

Maria Cristina Marini Lucilla Titta

I'M CHANGING MY LIFE, STARTING TODAY

Eat well... to live well









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PREFACE

How familiar are we with the repercussions of scientific research and medical practice for our daily lives? What are the "passions" and motivations that drive researchers and healthcare professionals? What do we know about their professions?

Society strives to make science and its implications known to ordinary people in many different ways. Just think, for example, of the variety of leaflets promoting the importance of a healthy lifestyle and well-being in general. Of course, school does its part as well, introducing the principles of scientific literacy and raising awareness of a series of issues that help foster scientific thinking among young people.

These considerations are in fact the starting point for the *Let's Science!* project, carried out by the IBSA Foundation for Scientific Research in collaboration with the Department of Education, Culture, and Sport of the Canton of Ticino (DECS). The partnership has made it possible to identify interesting topics that have been addressed by the project, getting scientists working in the canton involved. Two different worlds that are often far apart – scientific research and school – have thus been brought together, promoting dialogue between professionals and students through themed workshops, in order to develop awareness of both the topic itself and how to communicate it.

But what was the range of topics the project would address and what considerations led to certain strategic decisions? Science and research are advancing rapidly, especially in biomedicine and related disciplines, and the continuous expansion of fields of investigation requires a constant effort to stay up to date, in order to both maintain a historical perspective and accommodate the numerous innovations. Access to scientifically accurate information, conveyed in accessible language, opens up the opportunity for children to get to know and become passionate about topics that are generally considered "difficult".

And that's the idea behind the *Let's Science!* series, which aims to broaden the range of scientific topics that can be explored at school. The topics, which are interdisciplinary and directly related to individual health and well-being, are presented in an innovative way: the scientific text is in fact accompanied by a story that draws on the experience of cantonal middle school classes, who,

under the guidance of their teachers, developed original scripts, which were then translated into comics by professionals in the industry.

The only thing left for us to do is invite young readers to explore the fascinating fields of research presented by *Let's Science!*, which in turn open up opportunities for further questions and insights. Who knows, one of these readers might in turn one day become the one taking important steps forward in understanding the complexity of life and the delicate balance that allows us to be healthy and happy. Enjoy reading!

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PART ONE

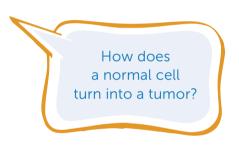


INTRODUCTION

Can proper nutrition stop you getting cancer? Over the next few pages, we will try to highlight the current evidence that supports a correlation between diet and developing cancer.

The hypothesis that lifestyle, and in particular diet, could be one of the causes of cancers had already been put forth as far back as the 1950s. But what is cancer, and what is a tumor? The term tumor, which comes from the Latin *tumor* (swelling), refers to the uncontrolled growth of abnormal cells in one part of the body. Tumors are usually divided into two categories: the first includes benign tumors, which are non-aggressive and tend to be self-limiting; the second type includes the most dangerous tumors, which can endanger the lives of those affected. These are known as malignant tumors or, more generally, cancer.

Every living organism is made up of cells that grow in a highly regulated environment, divide, and die in a programmed manner. Basically, in a healthy body, the cells are like the members of a harmonious orchestra and contribute to creating the symphony of life. The life of cells is



not at all monotonous; in our body, for example, cells divide rapidly in the first few years of life to enable growth; in adulthood, however, most cells only divide to replace the ones that are broken down, die, or are damaged by some form of injury, such as a wound.

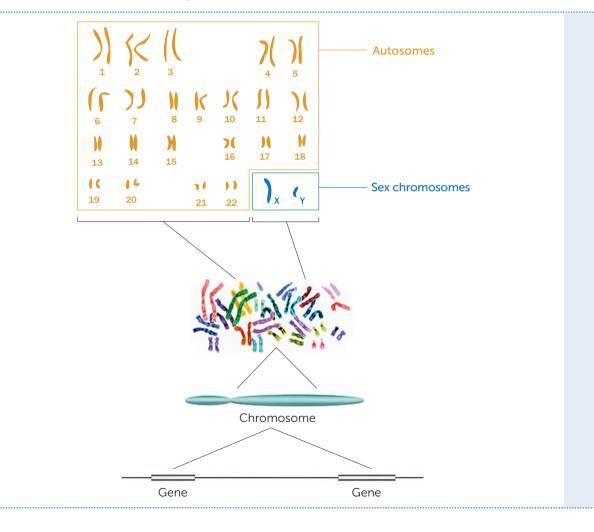
Cells are affected by the environment around them. We can say that they are sensitive to everything around them and the life cycle of each cell depends on its location and function. For example, skin cells are renewed every 2 weeks, while red blood cells live about 4 months.

The fundamental difference between normal cells and cancerous cells is that the latter grow and reproduce uncontrollably, invading the surrounding organs and tissues as well, without undergoing the process of programmed cell death (apoptosis) that old or damaged normal cells go through.

But what causes this loss of control? Each cell is regulated by a set of information that is encoded in a special molecule called **DNA**. The set of information that serves to program a cell's functions is called the **genome**; for example, the human genome consists of 23 pairs of distinct units that in their "compressed" form represent the chromosomes [figure 1].

The process that transforms normal cells into cancerous cells originates with damage to their DNA (mutations) or defects in the programming of gene expression in general (epigenetic factors). The genome is made up of DNA, the

Figure 1 The human genome



expression of which is highly regulated; it is present in every cell and determines its actions. We could say that the genome fulfils the same function for the cell as the operating system fulfils in a computer. In most cases, when DNA is damaged and cannot be repaired by specific mechanisms, the cell dies; in cancerous cells, however, the damaged DNA does not get repaired and the cell continues to replicate and generate new abnormal cells. The same thing happens when gene expression, the set of actions of the cell's operating system, is impaired and the cell begins to act in an unregulated way with respect to the environment around it.

In some cases, DNA damage can be inherited, but epigenetic mutations and defects are often caused by the substances we are exposed to in the environment we live in.

We introduce some of these substances into our body through food; so eating a proper diet reduces the risk of non-repairable regulatory errors or defects occurring in our DNA and, consequently, the risk of cancerous cells developing.

To draw conclusive recommendations from the huge number of studies that have been done to understand the correlation between what we eat and cancer, it was necessary to review all the scientific literature, that is, all the studies that have been published on the subject. After going through this process, the World Cancer Research Fund (WCRF) published 10 clear recommendations for cancer prevention in 2007. This "scientific library", as we might call it, is continuously updated and the latest version of these recommendations was published in 2018 [figure 2 ...].

Looking at the topic of the relationship between individual foods and cancer, we can see that there are very few associations we can actually be sure of. One possible explanation may be that individual foods are never consumed on their own, but almost always as part Is there a definite relationship between individual foods and cancer?

of a meal and, in general, along with other foods. Not only that, but each of us is different (we have unique DNA) and we each have our own individual lifestyle as well. Different people's cells are exposed to very heterogeneous environments and also start out from equally heterogeneous initial conditions





(determined by their individual genomes); the problem is therefore individual and highly complex. Nevertheless, it is possible to identify common characteristics, which is why for a number of years now, we have been hearing more and more about eating patterns (that is, the set of foods that make up a diet), rather than about individual foods.

Table 1 Risk factors

MODIFIABLE	NON-MODIFIABLE
Behavioral (e.g., smoking, alcohol, lack of physical activity)	Demographic (e.g., age, gender)
Physiological (e.g., being overweight, hypertension, high blood cholesterol levels)	Genetic
Environmental (e.g., hygiene, air pollution)	

In addition to diet, other lifestyle factors can also have a significant impact on the risk of developing cancer.

In medicine, these are called **risk factors**: conditions, characteristics, or behaviors that increase the likelihood of developing a certain disease or accelerate its course. It is customary to distinguish between **modifiable** and **non-modifiable** risk factors.

The former, those that we can change through our actions – such as smoking habits, being overweight, or lack of physical activity – can be reduced or eliminated; the latter, on the other hand, are ones we cannot change and include factors such as age, sex, and genetic susceptibility [table 1 |].

In the new few sections, we will describe the recommendations for preventing cancer through a healthy diet, trying to explain what happens in our bodies when...



1. MAINTAIN A HEALTHY WEIGHT

Being overweight or obese can increase your risk of various diseases and certain types of cancer, including colorectal, esophageal, pancreatic, and kidney cancer. In women, excess weight is also associated with uterine and breast cancer.

A person's **ideal weight** depends on a number of factors (such as their age, biological sex, and, more simply, their genetic makeup) and is normally calculated by measuring their **BMI** (Body Mass Index) [**figure 3**).



Caucasian adults should have a BMI between 18.5 and 24.9 kg/m². We say that a person is **overweight** when their body mass index exceeds 25 kg/m² and **obese** when it exceeds 30 kg/m² [figure 4].

In growing children and adolescents, on the other hand, we refer to slightly more complicated tables that give measurements in percentiles; this is why it is up to pediatricians to determine the appropriate weight for children.

We know that being overweight or obese has more serious consequences if this already occurs during childhood or adolescence.



