

4.3 Meat, poultry, fish, and eggs

MEAT, POULTRY, FISH, EGGS, AND THE RISK OF CANCER

In the judgement of the Panel, the factors listed below modify the risk of cancer. Judgements are graded according to the strength of the evidence.

	DECREASES RISK		INCREASES RISK	
	Exposure	Cancer site	Exposure	Cancer site
Convincing			Red meat¹ Processed meat²	Colorectum Colorectum
Probable			Cantonese-style salted fish³	Nasopharynx
Limited — suggestive	Fish Foods containing vitamin D ^{4,7}	Colorectum Colorectum	Red meat ¹ Processed meat ² Foods containing iron ^{4,5} Smoked foods ⁶ Grilled (broiled) or barbecued (charbroiled) animal foods ⁶	Oesophagus Lung Pancreas Endometrium Oesophagus Lung Stomach Prostate Colorectum Stomach Stomach
Substantial effect on risk unlikely	None identified			

1 The term 'red meat' refers to beef, pork, lamb, and goat from domesticated animals.

2 The term 'processed meat' refers to meats preserved by smoking, curing, or salting, or addition of chemical preservatives.

3 This style of preparation is characterised by treatment with less salt than typically used, and fermentation during the drying process due to relatively high outdoor temperature and moisture levels. This conclusion does not apply to fish prepared (or salted) by other means.

4 Includes both foods naturally containing the constituent and foods which have the constituent added (see chapter 3.5.3).

5 Although red and processed meats contain iron, the general category of 'foods containing iron' comprises many other foods, including those of plant origin.

6 The evidence is mostly from meats preserved or cooked in these ways.

7 Found mostly in fortified foods and animal foods.

For an explanation of all the terms used in the matrix, please see chapter 3.5.1, the text of this section, and the glossary.



These animal foods are sources of protein and micronutrients. The amount and nature of the fat content of meat, poultry, and fish depends on methods of rearing, processing, and preparation, as well as the type of animal.

Production and consumption of red meat and processed meat generally rise with increases in available income. Consumption of beef and products made with beef is still increasing, notably in China and other middle- and low-income countries. In many countries, poultry is now also intensively reared and consumption has increased greatly. Much fish is now farmed.

In general, the Panel judges that the evidence on red meat and processed meat is stronger than it was in the mid-1990s. Epidemiological evidence on other methods of preserving and preparing meats and other animal foods is sparse; the overall evidence remains suggestive, at most. The evidence on poultry, fish, and eggs is generally insubstantial.

The Panel judges as follows:

The evidence that red meats and processed meats are a cause of colorectal cancer is convincing. Cantonese-style salted fish is a probable cause of nasopharyngeal cancer. This finding does not apply to any other type of fish product. Cantonese-style salted fish is also subject to fermentation.

There is limited evidence suggesting that fish, and also foods containing vitamin D, protect against colorectal cancer. There is limited evidence suggesting that red meat is a cause of cancers of the oesophagus, lung, pancreas and endometrium; that processed meat is a cause of cancers of the oesophagus, lung, stomach and prostate; and that foods containing iron are a cause of colorectal cancer. There is also limited evidence that animal foods that are grilled (broiled), barbecued (charbroiled), or smoked, are a cause of stomach cancer.

7.3.5.10 Processed meat

(Also see chapter 4.3.5.1.2.)

Two cohort studies and eight case-control studies investigated processed meat. Both cohort studies were suggestive of increased risk; case-control data were inconsistent. The definition of processed meat varies (see box 4.3.1), which may increase heterogeneity.

Nitrates are produced endogenously in gastric acid and are added as preservatives to processed meats (see box 4.3.2). This may contribute to production of *N*-nitroso compounds and increased exposure. These compounds are suspected mutagens and carcinogens.⁵⁵

Many processed meats also contain high levels of salt and nitrite. Meats cooked at high temperatures can contain heterocyclic amines and polycyclic aromatic hydrocarbons (see box 4.3.4). Haem promotes the formation of *N*-nitroso compounds and also contains iron. Free iron can lead to the production of free radicals (see box 4.3.3).

