and polyunsaturated fats.

Avoid the artificial additive transfat (see pp.58–59) due to its links to inflammation, unhealthy cholesterol levels, impaired artery function, insulin resistance (see p.172).

MONOUNSATURATED FATS

This type of unsaturated fat contains only one double bond in its molecular structure. Monounsaturated fats are linked to several health benefits, including a reduced risk of serious diseases such as heart disease and diabetes.

Monounsaturated fatty acids (MUFAs) are typically liquid at room temperature and are fairly stable for cooking purposes (see pp.66–67). The most common MUFA is oleic acid, which is present in olive oil in high amounts. Excellent sources of this healthy fat are avocados, nuts, seeds, rapeseed oil, fish oils, and nut oils.

POLYUNSATURATED FATS

This type of unsaturated fat contains two or more double bonds in its structure. Polyunsaturated fatty acids (PUFAs) are found in sunflower seeds, oily fish, walnuts, flaxseeds and vegetable oils including safflower, sunflower, and corn oils.

Omega-3 and omega-6 are polyunsaturated fats. Omega-3 plays a crucial role in the production of hormones, in the immune system, blood clotting, and cellular growth. Studies show that consuming omega-3 fats is linked to reduced incidence of health conditions including neurodegenerative disease, heart disease, and diabetes. We need to consider increasing our intake of omega-3 fats, as these are usually eaten in small quantities, and found in less commonly consumed foods, like oily fish, flaxseeds, or walnuts.

SATURATED FATS

These come mainly from animal sources and tend to be solid at room temperature. Saturated fats are very stable at high temperatures and therefore less likely to be damaged during cooking. That's why, for instance, butter is used traditionally for baking cakes. Milk, cheese, fatty meats such as lamb, processed meat (sausages, burgers, and bacon), coconut oil, cakes, and biscuits are sources of saturated fats.

While saturated fat plays a part in nutrition, too much in the diet is linked to heart disease. We still eat too much saturated fat in the UK. No more than 11 per cent of our total intake of calories should come from saturated fats.

Cholesterol

Cholesterol is a lipid (fatty substance) the body uses to build cells, among other things. Some cholesterol is obtained from diet, but much of the body's supply is made in the liver. It attaches to a protein to form tiny spheres (lipoproteins) that are carried in blood to wherever they are needed. There are two types - HDL and LDL.



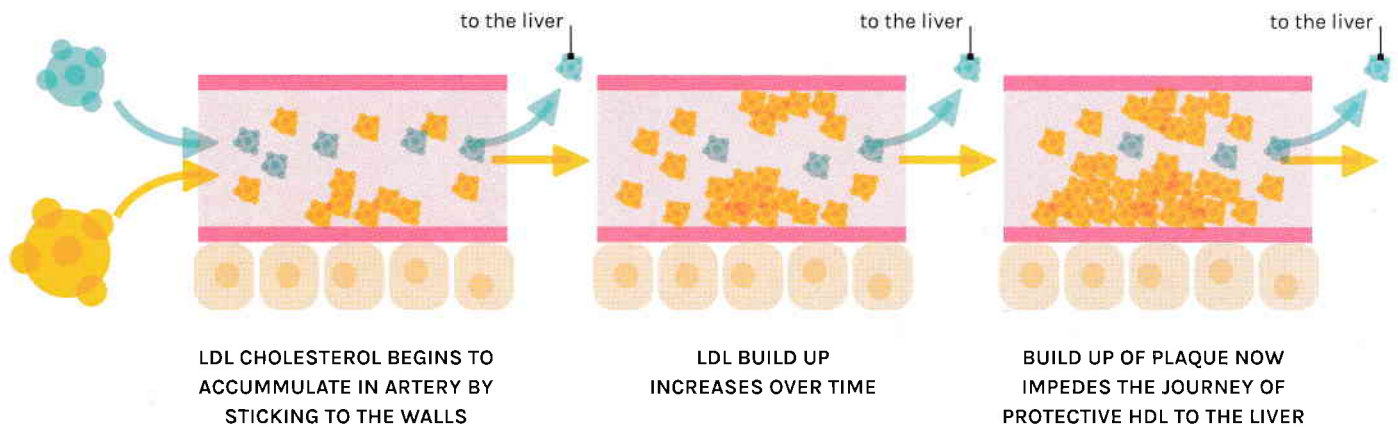
HDL

High-density lipoproteins (HDL) are good cholesterol. These particles contain a high proportion of protein to cholesterol. They protect the body by carrying LDL cholesterol away from arteries to the liver, and they have anti-inflammatory properties.



LDL

Low-density lipoproteins (LDL) are bad cholesterol. They have a lower proportion of protein to cholesterol. These types of fatty acids carry cholesterol to the cells. Too much LDL can be harmful because it sticks to the inside walls of your arteries, causing build up of fatty material, limiting blood flow and leading to heart conditions and stroke.



Increasing HDL and reducing LDL cholesterol

We want to aim for a preferential ratio between HDL and LDL cholesterol. There are measures we can take to increase our HDL cholesterol levels and lower LDL. Non-dietary actions include taking regular exercise and stopping smoking. Avoid trans fats completely, and include the following foods regularly in your diet.



Purple fruits and vegetables are rich in anthocyanins, which may help increase HDL cholesterol levels.



Eat oily fish 1-2 times a week, which may help increase HDL cholesterol levels and benefit heart health.



Olive oil increases HDL levels in healthy people, the elderly, and those with high LDL cholesterol.



Whole grains are linked to a lower risk of heart disease. Oats and barley contain beta-glucan, which lowers LDL cholesterol.



Nuts are rich in cholesterol-lowering fats and fibre, as well as minerals that are linked to improved heart health.



Avocados contain monounsaturated fatty acids and fibre, both of which lower LDL cholesterol.



Legumes such as beans, peas, and lentils help to lower LDL levels and are a good source of plant-based proteins.