Sometimes weight gain is due to reasons related to our genes and their regulation; some of these can also be attributed to the environment that the individual lives in and can be due to stress or the use of certain medications, for example. But we can

also gain weight when we consume more calories than our body needs (i.e., if we eat too much), when we do not move very much, or when we eat a poor diet: in short, it is about balancing energy intake with real needs, taking into



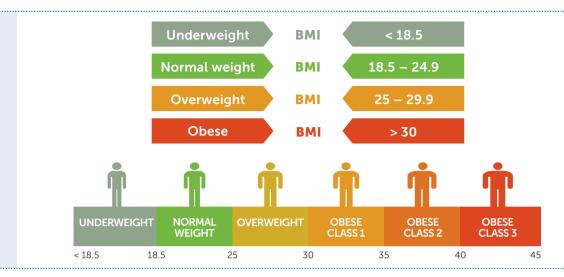
Figure 3 How to calculate the BMI



Divide the weight (in kilograms)
by the square of the height (in meters)

Example: a person who weighs 58 kg and is 1.60 m tall BMI = $58/(1.60)^2$ = **22.6**

<page-header> Figure 4 The ideal BMI



account that not all sources of metabolic energy are equivalent in terms of quality. The most common mistakes are related to choosing foods that are highly caloric but not very satiating (sweets, snacks, soft drinks, very salty foods, fried foods, etc.) and eating irregular meals (eating little and often, possibly skipping main meals). We can also gain weight even if we don't get much sleep or consume too much alcohol. Our lifestyle therefore has a substantial effect on our body weight and the risks associated with moving away from a normal weight.

When we gain weight, we accumulate a greater amount of fat, or rather, adipose tissue, in our body. When fat is deposited mainly in the lower body (think of a pear shape), we call this gynoid overweight or gynoid obesity (typical of women); when fat is deposited in the upper body and especially in the abdomen (apple shape), we call this android overweight or android obesity. The latter case is the most dangerous, in terms of both the risk of developing cancer and the risk of cardiovascular diseases.

The increase in adipose tissue is unfortunately associated with a state of chronic inflammation. In fact, every time we eat something, our body has to convert the food into a different and simpler form, nutrients, in order to absorb it (im-

agine for a moment what could happen if a whole hamburger ended up in our intestines!).

This process requires a lot of energy and involves the production of waste substances that the body has to eliminate in order not to be poisoned by toxins. When our body fails to expel these substances, an emergency disposal mechanism is activated, which we can call silent chronic inflammation (silent because we do not notice it and do not experience particular symptoms). This process involves activating certain immune system cells, called macrophages, which travel to tissues to clean them. Macrophages eliminate waste substances, but to do so they have to release molecules called cytokines, special proteins that serve to ensure communication between cells. Their physiological effect is to cause water to be drawn into the tissues affected by inflammation (like pouring water on the floor to remove dirt). Unfortunately, however, cytokines also have the ability to interfere with cell metabolism, directly or indirectly affecting the DNA regulation mechanisms, promoting the malfunction of the cell's operating system and thus the emergence of various types of cancer.

When a tumor has already developed, these same cytokines create an environment conducive to the migration of cancerous cells and thus the formation of metastases.

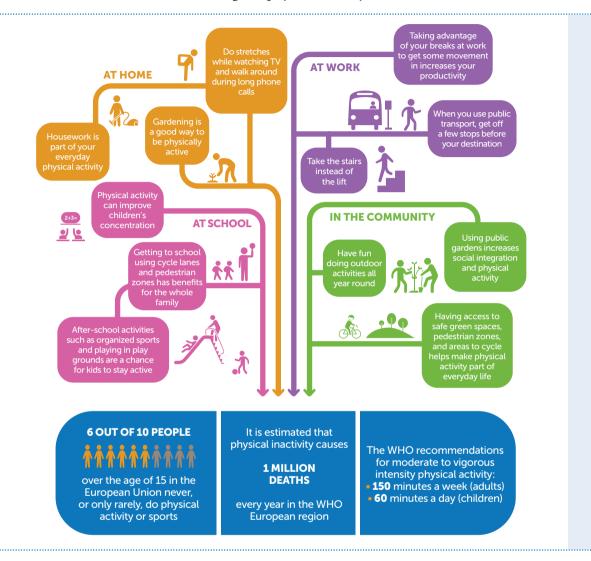


3. FOLLOW AN ACTIVE LIFESTYLE

People who engage in physical activity develop colorectal, breast, and uterine cancer less frequently. In addition, an active lifestyle helps prevent excess weight and obesity, thus reducing the likelihood of developing cancers associated with these risk factors.

We should engage in at least 60 minutes of moderate or intense activity every day between the ages of 5 and 17, reducing the hours we spend in front of the TV or playing video games. It is also important to stay active on a daily basis as adults and to spend at least 150 minutes a week doing moderate intensity physical activity or 75 minutes doing intense physical activity [figure 5 🐚].

Figure 5 The benefits of regular physical activity



Source: www.euro.who.int/physicalactivity.

What happens in our body during exercise? First of all, it is important to distinguish between two types of physical activity: aerobic (which is activated after about 3-4 minutes of intense effort and stabilizes after 20 minutes) and anaerobic (which is more immediate but relies on very limited energy reserves in the muscles).





LIGHT PHYSICAL ACTIVITY

Source: WCRF International.

During aerobic physical activity, the muscle tissue gets chemical energy by utilizing the metabolic pathways that use oxygen. In anaerobic physical activity, on the other hand, the muscle tissue gets the energy it needs from metabolic pathways that do not use oxygen [figure 6 1.].

Anaerobic exercise trains and strengthens the muscles, but does not raise the heart rate. Regular aerobic activity, on the other hand, causes an increase in blood flow and tissue oxygenation. This helps to prevent many cardiovascular diseases, as well as re-



ducing the body mass index and thus, indirectly, the risk of cancers related to overweight and obesity.

Exercise also speeds up intestinal transit. The longer waste substances derived from processing food remain in contact with the mucous membranes of the stomach and intestines, the higher the risk that any toxic substances will damage the cells. Speeding up the transit of food through the gastrointestinal tract is considered one of the main reasons why exercise prevents colorectal cancer.

Another useful effect of regular and moderately intense physical activity is the reduction of the concentration of certain hormones (especially estrogen), to which cancers such as uterine, breast, and prostate cancer are sensitive.

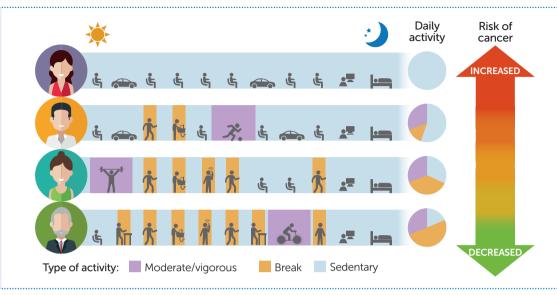
Physical activity also promotes the immediate use of sugars and reduces the release of insulin into the blood; this is a hormone produced by the pancreas that is essential for the body, in particular to properly metabolize sugars and ensure that they are used appropriately. But if insulin repeatedly reaches excessively high levels in the blood, it facilitates the growth of tumors.

Finally, physical activity stimulates the activity of white blood cells and in particular of Natural Killer (NK) cells, facilitating their detachment from the inner surface of blood vessels and their diffusion through the blood, thanks to improved blood flow within the vessels.

NK cells constitute a subclass of white blood cells and are normally present in the blood, where they constantly defend against both pathogens, such as bacteria and viruses, and cancer cells, thanks to the production of proteins that have an anti-inflammatory effect. When the need arises, their number increases, along with the concentration of the proteins they produce.



Figure 7 Physical activity and reduction of cancer risk



Source: American Institute for Cancer Research.



3. EAT A DIET RICH IN WHOLE GRAINS, (NON-STARCHY) VEGETABLES, FRUIT, AND LEGUMES

As part of a healthy diet, carbohydrates are the main source of energy.

Grains are an excellent source of energy because they are high in carbohydrates; they are also a good source of fiber, vitamins, minerals, and protein, and have a low fat content.

Grains are mainly used in cooking to make bread, pasta, and flour, but you can also eat the actual grains on their own. In addition, alcoholic beverages such as whiskey and beer can also be made by fermenting grains.

The main grains found in our diet are wheat, rice, barley, corn, oats, sorghum, and rye; each have important and beneficial nutritional properties for our health, including the ability to regulate the bowels and prevent vitamin or mineral deficiencies.

Grains can be divided into 2 main subgroups depending on the degree of processing to which they are subjected:

- whole grains;
- o refined grains.

The former contain the full nutritional potential of the grain; refined grains, on the other hand, lose many of the beneficial substances during processing and may also contain harmful added substances. This is why consuming whole grains is always recommended; they are considered "functional" foods in the full sense of the term because they have important effects on the functioning of the body.

The **starch** found in grains is an excellent source of energy because it is slow-releasing and is absorbed more gradually over time than simple sugars (such as those in sugar and honey). The other beneficial substances in grains include fiber and some compounds with somewhat complicated-sounding names, such as beta-glucans, lignans, phytosterols, polyphenols, etc., which carry out numerous biological functions.