There is limited evidence, mostly from case-control studies, suggesting that processed meat is a cause of oesophageal cancer.

The Panel is aware that since the conclusion of the SLR, one cohort study⁵⁴ has been published. This new information does not change the Panel judgement. Also see box 3.8.

7.3.5.11 Maté

(Also see chapter 4.7.5.6.1.)

Eight case-control studies and one ecological study investigated maté. Most were suggestive of an increased incidence with higher maté consumption. Meta-analysis of case-control data showed a 16 per cent increased risk per cup/day (figure 4.7.5). A dose-response relationship was apparent.

There is some biological plausibility. Maté is a tea-like beverage typically drunk very hot through a metal straw. This produces heat damage in the oesophagus. Repeated damage of this nature can lead to cancer (see chapter 2.4.1.3). Chemical carcinogenesis from constituents of maté has also been postulated.^{19 20}

The evidence from case-control studies is consistent and a dose-response relationship is apparent. There is robust evidence for plausible mechanisms. Regular consumption of maté, as drunk in the traditional style in South America, is a probable cause of oesophageal cancer.

7.3.5.12 High-temperature foods and drinks

(Also see chapter 4.7.5.7.)

Three cohort studies and 15 case-control studies investigated high-temperature foods and drinks. Most were suggestive of a relationship between them and increased incidence of oesophageal cancer but many were inadequately adjusted for alcohol and smoking.

High-temperature foods and drinks can produce heat damage in the oesophagus. Repeated damage of this nature can predispose to the development of oesophageal cancer.

The evidence is inconsistent. There is limited evidence suggesting that high-temperature drinks are a cause of oesophageal cancer.

The Panel is aware that since the conclusion of the SLR, two case-control studies^{50 51} have been published. This new information does not change the Panel judgement. Also see box 3.8.

7.3.5.13 Alcoholic drinks

(Also see chapter 4.8.5.1.)

Eight cohort studies, 56 case-control studies, and 10 ecological studies investigated alcoholic drinks. Most studies showed a relationship between increased consumption and increased cancer incidence. Meta-analysis of case-control data showed a 4 per cent increased risk per drink/week (figure 4.8.6). A dose-response relationship is apparent from case-control data, with no clear threshold.

It is biologically highly plausible that alcoholic drinks are a cause of oesophageal cancer. Reactive metabolites of alcohol such as acetaldehyde can be carcinogenic. Tobacco may induce specific mutations in DNA that are less efficiently repaired in the presence of alcohol. Alcohol may also function as a solvent, enhancing penetration of other carcinogenic molecules into mucosal cells. Additionally, the effects of alcohol may be mediated through the production of prostaglandins, lipid peroxidation, and the generation of free radical oxygen species. Lastly, heavy consumers of alcohol may have diets low in essential nutrients, making tissues susceptible to carcinogenesis.

There is ample and consistent evidence, both from cohort and case-control studies, with a dose-response relationship. There is robust evidence for mechanisms operating in humans. The evidence that alcoholic drinks are a cause of oesophageal cancer is convincing. No threshold was identified.

The Panel is aware that since the conclusion of the SLR, one cohort⁵⁶ and four case-control studies^{50 51 53 57} have been published. This new information does not change the Panel judgement. Also see box 3.8.

7.3.5.14 Body fatness

(Also see chapter 6.1.3.1.)

A sufficient number of studies investigated BMI to allow squamous cell carcinomas and adenocarcinomas to be analysed separately. While results were inconsistent for squamous cell carcinomas and for all oesophageal cancers, adenocarcinomas, when analysed separately, showed a consistent increased risk with greater BMI. Three cohort studies and eight case-control studies investigated body fatness, as measured by BMI and adenocarcinomas. All of the cohort studies and most of the case-control studies showed increased risk with increased BMI. Meta-analysis of case-control data showed a 55 per cent increased risk per 5 kg/m² (figure 6.1.2). A dose-response relationship is apparent. This is consistent with known geographical and time trends for both BMI and adenocarcinomas.

