

## Cancer Prevention with Nutrition and Lifestyle

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### Keywords

Nutrition · Lifestyle · Cancer · Cancer prevention · Colorectal cancer

### Abstract

**Background:** Although the crucial role of nutrition on well-being was known several hundreds of years ago in ancient healing methods such as traditional Chinese medicine, it often plays a minor role in modern society. However, 30–50% of all cancer cases are preventable by following a healthy diet and lifestyle, in accordance with the World Cancer Research Fund (WCRF) cancer prevention recommendations. **Summary:** In addition to maintaining a healthy weight and being physically active, a balanced plant-based diet with limited amounts of fast foods, sugar-sweetened drinks, red meat, and alcohol is recommended for enhancing health. Such a way of life helps to prevent both cancer and other noncommunicable diseases (NCDs) because of the common risk factors. Although these facts are widely known, the figures are still alarming. Only a fraction of the population follows the WCRF recommendations. **Key Message:** Urgent policy action is needed to promote healthy ways of living and to create health-enhancing environments to effectively reduce the risk of cancer and NCDs.

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### Introduction

Nutrition mostly plays a crucial role in ancient healing methods and theories. In traditional Chinese medicine therapies, for instance, nutrition is one of the five main-

stays in addition to acupuncture, Chinese healing herbs, Tuina massage, Tai Qi, and Qi Gong. According to traditional Chinese medicine, nutrition provides health and wellbeing by harmonizing Ying and Yang [1]. Although the critical role of nutrition for health has been well known for several hundreds of years, food and diet do not seem to rate highly nowadays, as reflected in low food prices and less time spent on cooking and eating. Furthermore, figures indicate that prevention programs are not often used today. In Germany, only 1.3 million of the 42.75 million employees (3.04%) were directly or indirectly provided with workplace health promotion from statutory health insurance companies in 2013 [2]. Although there was a significant increase in prevention offers in 2016 due to a new German prevention law, only 1.4 million people attended workplace health promotion events [3]. Prevention, however, is said to be the most cost-effective, long-term strategy to control the incidence of cancer [4]. But how can we prevent severe diseases such as cancer? What could be done to increase sensitivity for cancer prevention in the population, and how could healthy nutrition and lifestyle behaviors be integrated into our lives?

### Facts and Figures – Cancer Prevention

It is widely known that cancer is one of the most common causes of death: 25% of the German population die of cancer [5], which makes cancer the second most common cause of death in this country [6]. The development of cancer can be initiated by endogenous or exogenous factors. Endogenous factors, such as age or genetic predis-

**Fig. 1.** The ten World Cancer Research Fund cancer prevention recommendations. (This material has been reproduced from the World Cancer Research Fund/American Institute for Cancer Research. Diet, Nutrition, Physical Activity and Cancer: a Global Perspective. Continuous Update Project Expert Report 2018. Available at [dietandcancerreport.org](http://dietandcancerreport.org).)



position, cannot be influenced by lifestyle or behavior. Among exogenous environmental and lifestyle factors, smoking and nutrition are the main causes of cancer. Although the number of smokers overall is decreasing, cigarette smoking and exposure to tobacco smoke remain the leading causes of avoidable deaths worldwide. In Germany smoking accounts for an estimated 13.5% of all deaths [7], and 28.8% of cancer deaths in the US are attributable to smoking [8]. Moreover, smoking is the main risk factor for lung cancer. About 80% of deaths from lung cancer are attributable to smoking [7]. Thus, there is no doubt that smoking must be avoided to prevent lung cancer. Many global studies have been conducted to investigate the effects of nutrition and diet on cellular processes of carcinogenesis such as apoptosis, cell cycle, immunity, and inflammation. These research activities show that healthy balanced nutrition contributes to an adequate supply of nutrients at the whole-body level as well as at cellular and molecular level. Inappropriate nutrition at these levels has an impact on the microenvironment and metabolism. This makes cells conducive for detrimental changes such as accumulation of DNA damage and therefore for the development of cancer [9]. A recent Lancet paper [10] quoted intimidating figures: a low intake of vegetables and fruit together with other dietary risk factors led to 11 million deaths and about 255 million disability-adjusted life years in 2017. For cancer an estimated proportion of between 30 and 50% of cases are preventable through a healthy lifestyle and avoiding occupational carcinogens and environmental toxins [4]. This number differs according to the type of cancer. Lung and colorectal cancer have the highest rates of potentially preventable cases [11].

