



# Putting processed red meat in context

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## Putting processed red meat in context

### Introduction

*This briefing looks at processed red meat, its definition and the role it plays alongside fresh red meat in the national diet in the UK.*

*It is a live document which will be updated as more scientific research and analysis becomes available. It is intended as a useful reference point for consumers and the media.*

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### Summary

Most UK consumers continue to enjoy processed red meat, with 59% of UK households buying processed red meat in the form of sausages, burgers, bacon, ham and other cooked meats on an almost weekly basis. These products can help to meet a consumer need for taste and practicality – such as sliced cooked meats in sandwiches or fillings in Cornish pasties, pies and sausage rolls.

Organisations such as the European Food Safety Authority (EFSA), the World Cancer Research Fund (WCRF) and the International Agency for Research on Cancer (IARC) at the World Health Organization (WHO) have definitions of what constitutes processed meat but there is no consistently agreed definition. Moreover, the term ‘processed meat’ remains poorly defined in scientific literature, with different studies using different categorisations and terminologies, making meaningful comparisons challenging.

However, a high intake of red meat and processed meat has been associated with an increased risk of colorectal (bowel) cancer by WCRF and IARC based on evaluation of epidemiological research.

This body of research, primarily based on observational (epidemiological) studies, relies on a sample population self-reporting their behaviours and food consumption where the independent variable (e.g. red meat) is not under the control of researchers.

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It is accepted by the scientific community that epidemiological studies cannot directly prove 'cause and effect' on any one food and a health outcome, mainly because it is challenging for researchers to separate out the health impact from other factors such as environmental, lifestyle and genetic factors. Such types of studies therefore only establish an association – not a causal relationship. However, this type of data can give a good picture of the effects of certain dietary patterns on health outcomes which is now seen as far more important for health than singling out specific foods.

Observational data can play a meaningful role, especially when studying large population groups, and is often the best research available to base recommendations on. This is because nutritional research differs from, for example, pharmaceutical drug trials, which can be much more tightly controlled with different selected groups. The overall picture on processed red meat is also complicated by the fact that international research findings may not be applicable to the UK because of factors such as differing types and amounts of meat consumed in different countries, for example in the US where intakes, on average, are much higher.

The current UK Government advice is that individuals who are high consumers of red and processed meat, in other words who eat more than 90g (cooked weight) per day, cut down to 70g (this equates to approximately 500g a week), as high intakes are associated with an increased risk of colorectal (bowel) cancer. This is in the context of a healthy, balanced diet containing plenty of plant-based foods such as wholegrains, vegetables and fruit. The average UK daily consumption of red and processed meat for adults is 62g according to the latest data from the National Diet and Nutrition Survey (NDNS). However, there is a large variation in intake amongst the highest consumers vs lowest consumers (194g/day vs 0g/day). Men, on average, eat more than women (77g/day vs 47g/day).

A healthy lifestyle including a varied, balanced diet, regular physical activity, limiting consumption of alcohol, not smoking and maintaining a healthy weight are key factors to reducing the risk of developing certain cancers. This wider, holistic approach was outlined in the WCRF's 2018 report *Diet, Nutrition, Physical Activity and Cancer: A Global Perspective*.<sup>1</sup>

In the UK, the industry has reduced the salt levels in bacon from an average of around 3.5% - 4% close to the Government target of 2.88%, alongside a significant reduction in nitrite levels and this activity is ongoing. This is a positive response to a challenging reformulation issue as both salt and nitrite play a key role in ensuring the safety of the product.

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## What counts as 'processed meat'?

In the broadest sense of the word, nearly all meat eaten is 'processed' to some degree since it is cooked prior to consumption. Other processing techniques include fermentation (e.g. as used in salami), baking, boiling, pressing or preserving. Processing can help improve taste and texture, extend the shelf life of food, reduce the risk of food poisoning and reduce unnecessary food waste.

Organisations such as the European Food Safety Authority (EFSA), the World Cancer Research Fund (WCRF) and the International Agency for Research on Cancer (IARC) at the World Health Organization (WHO) have definitions of what constitutes processed meat (see Table 1), but there is no consistently agreed definition. Moreover the term 'processed meat'

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<sup>1</sup> WCRF's 2018 report *Diet, Nutrition, Physical Activity and Cancer: A Global Perspective* also highlights to eat little, if any, processed meat to help reduce the risk of developing bowel cancer.

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remains poorly defined in scientific literature, with different studies using different categorisations and terminologies, making meaningful comparisons challenging.