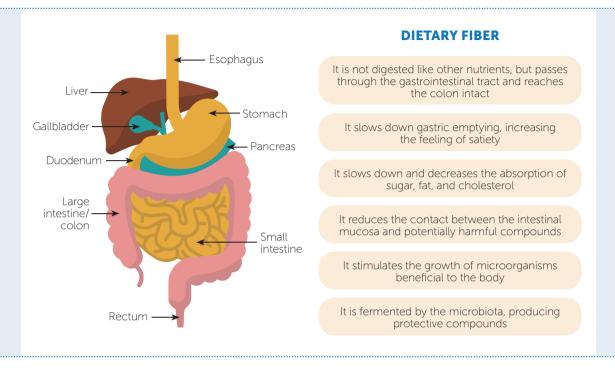
Fiber contributes to the well-being of our intestinal bacterial flora, which is important not only to defend us against infections, but also to reduce the absorption through the intestines of toxic substances that can increase the risk of developing cancer; they also contribute to reducing the risk of obesity and the cancers associated with it [figure 8 **[.]*].

Grains also contain substances that protect us against free radicals, which can damage DNA, and other substances that lower cholesterol levels. Thanks to all this, whole grains help prevent cardiovascular diseases and many cancers, including, in particular, colorectal cancer.

Finally, grains are rich in vitamins and minerals and have an even higher content of these substances if we eat them as whole grains.



Figure 8 The main functions of fiber



What do vitamins do in the body?

Vitamins are an integral part of the enzymes that drive the chemical reactions of cells and have numerous properties and functions:

- o they ensure vital functions in the tissues;
- they help convert the energy contained in nutrients into metabolic energy;
- they aid the protective antioxidant effect against free radicals;
- they ensure normal gene expression;
- (a) they aid the elimination of waste and toxic substances;
- (in they improve the immune system's defensive mechanisms;
- they are involved in the processing of sugars, fats, and proteins.

Minerals, on the other hand, are essential for the body and its vital functions, as they help make up the tissues, are involved in energy metabolism, regulate the exchange of fluids, activate enzymes, and are part of some hormones.

In addition to grains, vitamins and minerals are also found – and in even higher amounts – in fruit and vegetables, which are also high in fiber.

This is why, in addition to consuming whole grains every day, it is a good idea to ensure our body gets the right daily intake of **fruit and vegetables**: vegetables should be included in every main meal and fruit is an excellent snack that we can also eat at school in the breaks between classes, as an alternative to pre-packaged or junk food snacks. It is important to always choose seasonal fruits and vegetables: it means consuming foods that are healthier (because they grow at the right time without needing to be "helped by humans" in artificial growth conditions), more wholesome (because they are higher in vitamins and minerals), and, to be completely honest, even more economical, thanks to their lower environmental impact!

Let's not forget that potatoes are included under starchy foods, which means they mainly provide us with carbohydrates, instead of fiber and vitamins; they are therefore not to be considered vegetables and should not be eaten as a substitute for a good salad.

Legumes are an important source of carbohydrates that provide us with slow-release energy like whole grains, but they are also high in "healthy" proteins.



The most widely consumed legumes are beans, chickpeas, lentils, broad beans, green beans, peas, and soybeans.

Compared to animal proteins, vegetable proteins are more satiating, less caloric, and higher in fiber. Being more satiating and less caloric helps us maintain a normal weight and reduces the risk of cancers associated with overweight and obesity. Just like whole grains, the fibers they contain contribute to the well-being of our bacterial flora, reduce the damage induced by free radicals, and facilitate intestinal transit [figure 9 ...].



IDEAL FIBER

25-30 g A DAY



It is impossible to consume this amount of fiber just by eating 5 servings of fruits and vegetables.

It is therefore essential to eat whole grains and legumes as well.

Legumes are also high in calcium, iron, and potassium; ensuring an adequate intake of calcium in particular is important for the prevention of colorectal, breast, and prostate cancer.



9 4. LIMIT FAST FOOD AND READY-TO-EAT FOODS, WHICH ARE HIGH IN FAT, SUGAR, STARCH, AND SALT

Fast food is a type of food distribution that developed in Anglo-Saxon countries and has spread rapidly throughout nearly the entire world since the 1980s. The term "fast food" applies to all catering methods that aim to produce food that can be consumed quickly (for example, during a lunch break) and is affordable for the average population. Examples of fast food include hamburgers, hot dogs, kebabs, chips, pizza, etc. We also use the term "junk food" to describe these types of food.

There are numerous risks associated with this type of food, which relate to various different aspects of health. Their poor nutritional composition is due to the fact that they are too high in calories (due to an excessive concentration of harmful fats, sugar, or sweeteners) while being deficient in water, vitamins, minerals, and fiber; they are also very high in salt. All these factors, which can also be found in foods not distributed in typical fast-food establishments,

should be considered harmful because they significantly increase our fat mass and thus obesity and, with it, the risk of developing cancer [figure 10].

In addition to obesity, these factors are also associated with the risk of changes to the way fats (increased cholesterol and triglycerides) and sugars are metabolized, and thus with an increased incidence of cardiovascular disease and diabetes. Unfortunately, there is also a high concentration of sugar in ready-to-eat foods, as it is used as a means of preserving food.

It has also been demonstrated that there is a high concentration of toxic molecules in fast food, due to contamination with polycyclic aromatic hydrocarbons and their metabolites (acrolein, formaldehyde, and acrylamide). These substances are released by certain cooking methods, such as frying, grilling, or griddle pans.

Polycyclic aromatic hydrocarbons resulting from the carbonization of dietary fats and proteins are hazardous to health because they increase the risk of DNA mutations and are associated with an increased incidence of esophageal, stomach, liver, and colorectal cancers.

Figure 10 Highly caloric foods and cancer risk



Source: WCRF, UK.

Acrolein and formaldehyde, on the other hand, are released from the combustion of the glycerol present in fats and increase the risk of esophageal cancers and leukemias.

Finally, acrylamide is produced as a result of the carbonization of carbohydrates and is also carcinogenic.

Of course, the health and wellness trend of recent years has given rise to more health-conscious fast-food options, but we definitely still have a long way to go.

Why do we like fast food so much?

Now let's try to understand why junk food generates an almost uncontrollable desire in us.

Firstly, there is the sensation produced by eating itself, which includes the taste we like (sweet, salty, etc.) and what we feel in our mouths (the

mouthfeel). Fast food foods are very tasty and very easily satisfy our desire for pleasure.

The second factor is the composition of the macronutrients in the food, namely the mixture of carbohydrates, proteins, and fats. The food industries look for products that push us to consume more and more. Food that is very high in sugars and fats causes blood sugar levels to drop rapidly as a result of insulin production; this causes us to need another portion of this food.

Another important factor is the texture of the food. These types of food often exploit what is called a dynamic contrast, created by the combination of different sensations generated by the same food. Think about when we eat a cream-filled biscuit. There is a pleasant sense of crunchiness and our body immediately responds by producing a large amount of saliva. Salivation is part of the experience of eating and the more saliva a food makes us produce, the wetter our mouth will be so as to cover the taste buds. Our brain will be more stimulated by foods that cause this sudden and abundant salivation than those that do not.

Foods that "melt in the mouth" quickly signal to the brain that we are not eating that much. In other words, these foods tell our brain that we are not satiated, even though we are actually consuming a huge amount of calories. The result? We end up eating too much.



b 5. LIMIT CONSUMPTION OF RED MEAT (BEEF, PORK, LAMB), CURED MEATS, AND PRESERVED MEAT

The 2018 World Cancer Research Fund report confirms that excessive consumption of red or processed meat is associated with an increased risk of developing colorectal cancers. If you want to eat red meat, you should not consume more than 3 servings per week, which equates to between 350 g and 500 g [figure 11 **(**)].

Beef, veal, pork, mutton, horse, goat, and lamb are all considered red meats; chicken, turkey, and rabbit, on the other hand, are white meats.



When we talk about processed meats, we mean all those types of meat subjected to salting, age-

ing, fermentation, smoking, or other preservation methods. Processed meats include ham, cured meats, the various types of hot dogs, and some sausages (regardless of whether they are made with red meat such as pork or white meat such as chicken and turkey).

Red meat is definitely a good source of protein and iron, but it is not essential to enjoy excellent health and, above all, it is not good for you in excessive amounts.

What does excess red meat produce in our bodies?

First of all, red meat is rich in iron, which is found in its heme form. In food, we distinguish between two forms of iron: that in heme form, present especially in red meat, and that in non-heme form, which we find in green vegetables such as spinach, legumes, nuts, and other foods. Heme iron is a powerful oxidizing agent; it therefore promotes the formation of free radicals and carcinogens (nitrosamines) in the digestive tract. These substances are capable of causing damage to the lipids and proteins that make up cell membranes and ultimately also to DNA. This process is called **lipoperoxidation** or **lipid peroxidation**. Cell membranes are in fact made up of a complicated interweaving of lipids and proteins and serve to separate not only individual cells from the external environment, but also the various organelles and the nucleus, thus preserving their structure and functionality.