### Cancer Prevention Recommendations of the World Cancer Research Fund

One of the most important scientific organizations in terms of lifestyle and cancer prevention is the World Cancer Research Fund (WCRF). This not-for-profit association comprises internationally renowned, independent experts from all over the world, analyzing and judging the evidence on how lifestyle factors affect the risk of cancer. After reviewing the evidence these researchers make recommendations for diet, nutrition, and physical activity, which can protect from cancer and positively influence survival after a diagnosis. In 2018 the latest experts' insights were published in the Third Expert Report [9], an extremely comprehensive overview of the most recent research in this area. The key findings are summarized in the ten WCRF cancer prevention recommendations (Fig. 1). While following each individual guideline has the potential to prevent cancer, the benefit is best when following all recommendations and considering them as a whole way of life [12, 13].

#### *Be a Healthy Weight*

The first and most important WCRF recommendation is maintaining body weight within a healthy range (as low as possible), because there is very strong evidence that being overweight is a risk factor for cancer [12]. A "normal" (as defined by the World Health Organization) or healthy weight range assessed by means of BMI is 18.5–24.9. According to a recent survey of German households, 62.1% of men and 43.1% of women are overweight or obese [14]. As becoming overweight begins in childhood, ex-

cess weight gain has to be prevented from infancy on. For adults it is also best to maintain energy balance and weight throughout life. There is strong evidence that greater body fatness can cause various types of cancers, e.g., mouth, pharynx and larynx, esophagus, stomach, pancreas, gallbladder, liver, colorectal, breast, ovarian, endometrial, prostate, and kidney cancer [9].

### *Be Physically Active*

There is strong evidence that physical activity reduces the risk of several types of cancers. Therefore “walk more and sit less” is the principle of the WCRF regarding exercise [12]. The evidence is particularly strong for colon cancer, (postmenopausal) breast cancer, and endometrial cancer [9], but physical activity may also reduce the risk of other types of cancers [15]. In Europe 9–19% of all cancer cases may be attributable to insufficient physical activity [16]. Exercise influences the risk of cancer by influencing several systems of the body such as immunology, metabolism, and endocrinology. It also helps to maintain a normal weight and reduces body fatness, an independent risk factor for many cancers. The World Health Organization recommends being active every day and limiting sedentary behavior. At least 150 min of moderate-intensity training (e.g., gardening, dancing, walking) or at least 75 min of vigorous training (e.g., jogging, aerobics, team sports) per week is the advice for adults [17]. It does not matter what kind of activity you choose. Physical activity is simply defined as “any movement that uses skeletal muscles and requires more energy than resting” [18]. Household chores, gardening, and certain occupations as well as recreational activities contribute to cardiometabolic health. In most parts of the world, people do less physical activity than necessary for health promotion whereas long screen times, including at work, are widespread. These habits can easily contribute to weight gain or becoming overweight which, in turn, increases the risk of cancer.

Five recommendations for a healthy diet complete these two WCRF guidelines for weight and physical activity [12]:

(1) *Eat a Diet Rich in Wholegrains, Vegetables, Fruit and Beans.* For cancer prevention plant-based foods should constitute a major part of the diet. Wholegrains, vegetables, fruit, and pulses (legumes) such as beans or lentils provide many essential nutrients and dietary fiber. The WCRF recommends 30 g of fiber and five portions – at least 400 g – of fruit and vegetables per day [12]. This kind of diet is effective in regulating energy intake, thus protecting against weight gain and becoming overweight. Dietary fiber, moreover, helps to protect against colorectal cancer [9].