Table 1: Definitions of processed red meat products

Organisation	Definition
EFSA	<b>Meat products</b> Processed products, resulting from the processing of meat or from the further processing of such processed products, so that the cut surface shows that the product no longer has the characteristics of fresh meat.
WCRF	<b>Processed meat</b> Meat that has been transformed through salting, curing, fermentation, smoking or other processes to enhance flavour or improve preservation. Depending on food preparation practices, processed meat can include ham, salami, bacon and pastrami and some sausages. These include sausages, bratwursts, chorizo, frankfurters and 'hot dogs', to which nitrites, nitrates or other preservatives are added. Most processed meats contain pork or beef but may also contain other red meats, poultry, offal or meat by-products such as blood. Minced meats such as hamburgers or fresh sausages may sometimes, though not always, fall within the definition of processed meat.
IARC	<b>Processed meat</b> Meat that has been transformed through salting, curing, fermentation, smoking, or other processes to enhance flavour or improve preservation. Most processed meats contain pork or beef, but processed meats may also contain other red meats, poultry, offal, or meat by-products such as blood. Examples of processed meat include hot dogs (frankfurters), ham, sausages, corned beef, and biltong or beef jerky as well as canned meat and meat-based preparations and sauces.

Source:

- [EFSA Regulation \(EC\) No 853/2004](#);
- WCRF <https://www.wcrf.org/sites/default/files/Preservation-and-processing-of-foods.pdf>;
- IARC [https://www.iarc.fr/wp-content/uploads/2018/07/Monographs-QA\\_Vol114.pdf](https://www.iarc.fr/wp-content/uploads/2018/07/Monographs-QA_Vol114.pdf)

In reality, most fresh sausages and burgers produced in the UK only fall into the processed meat category because of the preservatives that are added. All authorised food additives, like preservatives, in the EU have gone through a rigorous safety evaluation by EFSA. The Scientific Advisory Committee on Nutrition (SACN) in a 2010 report stated that '*no data have been identified that support a hypothesis that sulphate preservatives used in preserved meats could be linked to colorectal cancer*'. EFSA has further stated after a review of the data that the current safe level for sulphites used as additives in wine and other foods is sufficiently protective for consumers. It's important to highlight that not all processed meat is the same even within a single category such as sausages and burgers, where the composition can vary significantly especially between different countries.

### Why has processed meat been linked to colorectal cancer risk?

Over the years, many studies have looked at possible links between eating processed meat and risk of cancer – these are generally epidemiological studies where populations of people are followed over time and links made between their lifestyle and health outcomes. These

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studies provide information about associations between what we eat and our risk of disease but cannot be used to prove a direct cause and effect relationship between the two.

The International Agency for Research on Cancer (IARC) is the specialised agency on cancer for the World Health Organization (WHO) and looks at the role of environmental and lifestyle risk factors, including the diet, in cancer risk. Following a meeting of an expert group in 2015, IARC published a report (IARC monograph 114) in 2018, which considered more than 800 different studies on cancer in humans (some studies provided data on both types of meat; in total more than 700 epidemiological studies provided data on red meat and more than 400 epidemiological studies provided data on processed meat). Processed meat was classified as being carcinogenic to humans based on an association between consuming processed meat and increased risk of colorectal (bowel) cancer. This classification, also referred to as 'Group 1', relates to the strength of the scientific evidence for a link and is used by IARC when there is 'sufficient evidence' that this factor can cause cancer in humans<sup>2</sup>.

The IARC classifications describe the strength of the scientific evidence about an agent being a cause of cancer but doesn't tell us anything about how dangerous the substance is or the level of risk involved. Although newspaper headlines that featured when the report was published, compared processed red meats to smoking or asbestos (also classified as carcinogenic by IARC), this is misleading because it does not mean they are all equally dangerous. Being exposed to tobacco smoke or asbestos is likely to be much more harmful to health than eating processed meat.

WCRF has also reviewed the evidence for a link between the consumption of processed meat and cancer. They concluded that there was strong evidence of a link between eating processed meat and increased risk of bowel cancer and advise eating very little, if any, processed meat in its cancer prevention recommendations.

It is important to remember that diseases like cancer are affected by many different factors – some of which we can't change, like our genes or our age and others that we can, including our diet and lifestyle. We know from studies that by eating a healthy, balanced diet, maintaining a healthy weight, keeping active, limiting intakes of alcohol and not smoking, we can reduce our risk of cancer and other diseases. So when considering the effect of any one food or nutrient we need to look at this in the context of a healthy diet and lifestyle overall. Evidence suggests that it's a good idea to limit consumption of processed meat as high intakes are associated with increased risk of colorectal (bowel) cancer. This is reflected in the current UK Government advice that those who eat 90g a day or more of red and processed meat should cut down to 70g a day alongside eating a healthy, balanced diet overall. So enjoying a bacon sandwich now and again, for example, is probably fine.

## **Facts and figures about processed red meat in the UK**

According to Kantar, where they define the UK's processed meat market as bacon, gammon, burgers, sausages and sliced cooked meat, the retail market was worth £4.6 billion for the year to December 2019. Using a similar definition, we can estimate that the eating-out market was worth approximately £11.3bn for the year to September 2019 (MCA/AHDB). Retail is seeing value losses of -2.3%, while out-of-home remains relatively static.