It is biologically plausible that body fatness is a cause of

Introduction to Part 3

The culmination of the five-year process resulting in this Report is Chapter 12, in which the Panel's public health goals and personal recommendations are specified. These are preceded by a statement of the principles that have guided the Panel in its thinking.

The goals and recommendations are based on judgements made by the Panel in Part 2, as shown in the introductory matrices. Such judgements are of a 'convincing' or 'probable' causal effect, either of decreased or increased risk.

Judgements of 'convincing' or 'probable' generally justify goals and recommendations. These are proposed as the basis for public policies and for personal choices that, if effectively implemented, will be expected to reduce the incidence of cancer for people, families, and communities.

Eight general and two special goals and recommendations are specified. In each case a general recommendation is followed by public health goals and personal recommendations, together with footnotes when further explanation or clarification is required. These are all shown in boxed text. The accompanying text includes a summary of the evidence; justification of the goals and recommendations; and guidance on how to achieve them.

Reliable judgements are carefully derived from good evidence. But specific public health and personal goals and recommendations do not automatically follow from the evidence, however strong and consistent. The process of moving from evidence to judgements and to recommendations has been one of the Panel's main responsibilities, and has involved much discussion and debate until final agreement has been reached. The goals and recommendations here have been unanimously agreed.

Food, nutrition, body composition, and physical activity also affect the risk of diseases other than cancer. Informed by the findings of other reports summarised in Chapter 10, the goals and recommendations have therefore been agreed with an awareness of their wider public health implications.

The goals and recommendations are followed by the Panel's conclusions on the dietary patterns most likely to protect against cancer. As conventionally undertaken, epidemiological and experimental studies are usually sharply focused. In order to discern the 'big picture' of healthy and protective diets, it is necessary to integrate a vast amount of detailed information. This also has been part of the Panel's task.

The main focus of this Report is on nutritional and other biological and associated factors that modify the risk of cancer. *The Panel is aware* that, as with other diseases, the risk of cancer is critically influenced by social, cultural, economic, and ecological factors. Thus the foods and drinks that people consume are not purely because of personal choice; often opportunities to access adequate food or to undertake physical activity can be constrained, either for reasons of ill health or geography, economics, or equally powerfully, by culture.

PRESS RELEASE:

Landmark Report: Excess Body Fat Causes Cancer

Other recommendations on meat, breastfeeding and supplements

People should aim to be at the lower end of the healthy weight range, according to a landmark report published today that links body fat and cancer more closely than ever before.

The World Cancer Research Fund (WCRF) report is the most comprehensive ever published on the link between cancer and diet, physical activity and weight. Searches at nine academic institutions across the world for studies published since records began in the 1960s initially found half a million – 7,000 of which were judged to be the most relevant and robust for inclusion in the report.

It includes 10 recommendations from a panel of 21 world-renowned scientists that represent the most definitive and authoritative advice that has ever been available on how the general public can prevent cancer. Unicef and the World Health Organization were among the official observers of the report's process.

And its key finding is that maintaining a healthy weight (a BMI of 20-25) is one of the most important things you can do to prevent cancer. The number of types of cancer where there is "convincing" evidence that body fat is a cause has risen from one to six since the last WCRF report was published in 1997, including colorectal cancer and post-menopausal breast cancer.

Prof Sir Michael Marmot, Chair of the Panel, said: "We are recommending that people aim to be as lean as possible within the healthy range, and that they avoid weight gain throughout adulthood.

"This might sound difficult, but this is what the science is telling us more clearly than ever before. The fact is that putting on weight can increase your cancer risk, even if you are still within the healthy range.