Figure 11 Consumption of red meat



On top of that, red meats are high in saturated fat, which increases not only the risk of cardiovascular disease and breast cancer, but also the risk of becoming obese and developing cancers associated with obesity. In addition, saturated fats make our tissues less sensitive to insulin, thereby impairing sugar metabolism.

In addition, we must not forget that the cooking methods we often use for red meats (such as grilling or roasting) produce harmful substances, such as aromatic hydrocarbons, which we already discussed when talking about fast food.

In addition to heme iron, processed meats also contain nitrites and nitrates, salts used to preserve the meat that can react with protein degradation products in the intestines and form nitrosamines, which are as toxic and carcinogenic as those produced by unpreserved red meat.



6. LIMIT CONSUMPTION OF SUGARY DRINKS. DRINK MAINLY WATER AND UNSWEETENED BEVERAGES

Drinks with added sugar should be consumed infrequently. Drinking orangeade, cola, fruit juices, or canned iced tea every day greatly increases the risk of becoming overweight or obese and this condition, as we have seen, can in turn

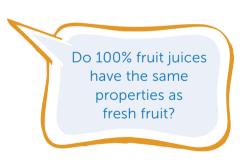
increase the risk of many types of cancer in adulthood. Consumption of these beverages is also correlated with sedentary lifestyles, which, when combined, constitute two powerful risk factors for health [figure 12].

There is, therefore, no direct link between sugar consumption and increased cancer risk, but since maintaining a normal weight is a highly protective factor for health, the World Cancer Research Fund devotes ample space to those factors that contribute to weight gain and the development of obesity. From the analysis of the literature, it can be concluded that consuming **sugary drinks** represents a clear **risk factor for developing obesity** and consequently for developing related cancers. The evidence for this is significant, especially when such drinks are consumed on a daily basis.

According to a report by the World Health Organization (WHO), children who consume more sugary drinks are more likely to be overweight or obese than children who only consume them occasionally.

In the same way as you can eat very fatty or sugary foods occasionally, you should strictly limit how often you drink carbonated and sugary drinks; this is also because such drinks provide lots of calories without increasing your sense of satiety.

There are several varieties of **fruit drinks** on the market and, although the packaging on some of them says "100% fruit", they cannot be considered a valid substitute for fresh fruit. In fact, these products are often made from concentrated juices reconstituted with water that, at the end of



the preparation process, are generally deficient in, if not completely devoid of, fiber and vitamins, but with a high sugar content: this is why juices are sweeter than fruit!

In addition to loose-leaf tea or tea bags, tea it also commercially available in bottles, cans, or powders that you add to water. These products only have the same flavor and color as tea; they do not have the same composition as the



Figure 12 Beverages with added sugar



Fruit juice, 200 ml ≈ 20 g sugar



Can of iced tea, 330 ml ≈ 30 g sugar



Can of orangeade/cola, 330 ml ≈ 35 g sugar

EXAMPLES OF SUGARY BEVERAGES

- Carbonated drinks: orangeade, cola, lemonade, tonic, ginger beer, and other sodas
- Flavoured drinks: iced tea, green tea drink
- Juices: fruit juice and pulp, fruit cordial, juice 100% from concentrate

traditional drink obtained by infusing it in boiling water and consumption of such products should be limited. They are nothing more than sugary drinks, in which the tea infusion or extract is present in very low quantities.

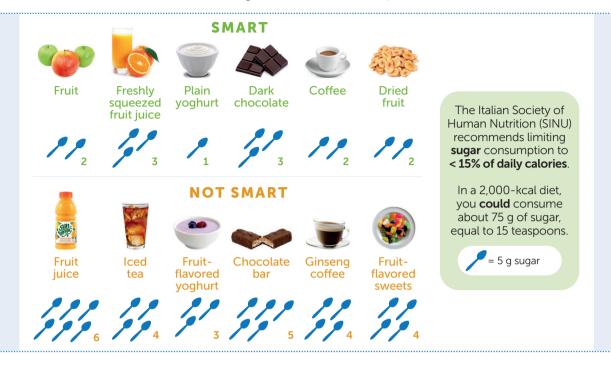
Fruit juices, iced tea, and carbonated and sugary drinks contain large amounts of sugar, which we only notice if we read the nutritional information on the label. For example, a carbonated drink can contain up to 40 g of sugar, while an iced tea can contain 30 g. These are excessive amounts if you consider that the reference intake levels indicate that sugar should not make up more than 15% of your total energy intake. This means that, in a 2,000-kcal diet, you should not exceed 75 g of sugar per day, which also include sugars naturally present in fruit; by drinking a single can of sugary soda, you would thus be drinking more than half of the maximum amount [figure 13 (**)].

Even the fact that these drinks are typically consumed cold actually makes them taste less sweet. Try drinking a sugary drink at room temperature and you will notice it tastes much sweeter! Given the importance of proper hydration to maintaining health, it is necessary to prioritize drinking water in everyday life.

You might think that sugar-free, light, or diet drinks are therefore totally free of these risks, but in reality, they also indirectly represent a health risk.



Figure 13 How much sugar we consume in a day...



In fact, the sweeteners found in light or diet drinks do not stimulate the production of hormones involved in the processes of satiety, do not satisfy the brain, and are not able to stop you seeking calories, thus creating a vicious circle that pushes you to consume more food.

Children and teens should get used to less intensely sweet tastes, thus making them able to appreciate fresh fruit, which contains a lower amount of sugar, as well as providing a good dose of nutrients. And as for adults, it's never too late to start doing it!



7. LIMIT ALCOHOL CONSUMPTION

Since ancient times, humans have learned to exploit yeast (Saccharomyces cerevisiae) to make alcoholic beverages such as wine and beer. But if drinking in moderation is part of our culture, excessive drinking is very dangerous: alcohol **abuse** causes 30 to 50% of road traffic accidents. In Switzerland, 8 people die every day due to accidents or diseases caused by alcohol.

In addition, the scientific literature is clear: excess alcohol, regardless of the type of drink, increases the risk of developing oncological diseases.

Ethanol, which is classified as a carcinogen, is metabolized in the liver and converted into acetaldehyde, a molecule that plays an important role in the neoplastic process. What's more, research shows that alcohol consumption is often associated with tobacco use, thereby amplifying the negative impacts on health.

The 2018 World Cancer Research Fund report confirms the close link between alcohol consumption and an increased risk of developing seven types of cancer. Although alcoholic beverages may contain a number of potentially carcinogenic compounds, the evidence is mostly based on the role of ethanol and acetaldehyde.

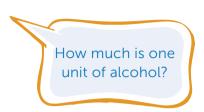
The role of alcohol in the development of cancer seems to be linked to how it is metabolized, which leads to the production of prostaglandins and the generation of reactive oxygen species, all molecules capable of increasing the level of inflammation in the body. Most of the alcohol absorbed (over 90%) is metabolized by the liver, while the remaining 8-10% is eliminated through the urine or exhaled air.

The first stage of metabolizing alcohol involves converting it into acetaldehyde, a process mediated by the enzyme alcohol dehydrogenase, which is found in liver cells. It is an "inducible" enzyme, which means that the presence of alcohol induces the body to produce the enzyme (an example of how the metabolism can be regulated by external factors through feedback mechanisms). The acetaldehyde produced is subsequently transferred into the mitochondria (the powerhouse of the cell), where it is promptly oxidized through the action of another enzyme to form carbon dioxide. It is important to emphasize that this process has repercussions at a general level, due to the fact that the natural systems involved are not able to cope with the accumulation of the various metabolites of alcohol that can be toxic to the body.

There are no recommendations for alcohol consumption; however, there are indications of what constitutes a moderate intake for adults if they do want to

consume alcohol. It is recommended not to exceed 1 unit of alcohol (UA) per day for women and 2 for men.

One unit of alcohol, equal to about 12 g of ethanol, corresponds to: a 330 ml glass of beer, a 125 ml glass of wine, 80 ml of an aperitif, or 40 ml of spirits [figure 14].



Alcohol consumption behaviors prevalent

among young people have serious implications not only in the short term, such as ethyl coma, but also in the long term, such as irreversible liver damage. In addition, consuming alcohol at a young age is associated with impaired school performance, aggression, and violence, as well as possible negative impacts on social skills and cognitive and emotional development. This is why the WHO recommends total abstention from alcohol consumption until the age of 15.

According to a major public health study conducted in the UK, the current safety limits relating to the consumption of alcoholic beverages should be adjusted downwards. The authors suggest not exceeding 100 g of alcohol per week, which is equivalent to just under a liter of wine, just over 3 liters of beer, or about 300 ml of spirits. Consumption above this threshold increases the risk of cardiovascular diseases (in particular, stroke and hypertension) and reduces life expectancy (by as much as 4-5 years for those drinking more than 350 g of alcohol per week).