Pork sausages are a well-loved staple food in the UK, with sausage and mash being eaten on 153 million meal occasions in the home over the last year (Kantar Usage, 52 w/e

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<sup>2</sup> Other substances and activities within this grading include tobacco and asbestos, but also oral contraceptives, hormone replacement therapy and working as a painter.

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December 2019). There has been a slowdown in sausage volumes in UK retail during 2019, being down -2.5% year-on-year. Sausages are however growing increasingly popular out-of-home, with sausage sandwiches and sausage rolls alone accounting for 386 million eating-out occasions, up 6% year-on-year (MCA, 52 w/e September 2019).

Bacon is another popular choice in the UK, featuring in breakfast dishes and dishes such as spaghetti carbonara. Total bacon sales in the UK are declining, with losses in retail sales at 8,553,000kgs. Out-of-home the trusty bacon sandwich has lost 11 million occasions alone. From continuous attitude tracking we know that consumer concerns about bacon being unhealthy have been on the rise longer term, linked to the negative media.

Sliced cooked meats continue to sell large volumes at retail (224,163,000kgs in the year to 29<sup>th</sup> December 2019), of which more than half is ham (Kantar). These volumes have slowed over the last year, being down -3.2%. Despite this sliced cooked meat still has a high presence in lunchtime occasions, both in the home and carried out in lunchboxes.

When consumers are choosing what to eat, their primary motivation is enjoyment. Processed meats score highly for enjoyment, especially bacon, sausages and burgers. They also score highly on practicality, the second most important motivation for choosing meals. However, consumer concerns about processed meat and health has contributed to the decline in performance especially in the retail market; as health is a driver of one third of food consumption.

Typical salt and fat levels in processed meats consumed in the UK have steadily reduced over the years, as illustrated in the table below using McCance and Widdowson data.

100 g product	Date	Mc&W ref. no	Fat g	Sodium mg
Bacon rashers raw back	1976*	221	41.2	1470
Bacon rashers back raw	2015~	380	16.5	1140
Ham canned	1976*	394	5.1	1250
Ham loose and prepacked <sup>^</sup>	2015~	390	3.3	800
Pork sausages	1976*	411	32.1	760
Pork sausages raw 65–70% meat <sup>^</sup>	2015~	532	17.2	470

Source:

\* A.A. Paul and D.A.T. Southgate (1976). McCance and Widdowson's The Composition of Foods. Fourth Revised Edition. MAFF & MRC

~ Public Health England (2015). McCance and Widdowson's The Composition of Foods. Seventh Summary Edition. RSC & IFR

<sup>^</sup> Includes industry data submitted in 2013

## Red meat within the UK diet

A healthy diet consists of a wide variety of foods in the right proportions, to provide the body with fibre, protein, vitamins, minerals and other nutrients, to maintain normal health and to maintain a healthy body weight.

In the UK, the Eatwell Guide is a practical tool used to define Government recommendations on eating healthily and demonstrates how to achieve a balanced diet. It is based on five food groups – fruit and vegetables, starchy carbohydrates, protein foods, dairy and dairy alternatives, and oils and spreads – and shows how much of what we eat overall should come from each food group to achieve a healthy, balanced diet.

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Current Government advice is that individuals who are high consumers of red and processed meat, in other words who eat more than 90g (cooked weight) per day, cut down to 70g (this equates to approximately 500g per week), as high intakes are associated with an increased risk bowel (colorectal) cancer. A typical 70g portion of cooked red or processed meat\* equates approximately to one of the below;

- 2 rashers of thick bacon
- 1.5 British pork sausages
- Just over a third of an 8oz/225g sirloin steak
- 5 slices of thin lunch ham
- 5 tbsp cooked mince
- Half a patty of a large burger

*\*Figures are given as a guide only and are based on average cooked weights.*

The average UK daily consumption of red and processed meat for adults is 62g according to the latest data from the National Diet and Nutrition Survey (NDNS). However, there is a large variation in intake amongst the highest consumers vs lowest consumers (194g/day vs 0g/day). Men, on average, eat more than women (77g/day vs 47g/day).

Despite general advice for high consumers of red and processed meat to eat less, the NHS website acknowledges that red meat – such as beef, lamb and pork – is a good source of protein, vitamins and minerals, and can form part of a balanced diet. These nutritional properties are still found in processed red meat products to varying degrees, however these products tend to be higher in salt and saturated fat. Salt and saturated fat intakes in the UK, on average, are above recommended amounts, so we are advised to cut down on foods that are high in these.

