

Preventing cancer through nutrition has genuine potential, but care must be taken to avoid misinterpreting the scientific data

It has now been demonstrated that diet and exercise affect our health and our risk of developing cancer, in particular.

However, it is incorrect to claim that consuming a particular food, nutrient or dietary supplement can prevent the onset of cancer, especially when the overall diet is unbalanced.

The effective prevention of cancer through nutrition involves disseminating clear and accurate messages that inform the consumer as well as diet and health professionals about the nutritional factors that actually increase or decrease the risk of cancer. This is a major public health issue considering the diversity of modern lifestyles and consumption habits. In addition, issuing misleading health warnings, based on accurate but often misinterpreted or incomplete scientific information, adds to the difficulty of informing and guiding consumers in making their choices.

These questions and answers reaffirm the core message and clarify some misconceptions.

Find out more:

- On the ANSES website, see the 2011 Report on “Nutrition and Cancer”
- On the INCa and Ministry of Health websites, see the summary of the 2009 report on “Nutrition and Cancer Prevention” by the National Health and Nutrition Programme (PNNS), the National Food and Cancer Research Network (NACRE)/INCa/Directorate General for Health (DGS) endorsed by AFSSA, the National Institute of Prevention and Health Education (INPES) and the French Institute for Public Health Surveillance (InVS).

Questions and Answers

1. Can nutrition (including diet and physical activity) influence the risk of developing cancer?

Cancers are multifactorial diseases whose onset and development involve individual (genetic), behavioural (tobacco, **alcohol**, nutrition, sun exposure, etc.) and environmental (pollutants, infectious agents) factors. The effects of these factors are not specific in most cases (a single cancer may be caused by several substances) but can be synergistic. Knowledge about the causes of cancers and their predisposing factors is still incomplete and the subject of ongoing research (see the *Cancer Plan* recommendations).

It is estimated that all the nutritional factors (diet, alcoholic beverage consumption, overweight/obesity and insufficient physical activity) are involved in the onset of one third of the most common cancers. (Also see the 2009-2013 French Cancer Plan Measure 11 “to promote preventive actions on the links between diet, physical activity and cancer”).

2. How do the primary nutritional factors interact with the cancer risk?

The link between nutrition and cancer is rather complex and can be divided schematically into several modes of action:

1. Direct effects of diet:
 - by excess intake of certain nutrients or foods whose relationship to cancer has been demonstrated: alcohol, trans fatty acids, and even red meat, salt, etc.
 - by deficiencies in certain nutrients or foods, acknowledged for their protective roles against some cancers (fruits and vegetables, vitamin C, fibre, selenium, etc.)
2. Indirect effects of diet that may be linked to dysregulation, especially hormonal, induced by overweight and obesity.

3. Effects of physical exercise, especially hormonal, but also for its role in energy balance, which it helps maintain.

In addition, beyond nutritional factors in the strictest sense, potential effects may be related to dietary intake of contaminants. For this reason, regulations have established maximum residue limits (MRLs) for all contaminants likely to pose a health risk (pesticide residues, heavy metals, etc.). Public authorities conduct regular inspections to ensure compliance with these limit values.

3. Does engaging in physical activity affect the risk of developing cancer?

There is a relationship between physical activity*, inactivity and the risk of several cancers, especially colon, breast and endometrial cancer. The beneficial effects of physical activity on the cancer risk may be related to lowering circulation levels of various hormones (especially oestrogens) and growth factors. Physical activity also affects the speed of intestinal transit, thereby reducing exposure of the gastrointestinal tract to foodborne carcinogens, and stimulates immunity. In addition, physical activity contributes to reducing the risk of weight gain, overweight and obesity, which in turn are risk factors for several cancers.

This beneficial effect can be obtained through the regular practice (at least 30 minutes a day, five days a week) of a physical activity of moderate intensity comparable to brisk walking. In France, according to research studies, it is estimated that 21 to 37% of adults do not follow this recommendation.