At the same time, however, there is evidence that moderate consumption of red wine can help to reduce the risk of cardiovascular diseases thanks to its content of protective substances called polyphenols; however, it is important to remember that these substances are also found in many fresh fruits and vegetables. Therefore, even if it is true that moderate consumption of red wine may be good for the cardiovascular system, this benefit has never been demonstrated in the field of oncology. In summary, therefore, to prevent cancer:

- it is better not to drink alcohol;
- always keep in mind that the ability to metabolize alcohol varies based on various factors, such as gender, age, and body size.



Figure 14 Recommendations for alcohol consumption in adults

If you really want to consume alcohol





One unit of alcohol (UA) corresponds to about 12 g of ethanol

This is the amount contained in





8. YOU DO NOT NEED TO TAKE SUPPLEMENTS TO PREVENT CANCER. TRY TO MEET YOUR NUTRITIONAL NEEDS THROUGH DIET ALONE

There is still no evidence that the use of dietary supplements (vitamins, minerals, antioxidants, etc.) plays a role in preventing cancer; in fact, some scientific evidence shows the opposite.

Supplements, which can be in the form of tablets, capsules, powders, or liquids, **contain nutrients or other compounds** and should be used to supplement the diet only in specific cases, as indicated by a doctor. Only a doctor will be able to assess the amount of the nutrient or substance that the individual needs on a case-by-case basis. Supplements should not be considered as substitutes for real food.

Consuming a nutrient at high doses can have a completely different effect on the body than if it were consumed through food. Furthermore, studies have not demonstrated any protective effects against the risk of developing cancer, even though supplements are often advertised as having anti-cancer benefits. Because of this lack of evidence, the World Cancer Research Fund has been advising against using them for cancer prevention since 2007 [figure 15].

In fact, it has been shown that certain antioxidants taken in high doses in the form of supplements, instead of protecting our cells, actually increase the risk of developing certain cancers. This is the case with beta-carotene, which, according to one study, increases the risk of lung cancer by 18%. One of the hypotheses put forward to explain this paradoxical effect is that, since carotenoids are strong antioxidants, they protect the DNA of all cells against oxidation, including cancer cells.

As we have said, dietary supplements may be indicated to remedy nutrient deficiencies in some pathological or physiological conditions; during pregnancy and in the period preceding it, for example, supplementation with folic acid (vitamin B6) is widely recommended to reduce the risk of defects in the fetus' neural tube. Consuming a nutrient through supplements, however, does not always result in the same beneficial effect as observed after eating a food rich in that nutrient, probably because it is the synergistic effect of multiple substances present in the food matrix that causes these benefits.



Figure 15 The World Cancer Research Fund's recommendation on supplements

FOOD SUPPLEMENTS Try to meet your nutritional needs through diet alone* PUBLIC HEALTH OBJECTIVE Increase the proportion of the population that meets their nutritional needs without dietary supplements RECOMMENDATION FOR INDIVIDUALS Dietary supplements are not recommended for cancer prevention *This may not be possible. In some situations, such as in the case of illness or inadequate diet, supplements can be valuable.



9. FOR MOTHERS: IF YOU ARE ABLE TO BREASTFEED, THIS HAS BENEFITS FOR BOTH THE BABY AND THE MOTHER

Exclusively breastfeeding for up to 6 months can be protective for both the mother and the baby.

Breast milk has all the nutrients a baby needs to grow up to the age of 6 months. Solid foods should only be added gradually after this point, during weaning. Some evidence shows that breastfeeding for at least 6 months is able to prevent excess weight in the baby and related diseases.

According to international indications, the ideal approach would therefore be to exclusively breastfeed for the first 6 months of the baby's life, starting from the first few hours after birth, and continue until 2 years or even longer, obviously supplementing the baby's diet with foods other than breast milk.



The benefits of breastfeeding (when this is possible and desired) for the child, the mother, the family, and society are numerous and so well documented that there should be no doubt about the need to protect, promote, and support this practice, as confirmed by the Joint

Declaration of the WHO and UNICEF (United Nations Children's Fund).

Today, many doctors and researchers advocate for the unique benefits of breastfeeding and its importance to health, putting forward recommendations based on the results of numerous clinical trials that clearly demonstrate how a natural behavior like breastfeeding your baby offers a wealth of physical and psychological health benefits.

In general, when we talk about the benefits of breastfeeding, we are talking about the benefits for the baby, but it is also good for the mother's health in many ways, including in terms of cancer risk. In fact, breastfeeding stimulates the uterus to return to its original size, keeps glucose levels under control, thus reducing the risk of diabetes, facilitates the return to normal weight, and, last but certainly not least, reduces the risk of cancer.

If offers the greatest protection against breast and ovarian cancers, which are the types most affected by hormonal balances. The literature is clear regarding breast cancer: the risk decreases by 4.3% for each year of breastfeeding in women who choose to and are able to breastfeed compared to those who do not breastfeed. The protective factor against breast cancer persists both before and after menopause.

Researchers have also managed to understand the biological reasons that make breastfeeding so important for preventing cancer. During pregnancy, the breasts undergo a series of transformations and the mammary gland only completes its maturation process during breastfeeding, making the breast cells more resistant to mutations that can lead to cancer. Breastfeeding also totally or partially blocks the production of ovarian hormones: resting ovaries lead to lower estrogen levels, guaranteeing protection against breast cancer and, most likely, ovarian cancer as well.



10. FOR ANYONE WHO HAS HAD CANCER, THE SAME RECOMMENDATIONS AS FOR PREVENTION APPLY, AS FAR AS POSSIBLE AND IN AGREEMENT WITH YOUR DOCTOR

Following a varied diet, based on the recommendations for cancer prevention, can help reduce the risk of the disease recurring in those who have already had a cancer diagnosis. In addition, the right diet can mitigate the negative side effects of cancer treatments.

Thanks to screening programs and early diagnosis, the **number of survivors of the disease** has increased in recent decades and is **steadily growing**. It has now been scientifically confirmed that a healthy diet that is mainly plant-based and an active lifestyle promote better recovery of your state of health.

Reading, becoming informed, and making lifestyle changes are all important actions that can help prevent recurrence or other secondary illnesses. It should be noted, however, that research in this area is still in its infancy and it is not easy to obtain unambiguous and clearcut results. The important thing is to

know when the messages taken from scientific evidence are reliable and when, on the other hand, they are derived from erroneous interpretations or misrepresentations.

Unless otherwise advised by their doctor, after the acute phase of treatment, everyone who has been diagnosed with cancer is encouraged to follow the recommendations of the World Cancer Research Fund on diet, body weight, and physical activity that are valid for the general population. Cancer patients should also receive nutritional guidance and advice on physical activity from qualified professionals.

One of the emerging problems in the field of nutrition is without a doubt the high demand for information on nutrition and cancer from patients. The composition of their diet is now a crucial aspect not only for the patient but also for scientific research investigating how nutrition can help patients tackle the disease, deal with the side effects of treatments, and achieve a better prognosis.

When it comes to food and cancer, there are several different goals that should be considered.

The first is **nutritional prevention**, i.e., how to lower the risk of disease incidence and recurrences. We have tens of thousands of studies investigating the correlations between diet and cancer, even for individual tumor sites, which are then analyzed and translated into population guidelines by scientific societies. Based on the guidelines issued by the World Cancer Research Fund, experts have outlined the ten rules to follow for cancer prevention that we have covered in this booklet. The goal is to maintain a good state of health through a healthy diet, regular physical activity, and controlling one's body weight.

The second aspect relates more specifically to **nutrition during cancer treatment** and the different eating patterns that can affect the side effects of such treatments. There is less research on these aspects, but it is still possible to find institutional guidelines that give nutritional indications in relation to the types of cancer treatments and their side effects.

Finally, there is the most difficult and least studied aspect: **personalized nutrition for cancer patients**. This approach is only possible through the col-

laboration of a multidisciplinary team looking after the patient that includes a professional specializing in nutrition, a figure often still absent within oncology departments. In this case, the goal is to restore fundamental biological functions, correct any deficiencies, and avoid nutritional impairments.

In conclusion, the panel of the World Cancer Research Fund states that the available evidence on cancer survivors is of varying quality and therefore difficult to interpret; however, following a balanced diet, engaging in regular physical activity, and other measures for maintaining body weight can help reduce the risk of recurrence. However, it is very important to make it clear to patients that no food is able to protect us from a multifactorial disease such as cancer or to cause its onset. However, the quality, quantity, and frequency of foods, known as the "dietary pattern", can modulate the neoplastic risk, synergistically conferring a certain level of protection.

One example is the **Mediterranean diet**, a dietary and lifestyle model that seems to be the most protective against chronic diseases such as cardiovascular diseases and cancers. It is characterized by a high consumption of vegetables,



fruit, whole grains, extra virgin olive oil, and legumes and a low intake of red and cured meats.

ONCLUSIONS

Eating habits – in practice, the quantity, quality, and frequency of the food we consume – are the most powerful environmental factor that can affect our state of health and life expectancy.