WCRF also recognise that red meat is a good source of nutrients and so can form part of a healthy, balanced diet, but that it doesn't need to be eaten every day. The WCRF recommend that meat consumers aim to eat no more than about three portions of red meat a week, which is around 350–500g cooked weight (or 525–750g raw weight), to help protect against bowel cancer.

Adolescent girls and pre-menopausal women require more iron than men due to menstrual losses. About 50% of adolescent girls have low iron intakes putting them at greater risk of iron deficiency. Red meat contributes 9% of total iron intake in UK adults (38% of total iron intakes in adults come from cereals and cereal products). However, iron and zinc in meat is more readily absorbed by the body than from plant sources.

## **Nitrates and nitrites in the diet**

Nitrates and nitrites are compounds which are found naturally in soil and drinking water, as well as in some foods, particularly certain types of vegetables. In high-income countries, such as the UK, vegetables are the main dietary source of nitrates and can account for as much as 70-80% of dietary nitrate intake.

Dietary nitrates can be converted into nitrites by bacteria present in the mouth, or by the microflora of the gut, and it is estimated that the body converts 5 to 8% of consumed nitrate into nitrite. Overall, this accounts for the majority (80%) of our total exposure to nitrite, with a smaller amount coming directly from the diet and other environmental sources. Nitrates and nitrites are also added in small amounts (typically less than 1%) to some processed meats, such as bacon to improve appearance, taste and shelf life.

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Nitrites can react with the breakdown products of amino acids (amines or amides), via a process known as 'nitrosation', to form *N*-nitroso compounds (NOCs), some of which have been found to be carcinogenic in animal experiments. The main source of human exposure to NOCs is formation in the body, mainly in the stomach, from dietary nitrite (and nitrate). NOCs can also form in cured meats during processing and storage, although an analysis commissioned by the Food Standards Agency found that levels of NOCs in a range of UK manufactured foods, including cured meat, were low and unlikely to be a risk to human health.

Although vegetables are the main dietary source of nitrate, they also contain nutrients such as vitamin C and E, as well as other bioactive compounds such as polyphenols, which can inhibit the conversion of nitrate/nitrite to potentially harmful NOCs. Fruit and vegetables are important components of a healthy, balanced diet, and if consumed daily in sufficient amounts, could help to reduce the risk of certain diseases. It is recommended in the UK to eat at least five portions of a variety of fruit and vegetables a day.

Results from epidemiological studies have shown that a higher consumption of processed meat is associated with a greater risk of bowel cancer, however it is not known to what extent this may be due to nitrates and nitrites within processed meat. The WCRF Continuous Update Project has concluded that:

*“Overall, it is likely that a combination of mechanisms contribute to higher risk of colorectal cancer among people consuming high quantities of processed meat.”*

These include high temperature cooking or grilling of some processed meat products (such as sausages), which can lead to the formation of potentially carcinogenic heterocyclic amines and polycyclic aromatic hydrocarbons. Also, haem iron, found in red meat, may promote the formation of NOCs in the body.

EFSA concluded in June 2017 that the limits on sodium and potassium nitrite/nitrate added to meat and other foods remain safe and no further reduction was required. EFSA based its conclusions on an expert risk assessment which estimated the amount of nitrates and nitrites that could be eaten daily over a person's lifetime without any adverse health impacts. This work found that average intakes in the general population were within the Acceptable Daily Intake (ADI) ranges.

Sodium and potassium salts of nitrite and nitrate are authorised as food additives in the EU (E 249-252) and are used in meat, fish and cheese products to hinder microbial growth, in particular to protect against botulism, as well as to keep meat red and enhance its flavour. Although intake of sodium salts of nitrite and nitrate are safe within ADI, these products also contain salt (sodium chloride) as a preservative, which can contribute to overall daily salt intake.

## **Conclusion**

Current Government advice on healthy eating includes recommendations on red and processed meat consumption. This highlights that any individuals who are high consumers of red and processed meat, defined as those who eat more than 90g (cooked weight) per day, cut down to 70g. Therefore, current UK advice is that processed meat can be enjoyed in moderation as part of a healthy, balanced diet, including plenty of plant-based foods such as wholegrains, vegetables and fruit.

The lack of a universally agreed definition of processed meat and the different categorisations and terminologies used in studies, make meaningful comparisons challenging. It should also be acknowledged that not all 'processed meats' are the same, with UK sausages and burgers often only falling into this category because of the preservatives and salt added to them.



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Health authorities have raised concerns about high red and processed meat intakes. However direct 'cause and effect' on any one food or food group and a health outcome cannot be proven by observational (epidemiological) studies. Furthermore, the IARC's classifications relate to the strength of scientific evidence for a link, but does not tell us anything about how dangerous a substance is or the level of risk involved. This presents challenges which over the years has led to misleading reports in the media about the risk associated with red and processed meat and cancer.

We hope this report has provided some additional clarification and context to the debate.

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