*Physical activity covers occupation-related physical (farm work, materials handling), domestic (housework, gardening, etc.), recreational (jogging, dancing, etc.) and transportation-related (walking, cycling, etc.) activities.

4. Can obesity and even overweight contribute to the development of cancer?

Overweight and obesity increase the risk of developing numerous cancers (especially of the esophagus, pancreas, colon, rectum, endometrium, kidney, and breast after menopause), specifically through metabolic and hormonal dysregulation.

In France, overweight (excluding obesity) affects 31.4% of adults and obesity affects 11.6% (data from the INCA 2 survey).

A diet that is too high in calories combined with a lack of physical activity contributes significantly to the development of overweight and obesity. Thus, to prevent overweight and obesity it is specifically recommended that people engage in at least 30 minutes of physical activity (of the same intensity as brisk walking) five days a week and limit sedentary activities (such as working in front of a computer or watching television). A balanced and varied diet is also recommended (according to the nutritional guidelines of the PNNS).

5. Does the consumption of fruits and vegetables help reduce the risk of developing cancer?

The protective effect of fruits and vegetables with respect to some cancers is related to their composition of constituents that have beneficial effects on health, including certain nutrients like fibres, vitamins and minerals and other microconstituents like polyphenols. Thus, the consumption of fruits and vegetables is associated with a reduced risk of cancer. Moreover, the consumption of vegetables helps reduce the risk of overweight and obesity.

The recommended daily intake of fruit and vegetables is five servings (PNNS), or about 400 grams per day. In France, 57% of adults do not follow this recommendation and the average adult in France consumes only 283 grams per day of fruit and vegetables, or 3.5 servings (INCA 2).

It is also worth mentioning that to prevent the risks associated with pesticide residues, European regulations have established maximum residue limits (MRLs) for any contaminants that may pose a health risk.

6. Are there any “anti-cancer” fruits, vegetables or foods?

Some foods are promoted because they are rich in certain compounds (for example, vitamins, minerals, antioxidants, etc.) whose effects on cancer have been observed experimentally in animals or *in vitro* on isolated cells. These include, in particular, certain berries (blueberries, blackcurrants, etc.), pomegranate, onion and broccoli, which are therefore sometimes referred to as 'anti-cancer' foods.

The term 'anti-cancer food' is deceptive, in that it can lead to the belief that the consumption of a particular food can prevent the development of cancer, or even cure it, which is completely false and unfounded. Indeed, no food, irrespective of its nutritional composition, can by itself counter the development of cancer or any other disease. From the standpoint of cancer prevention, it is necessary to think globally and therefore, only a balanced and varied diet with caloric intake adjusted for energy expenditure, combined with regular physical activity, can help reduce the risk. In addition, the development of diseases, and cancer in particular, involves a great many factors, some of which are unrelated to diet.

7. Is there such a thing as an anti-cancer diet?

This expression, used extensively in the media and occasionally in books, implies that the food that we eat can act like drugs. This is a false assertion, scientifically baseless, and even dangerous. In fact, no dietary regimen can substitute for medical treatment, irrespective of the disease.

For the nutritional factors, only diet and regular physical activity conforming to the nutritional guidelines of the PNNS and reduced alcohol consumption (which also contributes to avoiding excess weight and cardiovascular diseases) may reduce the risk of developing cancer, without completely eliminating it. Cancer formation indeed involves other behavioural (smoking, UV exposure), individual (genetic, hormonal) and environmental (pollutants, infectious agents) factors unrelated to diet.

8. More generally, are there fruits or vegetables that should be prioritised as part of the nutritional prevention of cancer?

Some vegetables and fruits contain micronutrients (such as some sulphur compounds in garlic or the indoles in cruciferous vegetables such as cauliflower and broccoli) whose anti-tumour properties have been observed experimentally in animals or in isolated cells. However, in the current state of knowledge, it is impossible to extrapolate these results to the development of cancer in humans.

