

FOOD FOR THOUGHT

BEEF AND VEAL

Taste, nutrition and cooking



**WHAT AFFECTS EATING QUALITY?
COOKING - MYTHS AND FACTS
INFORMATION ABOUT PROTEIN,
FAT, IRON AND VITAMINS**

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Preface

Beef and veal are traditional favourites for everyday and festive occasions, and central to the food culture of many Danes.

They are common and cherished flavoursome components of Nordic dishes, and therefore well-suited for introducing new, less familiar ingredients. The dietary guidelines recommend that we eat more legumes in the future to promote a varied diet, safeguard the climate, and our health. These are still new to many Danes, but legumes can be introduced in familiar and tasty contexts in meat sauces, lasagne or other classic beef dishes.

In addition to taste, many different cuts and well-known dishes, meat also provides important nutrients. The high content of protein and iron makes meat a key component of the Danish diet and of meals for consumers with special nutritional needs.

This booklet has been developed for food professionals and for those who take particular interest in flavour, cooking, and nutrition. It provides the most important facts and knowledge about the multitudes of flavours, cooking options, and nutrients in beef and veal.



Taste & eating quality

Taste is both an individual experience and an objective measurement of the chemistry that comprises the constituents of taste. Taste depends on the blending of many parameters, and the final link is the cooking of the meat (see page 8).

Eating quality and the nutritional value of beef and veal vary greatly as the meat comes from animals of different sex, age, slaughter weight, breed, and feed. The carcasses are graded on the so-called EUROP scale, where E is the best and P the lowest. Tenderness, juiciness, and taste are reflected in the classification.

Handling before slaughter, method of slaughter, hanging of the carcass and, not least, the ageing of the meat are of great importance to the eating quality of beef and veal.

The fat content of meat, including fat in the muscles, has the greatest impact on the taste and eating experience. BUT it is a myth that the taste is only in the fat. The taste is also in the muscles and connective tissue. Fatty acids are part of compounds with sugars and protein that are the basis for the desirable umami taste sensation.

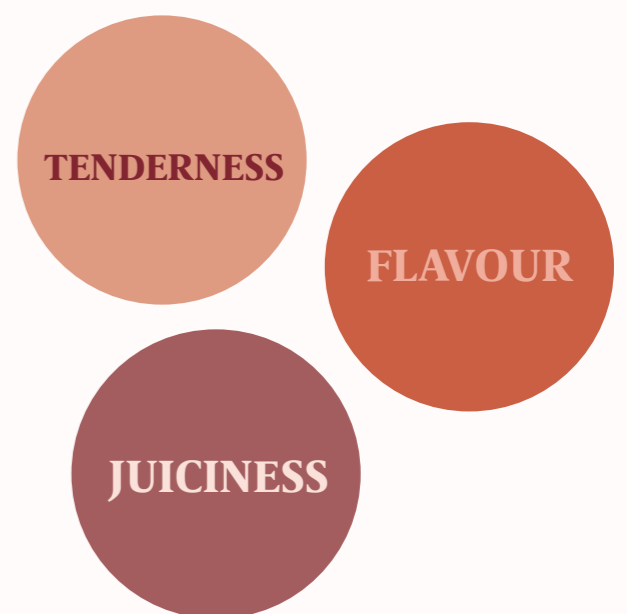
Eating and nutritional quality also vary with the fat content (fat composition) of the specific cut and the content of connective tissue. Finally, eating quality depends on the cooking method.

What is eating quality?

Flavour, tenderness and juiciness are the three characteristics, in no particular order, that most people mention when describing the taste and eating experience of meat. They are the terms consumers use to describe their individual experiences, and they are the terms scientists use as their starting point in professional sensory and physical/chemical measurements.

The consumer's conclusion is: I either like it or I don't - a subjective assessment.