"So the best advice for cancer prevention is to avoid weight gain, and if you are already overweight then you should aim to lose weight."

Other findings in the report include:

- There is "convincing" evidence that **processed meats**, including ham and bacon, increase the risk of colorectal cancer. People who consume them are advised to do so sparingly.
- The evidence that red meat is a cause of colorectal cancer is stronger than ever before. People should not eat any more than 500g of **red meat** a week.
- This figure is for cooked meat, and is the equivalent of between 700 and 750g of non-cooked meat.
- In one of the first times a cancer report has made a breastfeeding recommendation, mothers are advised to breastfeed exclusively for six months and to continue with complementary breastfeeding after that. This is because of "convincing" evidence that breastfeeding protects the mother against breast cancer and "probable" evidence that it protects the child against obesity later in life.
- **Dietary supplements** are not recommended for cancer prevention.
- The evidence that **alcohol** is a cause of cancer is stronger now than ever before.

Professor Martin Wiseman, Project Director of the Report, said: “This report is a real milestone in the fight against cancer, because its recommendations represent the most definitive advice on preventing cancer that has ever been available anywhere in the world.

“When individual studies are published, it is impossible for the public to put them into context and know how seriously they should be taking the findings. But the great thing about this report is that it does this job for them.

“If people follow our recommendations, they can be confident they are following the best advice possible based on all the scientific research done up to this point. These recommendations are not based on one study but are based on 7,000.”

Deputy Chief Medical Officer, Dr Fiona Adshead, who is in charge of delivering on the Government's obesity target, said:

‘We will examine the findings and detail of this comprehensive and useful report. We have already made progress in tackling obesity with improved physical activity levels at school, healthier school food for children, clearer food labeling and tougher restrictions on advertising foods high in fat and sugar to children – but we know that we need to go further and faster.

‘We want to see the positive work by the food industry continued with more and more retailers and manufacturers adopting the traffic light model to make it easier for people to make the right food choices. We are encouraging the most sedentary people to get more active through pedometer schemes and some physical activity pilots based in GP surgeries.

There is no single solution to tackle obesity and it cannot be tackled by Government action alone. We will only succeed if the problem is recognized, owned and addressed at every level and every part of society. With new resources from the CSR we are planning a long-term drive for action on obesity. There is high-level cross-government commitment to tackling obesity, and we will provide the leadership, vision and sustained commitment required to help start this cultural and societal shift.’

Professor Mike Richards, the Government's Clinical Director for Cancer, welcomed the report in advance of his Cancer Reform Strategy.

He said: “The WCRF report is the most authoritative and exhaustive review done thus far on the prevention of cancer through food, nutrition and physical activity.

“For those of us wanting to lower our risk of developing cancer, the Report provides practical lifestyle recommendations. The Report also provides public health goals. Both will form an important element for the forthcoming Cancer Reform Strategy.”



WCRF UK Recommendations for Cancer Prevention

- 1** Be as lean as possible without becoming underweight
- 2** Be physically active for at least 30 minutes every day
- 3** Avoid sugary drinks. Limit consumption of energy-dense foods (particularly processed foods high in added sugar, or low in fibre, or high in fat)
- 4** Eat more of a variety of vegetables, fruits, wholegrains, and pulses such as beans
- 5** Limit consumption of red meats (such as beef, pork and lamb) and avoid processed meats
- 6** If consumed at all, limit alcoholic drinks to 2 for men and 1 for women a day
- 7** Limit consumption of salty foods and foods processed with salt (sodium)
- 8** Don't use supplements to protect against cancer

Special Population Recommendations

- 9** It is best for mothers to breastfeed exclusively for up to 6 months and then add other liquids and foods
- 10** After treatment, cancer survivors should follow the Recommendations for Cancer Prevention

And, always remember – do not smoke or chew tobacco

WCRF UK is part of the WCRF global network
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“Stopping cancer before it starts”

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