What has been termed the "portfolio" approach, which evaluates all the data from different methodologies (observational or interventional epidemiological studies, studies on animals or cells) confirms that there is no single food or nutrient that could be directly involved, in isolation, in the prevention of cancer.

Given their varying composition, all fruits and vegetables are of interest because they can diversify the diet while providing all the micronutrients the body needs.

9. Do certain herbs or spices, such as turmeric, tea, thyme, parsley, or garlic, show particular promise with respect to cancer protection?

As with fruits and vegetables, certain microconstituents in herbs and spices (such as the flavones in thyme and parsley, the catechins in tea, and the polyphenols in turmeric) have potentially useful properties, but the effects have only been observed experimentally in animals or in isolated cells.

In the current state of knowledge, it cannot be asserted that consuming these types of herbs or spices is of specific value in preventing cancer in humans.

10. Does alcohol consumption contribute to developing cancer?

Beverages such as wine, beer, spirits, etc. all contain alcohol, which becomes a genotoxic compound in the body. Consuming alcoholic beverages increases the risk of developing cancers of the mouth, pharynx, larynx, esophagus, colon-rectum, breast and liver. In addition, the consumption of alcohol alters the permeability of mucous membranes (in the mouth, pharynx, larynx and esophagus), which promotes the absorption of other carcinogenic compounds, especially those in tobacco smoke. Lastly, high alcohol

consumption causes nutritional deficiencies in certain vitamins, especially the folates, which play a critical role in the integrity of DNA.

In terms of preventing cancer, it is recommended that drinkers reduce their consumption of alcoholic beverages, the increased risk being significant with an average consumption of one or more drink per day.

11. Does excess consumption of red meat and delicatessen meats promote the development of cancer?

Red meat contains haem iron and delicatessen meats contain potassium nitrate that, when consumed in excess, promote the development of colon and rectal cancers.

It is recommended that the consumption of red meat be limited to less than 500 grams per week and that the consumption of delicatessen meats be reduced. It is advisable to alternate with white meats, eggs, fish and legumes combined with cereals.

In France, the average adult consumes 370 grams of red meat per week (53 grams per day) and 270 grams of delicatessen meats per week (38 grams per day). One quarter of adults (39% of men and 13% of women) consume more than 500 grams of red meat per week.

12. Does a high salt diet promote the development of stomach cancer?

When consumed in excess, salt can cause alterations in the gastric mucosa and act synergistically with other stomach cancer risk factors. The World Health Organization (WHO) recommends a daily intake of no more than five grams per day.

In France, the average salt intake in adults is 8.5 grams per day (INCA 2); 67% of men and 26% of women consume more than eight grams per day. The objective of the PNNS is initially to reduce these intakes to less than eight grams per day in men and less than 6.5 grams per day in women and children.

It is advisable to limit salt intake, especially from the consumption of salted processed foods (delicatessen meats, cheeses, various snacks, prepared dishes) and the addition of salt during cooking or at the table.

13. Does the food preparation method affect the risk of developing cancer?

The cooking process, even at home, can lead to the formation of potentially carcinogenic substances, mostly during intense and prolonged cooking (frying, grilling, barbecuing, etc.). This does not occur when the various cooking methods are used properly. However, the data in humans are still limited.

14. Would supplementing the diet with phytoconstituents or antioxidant nutrients prevent the onset of cancer?

The protective effect of antioxidants has been suggested in some observational and mechanistic studies (*in vitro* or on a model organism). However, this effect is rarely found in general population studies, because it is mainly observed in specific sub-populations (those suffering from various deficiencies). In contrast, under certain conditions, supplementation with antioxidants may increase the risk of cancer. For example, beta-carotene supplementation in smokers increases the risk of developing lung cancer. In a broader perspective, it is thus important to emphasise that supplementation with antioxidants, microconstituents or micronutrients may entail more risks than benefits. In addition the nutritional need for microconstituents, micronutrients and antioxidants can be satisfied by a balanced and varied diet, and does not require the use of dietary supplements.