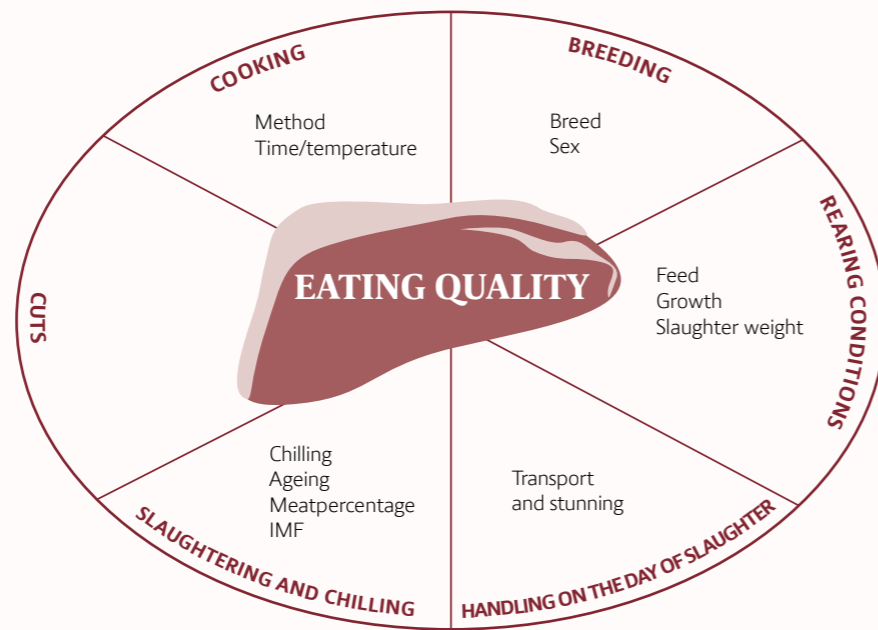
The scientist's conclusion is: juiciness and tenderness must be able to be measured on a given scale, and then described in appropriate technical terms - in other words, an evidence-based and objective assessment.



Multiple parameters influence the eating quality of the meat on your plate

It starts with the breed and sex of the animal and progresses from rearing conditions in the cowshed through transport, slaughter and ageing to cooking, which, as the final link, can optimise or ruin the eating quality of the meat.

Many factors affect the eating quality of beef. Here's an overview.



The special function of ageing

Each parameter has its influence on the final meat-eating experience, but ageing has a specific function in relation to beef and veal.

During the ageing process, enzymes in the meat break down various chemical bonds, making the meat more tender and easier to chew. Ageing also brings out a more intense meat flavour.

The vast majority of beef and veal ages the specific cut in a vacuum. The continued growth of lactic bacteria can give a slightly sour smell when the pack is opened. However, this goes away quickly and is not an indication of inferior quality.

Dry-aged meat is subject to much experimentation as, over time, both bacteria on the surface of the meat and enzymes in the meat bring about a wide variety of more intense flavours.

In relation to breeds, most of the Danish beef comes from the Danish Holstein dairy cattle breed. Based on the best dairy cow, and with optimal handling and ageing, meat from dairy cattle will have the same high quality as meat from beef cattle. Approximately 10% of cattle in Denmark are beef cattle breeds, such as Hereford, Simmenthaler and Charolais.

Experiments with feed show minor differences in eating quality between grass-fed animals and indoor-fed animals with concentrated feed. Indoor feeding results in slightly more tenderness and flavour, while grass feeding results in slightly more aftertaste. In Europe, consumers prefer meat from mixed-fed animals.

Read more about food quality: okologi.dk/opnaa-den-gode-spisekvalitet.pdf

How to achieve the ultimate taste and eating quality

Taste is one of the biggest factors when you ask consumers how they choose what to eat. How much your family, children, customers or guests like the food matters a lot, which is why it is important to know how best to prepare the meat.

The cooking method and, most importantly, the core meat temperature greatly affect the taste/eating quality.

The specific cut determines the cooking method and the combination of time and temperature. The more connective tissue the meat contains, the longer the cooking time and the higher the core temperature required to achieve the best results.