(2) *Limit Consumption of “Fast Foods” and Other Processed Foods High in Fat, Starches, or Sugars.* Eating “fast

foods” or processed foods high in fat, starches, or sugars is part of a “Western type” diet and should be limited. These foods are usually palatable, readily available, and affordable. They mostly contain more energy, but less micronutrients, than unprocessed foods. Thus, they facilitate excess energy consumption relative to energy expenditure which, in turn, easily leads to weight gain and becoming overweight. More than half of the calories consumed in the US diet come from highly processed foods [19]. A recent pilot intervention study showed that ultra-processed foods in comparison to unprocessed foods lead to higher energy intake and thus cause weight gain [20].

(3) *Limit Consumption of Red and Processed Meat.* The dietary goal of the WCRF concerning meat is not to exceed 350–500 g (cooked weight) of red meat per week [12]. Red meat includes beef, pork, veal, lamb, goat, mutton, and horse. Processed meat – e.g., ham, bacon, salami, and sausages – should be consumed as little as possible. The recommendation concerning red meat strikes a balance between the advantages and disadvantages of eating meat. This means it is best not to completely avoid meat, even though eating meat is not essential for a healthy diet. Meat is rich in micronutrients such as vitamin B<sub>12</sub>, iron, and zinc. It is also a valuable source of protein with high bioavailability. On the other hand, too frequent consumption of red meat seems to increase the risk of colorectal cancer and other noncommunicable diseases (NCDs) [9]. Thus, no more than a moderate amounts of red meat should be consumed. Lean cuts are preferred over fatty pieces. Fish, poultry, eggs, and dairy products are other valuable sources of protein and micronutrients. As substitutes for meat they can complete a healthy, plant-based daily diet.

(4) *Limit Consumption of Sugar-Sweetened Drinks.* High amounts of sugar-sweetened drinks can cause weight gain and make people overweight. Causing no satiety signal but providing many calories, sugar-sweetened drinks facilitate an energy intake that exceeds energy expenditure. This in turn may lead to people becoming overweight and obese, which increases the risk of many cancers. Thus, water and tea or coffee without added sugar should be preferred to maintain adequate hydration. Incidentally, coffee seems to have a protective function against liver and endometrial cancer [9]. The consumption of sugar and sugar-sweetened foods, including soft drinks and sweetened fruit soups, may be associated with a higher risk of pancreatic cancer [21].

(5) *Limit Alcohol Consumption.* For cancer prevention it is best to drink no alcohol [12]. Even small amounts of alcohol may increase the risk of at least some cancers, which substantiates this strict WCRF guideline. The evidence is strong or convincing that the risk of certain cancers, i.e., cancers of the mouth, pharynx and larynx, esophagus, liver, colorectum, breast, and stomach, is

highly dependent of drinking alcoholic drinks. Even if alcohol is still a part of everyday life and closely related to quality of life for a big part of the population, the WCRF recommends not exceeding the national guidelines. In Germany this means that men should not drink more than two alcoholic drinks (20 g of ethanol) and women no more than one drink (10 g of ethanol) per day [22].

### Do Not Use Supplements for Cancer Prevention

There is no evidence that nutritional supplements can prevent cancer [5]. Usually it must be assumed that a healthy balanced diet composed of foods from all food groups completely covers nutritional needs [23]. Only people with proven deficiencies should be advised to take supplements by qualified health professionals.

### Eating Behaviors and Cooking

The WCRF recommendations are just one example of lifestyle recommendations for cancer prevention. Another example is the European Code against Cancer from the International Agency for Research on Cancer which includes twelve ways to reduce cancer risk [24]. In Germany the most prominent and professional organization for nutritional recommendations is the “Deutsche Gesellschaft für Ernährung.” Their ten guidelines on healthy lifestyle and nutrition include two additional points which, in our opinion, are very important for a balanced lifestyle. The first point is to enjoy the diversity of food and to eat a versatile range of food [22]. This implies that a varied diet is required to completely cover nutritional needs. No single food such as raspberries or kale contains all essential nutrients. The next recommendation we would like to add to the WCRF guidelines is “take a break while you eat and allow plenty of time for eating” [22]. Eating slowly ensures that there is enough time for chewing, which in turn enhances the tolerability of the meal. It also facilitates the perception of satiation. This helps to prevent people from becoming overweight which, as mentioned above, is one of the main risk factors for cancer. Moreover, a mindful eating behavior also provides conscious enjoyment. This includes for example preparing your own meals and eating in good company, which are also ways to relax and easy to integrate into everyday life. Relaxation and stress reduction play a crucial role in maintaining health and wellbeing. For instance, mindfulness-based stress reduction helps to improve quality of life and psychological function in breast cancer survivors [25].