15. Will taking more vitamins and/or minerals than the population reference intake prevent the onset of cancer?

Vitamins (A, C, E, folates or vitamin B9, beta-carotene, etc.), minerals (iron, calcium, magnesium, sodium, potassium, chlorine, phosphorous) and oligoelements or trace elements (copper, iodine, selenium, etc.) are involved in various body functions. The body's requirements for each of these micronutrients are known and can be met by a varied and balanced diet, emphasising the consumption of foods rich in vitamins and minerals (such as fruit and vegetables). Therefore, additional intake of dietary supplements is unnecessary and may even pose risks, especially resulting from the 'cocktail effect' of substances with an unknown interaction or synergy.

It is therefore inadvisable to use dietary supplements, except in certain special situations of deficiency or increased need, substantiated by medical supervision.

16. Does breastfeeding reduce a woman's risk of developing breast cancer?

Breastfeeding reduces the risk of developing breast cancer through hormonal mechanisms and the elimination of potentially cancerous cells toward the end of breastfeeding. It is recommended that a woman breastfeed her child, ideally for six months, and doing so exclusively, if possible.

17. Can a single study be used to establish a link between consuming a type of food or nutrient and cancer?

The relationship between a nutritional factor and the risk of cancer is difficult to demonstrate, for a variety of interrelated reasons:

- the complexity of the disease;
- the complexity and diversity of nutritional factors and their mechanisms of action;
- the interactions among nutritional factors within the food and within the overall diet;
- the interactions between nutritional factors and other environmental or individual factors.

Thus, it is necessary to have results from many studies, conducted with complementary approaches (epidemiological, mechanistic). Then, only the assessment of all the available results allows a link to be established between a nutritional factor and the development of cancer.

18. What should be concluded from analysing the relationships between nutrition and the onset of cancer?

The links between diet and cancer are complex and can only be demonstrated by accumulating data from different types of studies: experimental in animals and *in vitro*, epidemiological, and clinical. A single study, irrespective of its methodology, is insufficient to establish a causal relationship between a nutritional factor and the cancer risk.

There are relationships between the way we eat and the risk of developing cancer, but there is no 'anti-cancer' food or nutrient.

Only a balanced and varied diet with a caloric intake adjusted for energy expenditure may reduce the risk of developing cancer. More specifically, it is advisable to limit the consumption of calorie-dense foods that increase the risk of becoming overweight. Furthermore, the consumption of red meat, delicatessen meats, salt and salty foods, implicated in the onset of certain cancers should be limited and the consumption of alcoholic beverages should be reduced. It is also recommended that priority be given to eating fruits and vegetables that contribute significantly to the coverage of micronutrient requirements and to reducing the caloric density of the diet.

Lastly, physical activity of the same intensity as brisk walking, for at least 30 minutes a day, five days a week can help to limit weight gain and the risk of developing cancer.

19. Does eating fish have an impact on the risk of developing cancer?

Fish is an important source of omega 3 fatty acids and vitamin D, and the PNNS recommends eating it at least twice a week. However, depending on their geographic origin, some species of fish may also contain substances that can pose a cancer risk, due to water pollution.

To enjoy the general health benefits of eating fish, ANSES recommends consuming two servings of fish a week, including one that is high in omega 3, and varying the species and the sources of supply. This regimen can provide optimum coverage of nutrient requirements while limiting the risk of overexposure to chemical contaminants.

20. Does a high-fat diet promote the onset of cancer?

The link between a diet that is high in fat and the occurrence of breast, colorectal and endometrial cancers is sometimes suggested. However, this relationship may only be due to a caloric imbalance related to an excess consumption of fat and its impact on overweight.

ANSES refers back to its past recommendations that fat intake should account for between 35 and 40% of total energy intake with preference given to polyunsaturated fatty acids. In France, 43% of adults have fat intakes greater than 40% of total energy intake.