The similarity in thickness of steaks and schnitzels, and the diameter of joints, must be factored in when deciding on the cooking time and temperature. Fat layers, bone, cartilage and tendons also affect the cooking process.

Less pure cuts – those with a lot of connective tissue and/or fat content – are generally cheaper to buy. They develop a deep and intense flavour when cooked and are suitable for large portions that can last several days. Brisket and chuck rib are good examples.

The chart shows the correlation between cut, connective tissue, and cooking. The more connective tissue in the meat, the longer the cooking time and the higher the core temperature needed for the best result.

Finally, the eating experience is affected by external parameters, such as your company, ambiance, occasion, etc., just as the accompaniments to the meat and garnish affect the taste experience.

Connective tissue content in cuts of beef





Cooking meat

When you cook meat, you do it for three reasons, it must be:

- Tasty
- Safe to eat
- Easier to digest

There are many ways to cook meat. There are also many long-standing myths about cooking, of which few stand up to scientific examination.

In order to separate the most persistent myths from the facts and to achieve the best eating quality of beef and veal, the Danish Agriculture & Food Council, in collaboration with the Danish Meat Research Institute and the DTU Food Institute, has carried out a series of sensory tests of beef and veal cooked by different methods. These evaluations and sensory tests centre on the most common cuts from the retail trade.

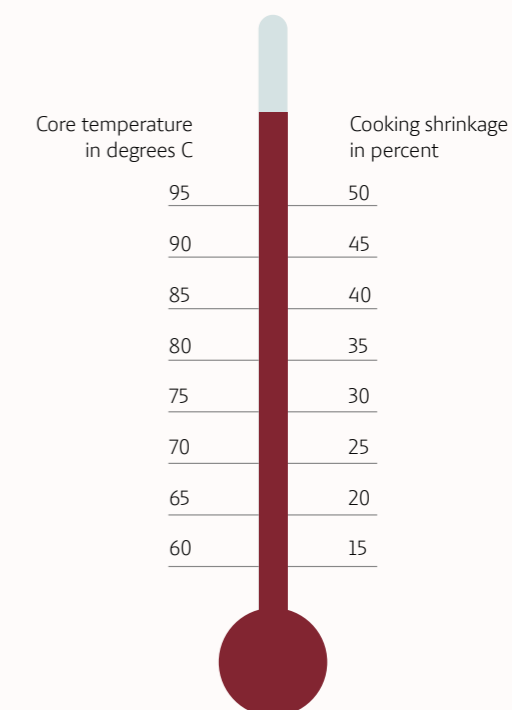
Myths and facts

MYTH: The more you cook steak, the tenderer it becomes.

It is a myth that you can cook lean meat tender. The more you cook steak, the more the juice evaporates, and the drier and stringier it becomes. If lean meat is not tender to begin with, no amount of cooking can change this.

It's a different story for cuts with a lot of connective tissue and fat marbling. Such cuts require longer cooking times and higher core temperature to become tender and achieve optimal eating quality.

Correct core temperature is crucial for the meat's tenderness, juiciness, taste, colour and for cooking shrinkage.



MYTH: The steak must be browned on high heat to close the pores of the meat.

No, you cannot close the pores in the meat - not even at a very high heat in a pan. This myth dates all the way back to 1850, when a German chemist put forward the thesis that the juice can be preserved inside the meat if the meat's pores could be closed. A few decades later, this claim was refuted. The juice in the meat evaporates no matter what, and you run the risk of the meat ending up too brown on the outside and too red on the inside.

The proteins in the meat change structure when heated, whereby liquid/meat juice is secreted, but the outer surface does not retain the juice.

At a high heat, the meat juice disappears as it evaporates. At lower heat, the juice runs out into the pan and frying turns into boiling.

MYTH: Steak absorbs fat from the pan.

Lean meat does not absorb fat from the pan. A thin film forms around the meat. For most cuts of meat, this is less than 1 g per 100 g of meat. Meat must be removed from the pan when done, or the fat will solidify as the temperature drops and settle on the meat. Fatty cuts render fat in varying amounts, while the intramuscular fat in these cuts provides flavour and juiciness.