### Recent Data on Nutrition and Physical Activity Recommendations and Cancer Prevention

Adherence to these lifestyle recommendations helps to protect against cancer. For example, never having smoked, a BMI <30, physical activity of  $\geq 3.5$  h/week, and fulfilling healthy eating scores such as high consumption of fruit and vegetables or wholegrains lower the risk of cancer by about 36% [26]. Another analysis revealed that meeting 1–3 of the WCRF recommendations or meeting 4–6 recommendations compared to following none of these guidelines decreases the incidence of colorectal cancer by 34–45% or 58%, respectively [13]. A large population-based cohort study [27] showed that adherence to nutritional and lifestyle recommendations such as the ones established by the WCRF is associated with reduced overall risk of breast and prostate cancer. A systematic review suggested that following cancer prevention guidelines is associated with a lower overall cancer incidence and mortality of 10–61% [28]. The WCRF recommendations are also applicable and decrease cancer risk in the elderly [29]. Adhering to an additional recommendation postponed the incidence of cancer by about 1.6 years in people aged  $\geq 60$  years.

### Public Health Policies

As mentioned above, prevention programs are poorly recognized and attended at present. In addition, only a small proportion of the population fulfils the cancer prevention recommendations. For instance, among African American women merely 8.5% adhered to >4 guidelines [30]. Moreover, the cancer and NCD burden is rising all over the world. Developed from scientific evidence, the WCRF and other similar recommendations form the basis for reducing the risk of cancer and other NCDs due to common underlying risk factors, and even the environment benefits from those prevention guidelines as they promote dietary patterns based on foods of plant origin. Urgent policy action is now needed to improve communication of these recommendations to the public.

But what can policymakers and health professionals do to promote adherence to the WCRF recommendations? First of all, motivational aspects must be addressed more thoroughly as people’s behavior is influenced by environmental, economic, and social factors. Promoting awareness of the impact of people’s habits on health is the first crucial step in changing behavioral patterns, be it by providing information about disease prevention or by promoting the advantages of preventive screenings as well as follow-up care measures [31]. In public health organizations a paradigm change is ongoing from dietary restriction to promoting healthy lifestyle behaviors and

from nutrient-based to food-based guidelines. Furthermore, effective public health policies in the form of laws, regulations, or guidelines are required to prevent cancer and other NCDs. Policymakers are responsible for creating health-enabling environments for society. The availability and affordability of healthy foods and the accessibility of environments for active ways of life should be improved compared to unhealthy foods, drinks, alcohol, and physical inactivity. This could be, e.g., labelling standards for foods, restriction of food advertising, or improving the overall nutritional quality of food [9]. Another approach is making nutritional advice and counseling in health care settings available at any time for everybody.

## Conclusions

Cancer is one of the leading causes of death worldwide. With rising incidence, it has now even replaced cardiovascular diseases as the most common cause of death in some countries [32]. Thus, cancer and other NCDs constitute a huge burden not only for affected people, but also for their family and carers as well as for society, as these diseases often entail enormous economic costs. However, almost half of all cases could be prevented through a healthy lifestyle. Prevention of cancer and other NCDs therefore requires urgent policy action. The WCRF cancer prevention recommendations help to protect health by promoting physical activity and balanced nutrition as well as healthy drinking and eating behaviors and maintaining a normal weight. The guidelines are effective for

reducing personal cancer risk and provide the basis for future policy implications such as informing the population and creating health-promoting environments.

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