The large amount of scientific literature on which this observation is based includes epidemiological studies, in which the associations between food consumption and the onset of diseases are observed; nutritional intervention studies, in which the effects of food consumption on markers of disease risk are analyzed; and finally, studies carried out on animal and cell models to analyze the mechanisms underlying the observed effects.

In addition, research into **nutrigenomics**, the most cutting-edge nutritional science that studies the effects of foods on gene expression, has established that this process is continuously modified during transcription in response to exposure to nutrients. Nutrition, therefore, represents the most long-lasting, persistent, and variable environmental factor that probably contributes to shaping the "behavior" of the human genome.

Faced with these findings, you might wonder why scientists do not provide us with personalized diets that protect us from the most common chronic diseases such as cancers, diabetes, and cardiovascular and neurodegenerative diseases, and thus help us live longer and healthier lives. In reality, the ability to assess the effect on our DNA of foods and the innumerable substances that compose them in each individual and then design the most suitable diet for each person for their health is still some way in the future.

To date, what we can say is that we have very valid and effective indications to help put into practice a diet that is protective for health and thus lower the risk of developing the most common chronic diseases. This information comes from epidemiological studies, which international scientific societies analyze and evaluate to draw up recommendations for the population.

We therefore know that a protective diet for health is based on **foods of plant origin**, such as vegetables, legumes, whole grains and derivative products, fresh fruit, nuts, oilseeds, and vegetable oils (olive and seed oils).

The recommendations also indicate, as we have seen, that **foods of animal origin**, in particular red and preserved meat, should **not** be consumed in **excessive quantities** in a healthy diet and, finally, that salt and sugar consumption should not exceed precise limits.

A diet based on the recommendations of the World Cancer Research Fund is characterized by foods and beverages with a high concentration of vitamins, minerals, and fiber and low in salt, saturated fat, added sugar, and refined carbohydrates.

In conclusion, we have seen how our lifestyle and the diet we choose can have a significant effect when it comes to protecting us against a multifactorial disease such as cancer. Our metabolism and our "operating system" respond and adapt to external stimuli, stimuli that at least in part derive from our choices. We therefore each have a specific responsibility to do everything we can to adopt a healthy lifestyle and eating habits that will not only contribute to improving our general health, but will also allow us to live better with our fellow human beings by promoting a culture of general health and well-being.



PART TWO



TEXTS

By the students of class 3A of the Massagno Middle School:

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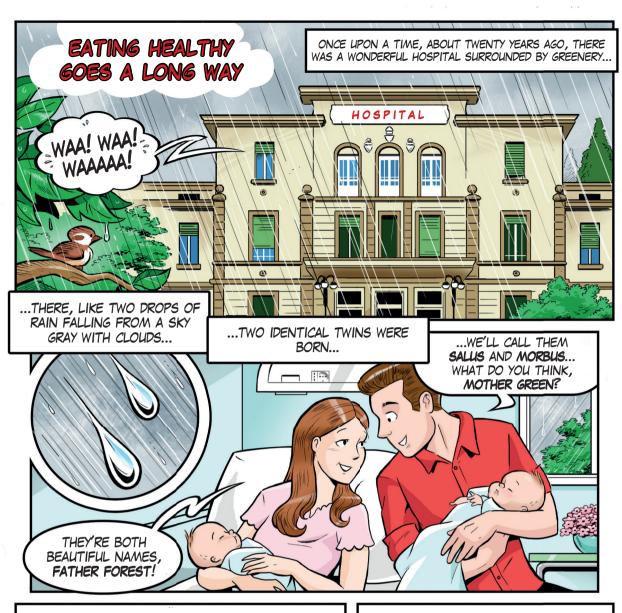
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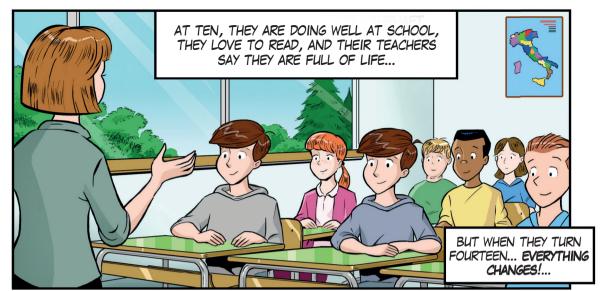


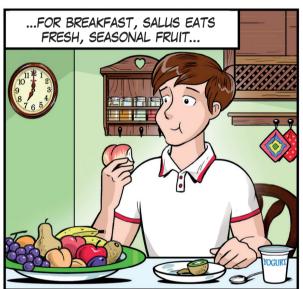


THE BABIES ARE PLUMP AND HEALTHY. THE NURSES

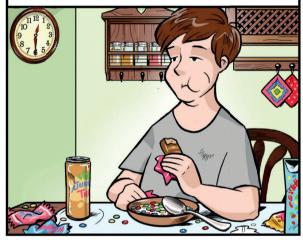








...WHILE MORBUS WAKES UP LATE, DRINKS COFFEE, AND WOLFS DOWN VARIOUS SWEETS...



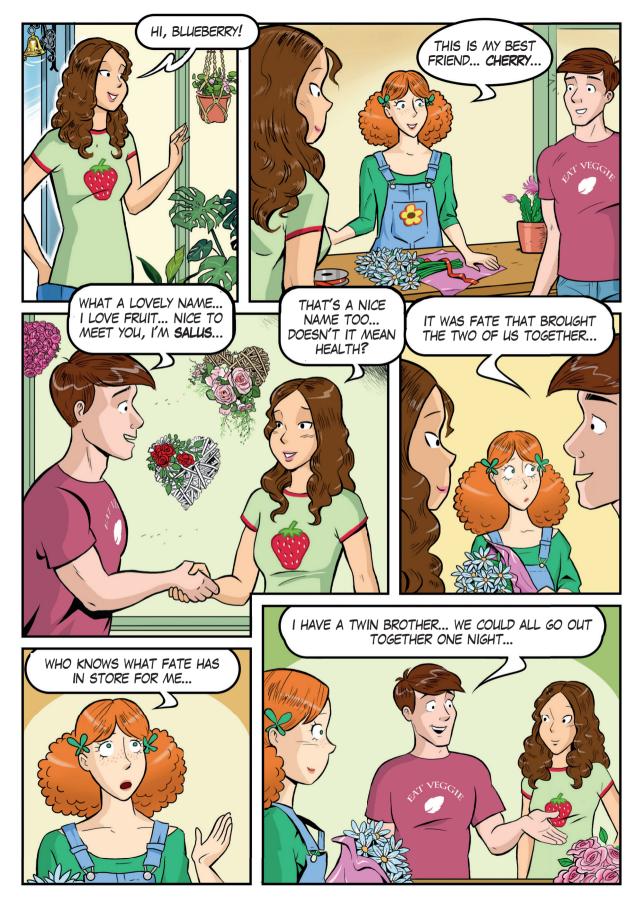
...AT LUNCH, SALUS EATS SALMON FILLET AND VEGETABLES AND DRINKS FRESH WATER... AS A SNACK, HE HAS PLENTY OF FRESHLY SQUEEZED JUICE AND FOR DINNER HE HAS WHOLE GRAIN PIZZA AND MORE VEGETABLES...



...MORBUS ALWAYS CHOOSES HAMBURGERS, PIZZA, HOT DOGS, AND CHIPS AND DRINKS ONLY XXL GLASSES OF DANGER COLA...