Cut	Core temperature when serving (centigrade)
Fillet of beef	55-60 degrees
Short loin	55-60 degrees
Full rib	55-60 degrees
Culotte, rump, roast beef	58-62 degrees
Flank	58-62 degrees
Cuvette, top-side	60-65 degrees
Brisket, chuck rib	80- degrees
Silverside, shank (osso buco)	80- degrees

MYTH: The best steak is the one with the subcutaneous fat.

No, it's a myth that flavour resides in the fat and that a fatty edge of the steak adds flavour. There is no difference in the taste when you compare steaks fried with or without subcutaneous fat using the same cooking method.

MYTH: A roast needs to rest to be at its most juicy and tender.

No, your roast should not rest before carving. If the roast has been cooked to the desired core temperature, it makes no difference to the taste, tenderness, or juiciness whether you let the roast rest or carve it straight away. The roast loses juice when carved straight from the oven. It will lose a similar amount of juice during the resting time.

The higher the oven temperature, the more the core temperature increases. The core temperature increases 0-5 degrees, and the more the roast is wrapped in, the more the core temperature increases.

You can choose to take the roast out of the oven before the desired core temperature is reached. The roasting can then be completed with the roast fully wrapped, cutting cooking time and saving electricity. However, this may make it harder to determine how long it will take.

MYTH: Salt draws juice out of meat.

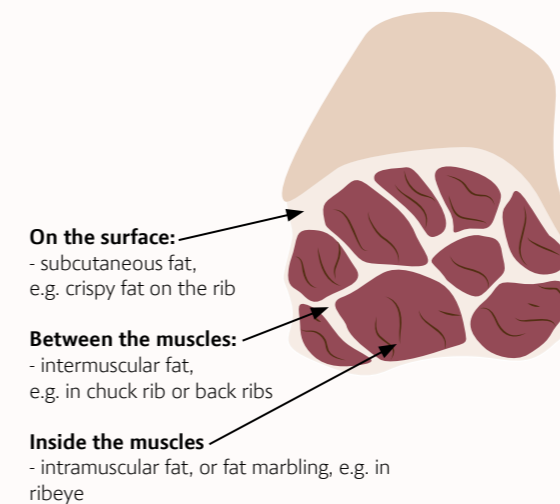
No, a mild salting (gourmet salting) does not draw juice from the meat, but can add more flavour and juiciness. However, this effect is less pronounced in beef or veal than it is in pork.

MYTH: Pre-salted meat has a hard time browning.

No, studies show no difference here. Meat will look just as brown whether salted beforehand or not, as long as the meat is patted dry before browning.

MYTH: It doesn't matter where the fat is.

Incorrect. Depending on where the fat is in the raw meat, it can melt away when cooked. Fat in meat is found in three places:



Fat marbling increases juiciness, tenderness and the roasted taste, and does not melt during cooking unlike, to some extent, subcutaneous and intermuscular fat.

INFO: Sous vide

"Sous vide" is a French expression meaning "under vacuum" or "vacuum sealed" and refers to the fact that the food is packed (possibly vacuum-packed) in a sealed plastic bag. Sous vide is a gentle cooking method for meat, fish, fruit, and vegetables at a precise low temperature. The food is packed in a sealed plastic bag that retains juice and flavour.

Meat rich in connective tissue or irregular cuts are full of flavour and different textures but are often tough. Sous vide can make them tender without loss of flavour and juiciness. Regular cuts (with less or little connective tissue) do not need to be tenderised, but sous vide can cook them evenly and precisely to the colour and texture that you prefer throughout the meat without the risk of over or under cooking.

In principle, sous vide is a complete cooking method, but it leaves the meat without the crispy rind and roasted flavour.

It is therefore recommended that you start or, even better, finish by browning the meat for a minute on each side. It does not have to be roasted, just browned at a high heat in a hot pan or grill.

Read about sous-vide: voresmad.dk/kokkeskole/sous-vide

INFO: Safe cooking

For many food safety is of the utmost concern while cooking beef, veal, and other meats. Ideally, safe cooking should never compromise good eating quality. DMRI - Danish Meat Research Institute has prepared documentation for safe cooking at low temperatures in the oven, in the pan, and in sous vide, while achieving the best eating quality and reducing shrinkage by 10%.

See the documentation reports here. They can also be used for documentation vis-à-vis Danish Veterinary and Food Administration inspectors.



Nutrition

Nutrients

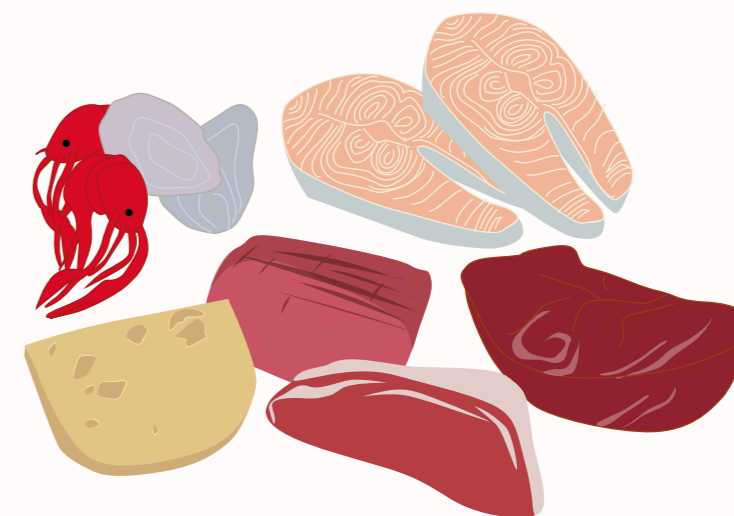
Besides the taste, many different cuts and well-known dishes, the nutritional value of beef is remarkable. Beef and veal are rich in high-quality protein, essential amino acids, fat, and a number of vitamins and minerals. The high content of nutrients makes meat an essential part of the Danish diet, particularly among consumers with special nutritional needs.

A multitude of different cuts of beef and veal offer varying amounts of micro and macro nutrients. Typically, meat has a high amount of quality protein, varying fat content and a low amount of carbohydrate. Beef also contains easily absorbable iron, of which many women, particularly in the 15-35-year age group, consume too little.

There is no evidence that a diet completely without meat is healthier than a balanced and varied diet with meat. However, you can reach a sufficient level of nutrients without eating meat. For anyone on a meat free diet, care must be taken to choose other foods that contain protein, vitamin B, iron, zinc and selenium.

*See macro and micro nutrients for selected cuts of beef and veal:
ernaeringsfokus.dk/næringsstofftabel*

Absorbable B12 vitamins are found only in food of animal origin.



Protein

Protein is made up of amino acids. Meat contains all nine vital (essential) amino acids in sufficient quantities for us to benefit from them. This is different from plant-based protein sources, which must be combined from several sources to provide all the essential amino acids.

Proteins of animal origin have significantly better absorbability (scores) than the vegetable proteins.