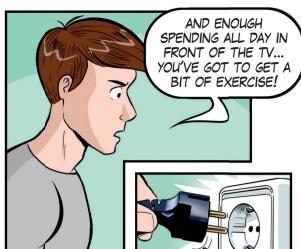








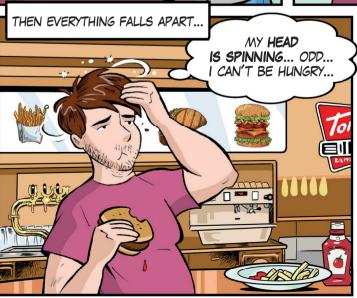


















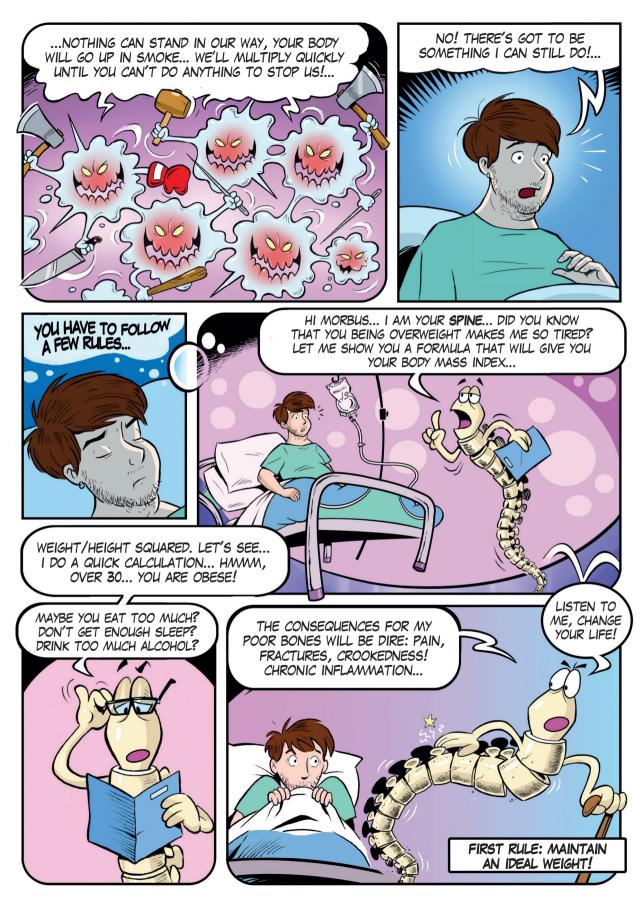


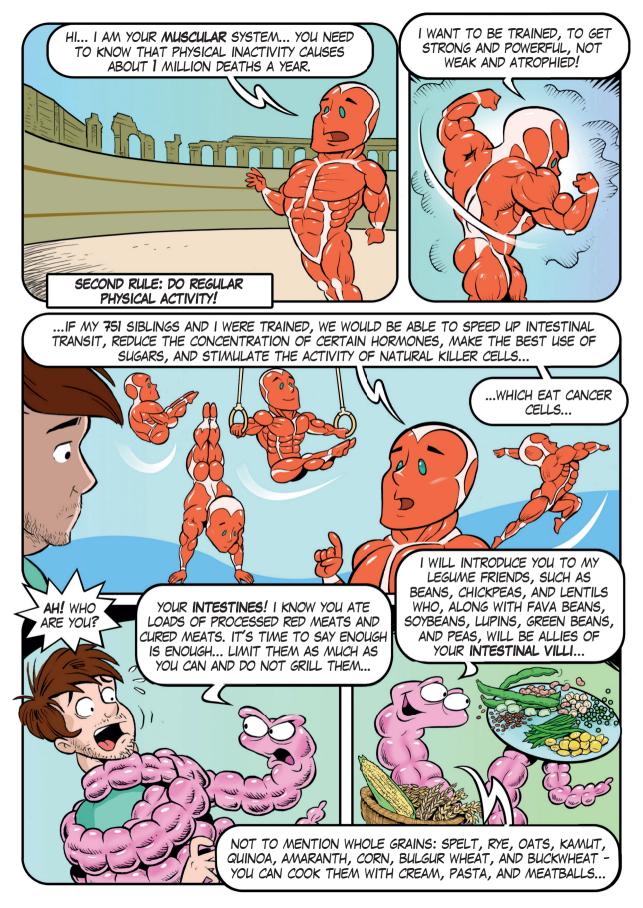


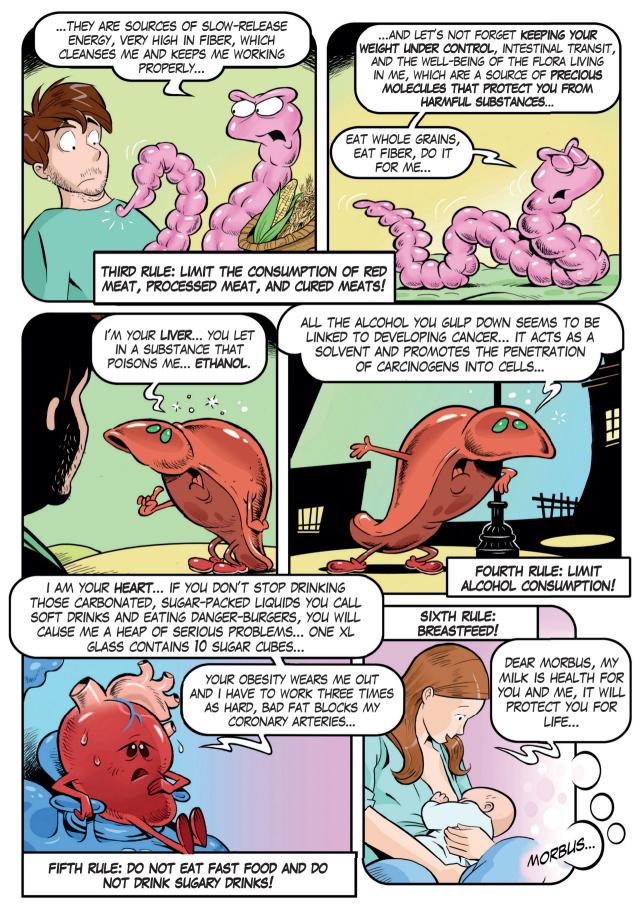


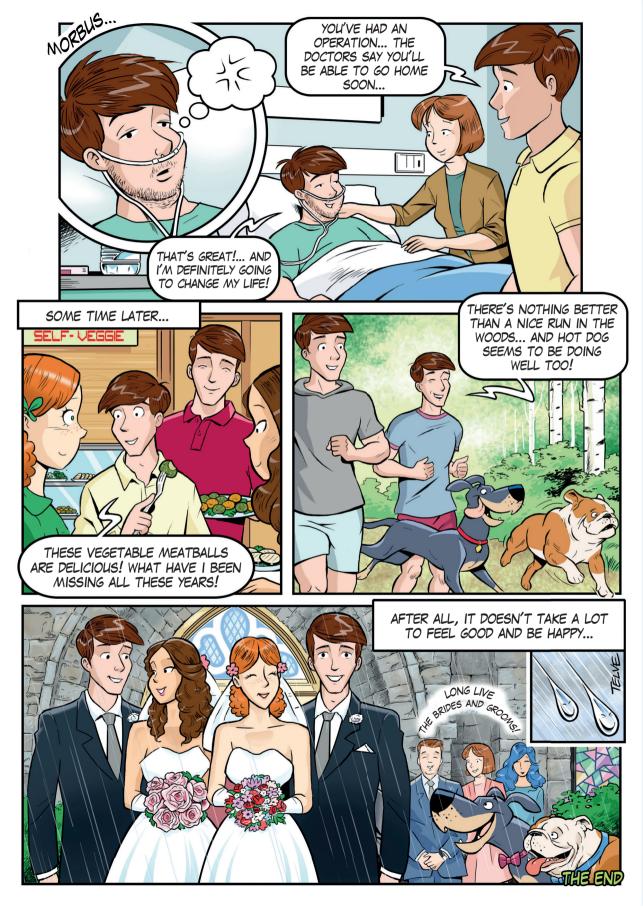














Antioxidant	A molecule found in food with the function of neutralizing free radicals, which damage the biological structures of cells.
Apoptosis	The programmed death of a cell at the end of its life cycle.
Beta- glucans	Components of dietary fiber that represent about 70% of the plant cell wall in some grains, such as barley and oats.
ВМІ	The Body Mass Index (BMI) is the ratio between an individual's weight and their height and can be used to assess whether healthy adult individuals are an appropriate weight. It is extremely simple to calculate: simply divide the individual's weight in kg by the square of their height in meters. An individual is considered "normal weight" if they have a BMI value between 18.5 and 24.9.
Calorie	A unit of measurement (kcal) used to express the energy content of food and the energy expenditure by the human body.
Cancer	A disease characterized by the uncontrolled proliferation of cells that have the ability to infiltrate the organs and tissues of the body, altering their structure and functioning.
Carcinogen	A chemical, physical, or biological factor capable of causing cancer or promoting its onset and propagation.

Cardiovascular diseases

Diseases affecting the heart and blood vessels. Although this definition includes any pathological condition affecting the cardiovascular system, in common parlance it generally refers to the various atherosclerosis-related pathologies, such as heart attack and stroke.

Cell The fundamental unit of living beings.

Cholesterol

A molecule belonging to the category of fats. It is a fundamental constituent of animal cell membranes, as well as a precursor of steroid hormones, vitamin D, and bile acids. It is transported in the blood by specific lipoproteins that differ in size and density; cholesterol bound to low-density lipoproteins (LDL) is called "bad" cholesterol because it can be deposited in the walls of the arteries and constitutes a risk factor for various diseases when present in excess. Cholesterol bound to high-density lipoproteins (HDL) is called "good" cholesterol because it does not cause damage to the arteries; rather, it removes the cholesterol from the walls of the blood vessels to transport it to the liver and, if it is present in good quantity, it is a guarantee of protection.

Complex carbohydrates

These include starch and dietary fiber. Starch is the main source in the diet of carbohydrates that can be absorbed and used as energy. A small percentage of starch may not be absorbed and is referred to as "resistant starch". Dietary fiber is, by definition, resistant to digestion and absorption in the human gut, but it can undergo fermentation by the microflora residing in the colon.

Cytokines

Protein molecules produced by various types of cells that induce processes such as growth, differentiation, and death once released into the body, usually in response to a stimulus.

Diabetes

A chronic disease characterized by an excessive amount of sugar (glucose) in the blood. This condition is caused by a malfunction of insulin, a hormone that is responsible for regulating the level of glucose in the body, or a defect in its production by the pancreas.

Dietary A structured set of food consumption choices and habits pattern (including traditional foods), which is characterized by geographical, cultural, ethnic, and scientific factors.

DNA

Deoxyribonucleic acid; in humans, nuclear DNA, also called the genome, is found within the nucleus of every cell. Its function is to preserve the genetic information (genetic code), which is determined by the sequence of the four nucleotide bases (adenine, guanine, cytosine, and thymine).

Essential An important family of polyunsaturated fats, they are called "essential" because our body is not able to produce them and it is therefore necessary to consume them through the diet. They include omega 3 and omega 6 fatty acids. The ratio of omega 3 and omega 6 in the diet is important to reduce serum levels of LDL cholesterol, which is the type of cholesterol associated with an increased risk of atherosclerosis and the formation of thrombi.

(or lipids)

Fats Lipids in the diet can be divided into three main groups: saturated, monounsaturated, and polyunsaturated. Saturated fatty acids are mainly important in terms of energy; monounsaturated fatty acids, in addition to providing energy, seem to have an effect that promotes the formation of HDL (good cholesterol); polyunsaturated fatty acids, on the other hand, have important structural and metabolic roles.

Fiber

Although it cannot be considered a nutrient, dietary fiber exerts functional and metabolic effects that make it an important component of the human diet. In addition to increasing satiety and improving intestinal function, consuming fiber with food has been linked to reducing the risk of major chronic degenerative diseases, particularly colon cancers, diabetes, and cardiovascular disease. Adequate amounts of dietary fiber can be achieved by regularly consuming whole grains, legumes, fruits, and vegetables.

Food An unprocessed, semi-processed, or processed product, wholly or partly edible, intended for human consumption. It may contain various combinations of macronutrients, micronutrients, and other substances with nutritional value, as well as substances that have no nutritional value. Foods can be divided into those of animal, plant, or mineral origin.

Food supplement

A product that supplements the daily diet if necessary and that constitutes a concentrated source of one or more nutrients and/or other substances of nutritional value. Available in single- or multi-compound preparations, which can be dosed (e.g., capsules, sachets, vials, drops, etc.), and are intended to be taken in small unit quantities.

radicals

Free Unstable oxygen molecules that are produced in cells by oxidation processes that occur within our body, such as respiration.

Glycemic index

A value that indicates the rate at which blood glucose rises, i.e., the amount of glucose in the blood, following the intake of a food. When you consume a food that contains carbohydrates, your blood glucose levels rise. The rate at which food is digested and absorbed varies depending on the food and the type of nutrients it consists of, the amount of fiber in it, and the composition of the other foods already present in the stomach and intestine during digestion.

Immune system

The set of anatomical structures, cells, and molecules dedicated to the defending the body against pathogens or foreign substances.

(heme and non-heme)

Iron Heme iron is only found in foods of animal origin, particularly in meat, as it is present in muscle proteins. It can be absorbed more easily than non-heme iron because it is more easily soluble. Non-heme iron is found in both meat and plant-based foods, but it is harder to absorb because it only dissolves with particularly acidic pH values.

Lipids see Fats

Oxidative degradation of lipids, caused by the interaction between free radicals and the hydrogen atoms present in lipids. It is a particularly important process in biology because it can cause cellular damage by damaging the lipids in the cell membrane.
A nutrient present in the diet in high amounts that has defined nutritional effects and a specific metabolic role, and is a source of energy for the human body. The macronutrients are proteins, carbohydrates, and fats.
A type of blood cell belonging to the phagocyte family that has the ability to engulf foreign bodies, such as altered cells and microbes, playing a non-specific role in the body's defense system.
A set of biochemical processes of interconversion between molecules within the body. It includes synthesis (anabolism) and breakdown (catabolism) processes.
The process by which cancer spreads to other parts of the body.
A collection of microorganisms present inside the body (mainly in the intestines) and outside the body (on the skin).
A mineral or vitamin present in the diet in smaller amounts (grams, milligrams, micrograms). It is not a source of energy, but performs important functions within the body.
In the field of nutrition, these are part of the group of micronutrients. The main ones are calcium, iron, potassium, phosphorus, magnesium, and selenium. Severe deficiencies are very rare, while slight insufficiencies can cause conditions that are hard to trace back to the deficiency itself, such as headaches and fatigue.

Mitochondria Organelles present within a cell that have the task of producing the energy necessary for many cellular functions, such as moving and transporting substances.

Mono- Oleic acid is the most common monounsaturated fat in our **unsaturated** diet. Foods that are particularly rich in oleic acid include fats extra virgin olive oil, hazelnuts, and almonds. Consuming this type of fat contributes to the maintenance of a healthy cardiovascular system by increasing HDL cholesterol (good cholesterol).

Neurodegenerative disorders

Diseases of the central nervous system that share a chronic, selective process of neuronal death. Depending on the type of disease, neuronal deterioration can lead to cognitive deficits, impairments in motor function, and behavioral and psychological disorders.

Nitrates, nitrites, and nitrosamines

Nitrates and nitrites are salts commonly used to age meat and other perishable products, to maintain their red color and improve their flavor; at the intestinal level, they can contribute to the formation of a group of compounds known as nitrosamines, some of which are carcinogenic.

Nutrient A substance that, absorbed in the gastrointestinal tract, has a specific role in the physiological processes and metabolism of the human body. Nutrients include: water, proteins, carbohydrates, fats, minerals, and vitamins.

genomics

Nutri- A science that studies the effects of dietary components on genome expression. Nutrigenomics involves characterizing the products of genes and their functions and studying the interactions between genes.

genomics

Nutritional The science that studies the relationships between the genome and diet. It includes nutrigenomics and nutrigenetics and uses methodological approaches from genomics such as mapping, sequencing, and analyzing some or all of the genes of a given species.

Nutritional prevention

Interventions aimed at increasing the adoption of eating habits and lifestyles that promote individual health and well-being.

Obesity	Malnutrition due to excess consumption, with a marked increase in adipose mass, of greater magnitude than overweight. It is defined in terms of the conventional threshold values of the body mass index, which vary depending on gender, age, height, etc.
Phyto- compounds	Bioactive components of plant origin. This term can be interpreted in various different way, since it can also indicate substances that have no nutritional effects.
Phytosterols	Natural substances present in foods of plant origin with a similar structure to cholesterol. They may contribute to the overall reduction of cholesterol absorption.
Polycyclic aromatic hy- drocarbons	Toxic chemicals that can also be found in foods cooked at high-temperatures resulting in carbonization, such as grilled meats, or in smoked fish.
Polyphenols	These constitute a family of about 5,000 organic molecules widely found in the plant kingdom. They are known for their positive impact on health.
Polyunsatu- rated fats	They are found in significant quantities in seeds (sesame, flax, sunflower, etc.), seed oils, nuts, and fish.
Preserved meat	
Proteins	Macronutrients formed by chains of different amino acids linked together. Each food can contain different proteins characterized by different amino acids in very specific sequences. The numerous different functions of proteins in our body are derived from the combination of the different amino acids.
Recurrence	The reappearance of a previously treated disease after a period of time.

Risk A condition that can increase the likelihood of developing a disease. For example, hypercholesterolemia, hypertension, and overweight are risk factors for cardiovascular disease.

Saturated fats

These are mainly found in foods of animal origin, such as butter, lard, cream, meats, and fatty cheeses. There are also some plant sources widely used in the food industry, such as palm oil and coconut oil. A high consumption of these foods can help increase triglyceride levels in the blood.

Scientific evidence

The set of data, literature, and expert judgement on which medical and scientific research or analysis are based.

Screening program

An initial diagnostic procedure aimed at early identification of individuals at risk of a disease in order to direct them to a subsequent and more comprehensive assessment of their health status.

Simple carbohydrates

Commonly referred to as sugars, these include glucose, fructose, sucrose, maltose, and lactose. Sugars are naturally present in primary foods; the refined forms can also be used on their own (sucrose) or incorporated into foods and beverages (sucrose, glucose syrup with variable fructose content) to make them more palatable thanks to the sweet taste.

Trans fats Modified fatty acids that have a negative impact on health.

Vitamins Molecules contained in foods that belong to the group of micronutrients and perform important biological functions in our body. Any deficiencies can cause effects that can even be serious, but are rarely found in our population.



Eating habits are the most powerful environmental factor that can affect health and life expectancy.

In this booklet, the authors explain and teach us how to follow the 10 Recommendations of the World Cancer Research Fund that highlight how a healthy diet, along with an active lifestyle, is a valid tool for the prevention, management, and treatment of many diseases. An appropriate and balanced diet not only guarantees an optimal supply of nutrients sufficient to meet the body's needs, but also provides substances that play a protective and/or preventative role against certain pathological conditions.

Maria Cristina Marini, oncologist, Oncology Institute of Italian-speaking Switzerland (IOSI), Bellinzona.

Lucilla Titta, nutritionist and researcher at the European Institute of Oncology, Milan.

Inside the comic:

Eating healthy goes a long way

Texts by the students of class 3A
of the Massagno Middle School,
Ticino, Switzerland.

Illustrations
by Alessandro Telve
for the Scuola Romana dei Fumetti.