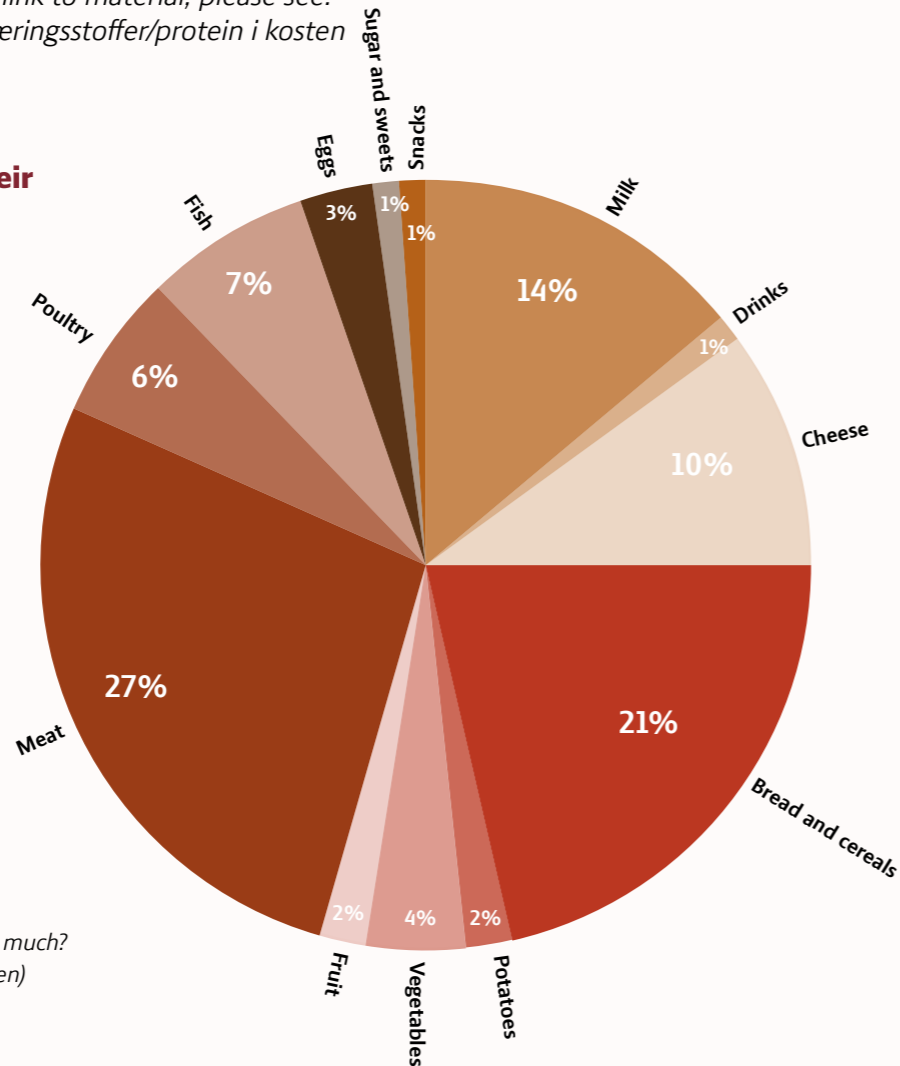
Most people eat a mixture of animal and vegetable proteins. Vegetarians can get enough protein when their diet includes peas, lentils, beans, seeds, grains, and nuts. But you cannot replace steak with beans one-to-one.

In order to achieve a sufficient intake of essential amino acids in a vegetarian/vegan diet, new dishes, other cooking methods, and planning are required as some legumes must be soaked for 10-12 hours prior to being boiled for 45 minutes.

Most Danes get sufficient or plentiful protein. 25-50% of the population get at least 15E% of protein through their diet. 1% of the population gets less than 10E% protein and 1% gets more than 20E% protein.

For further information and link to material, please see: ernaeringsfokus.dk/makronaeringsstoffer/protein-i-kosten

Where do Danes get their protein from?



Source: Proteins - do the Danes get enough and can you have too much? (ernaeringsfokus.dk/protein-i-kosten)

Fat

Fat in your diet is vital, as it is an important source of energy and provides important body functions, such as in the formation of body tissue. Fat is also a carrier of fat-soluble vitamins A, D, E and K. Some fats are vital because we can only get them through certain foods. They cannot be replaced by other types of fat.

Basically, there are two types of fatty acids - saturated and unsaturated. The unsaturated fatty acids can be divided into two groups: monounsaturated and polyunsaturated.

Another special type of unsaturated fatty acid is called trans fatty acids. These are found naturally in smaller amounts (3-6%) in fat from beef, mutton and milk.

Trans fatty acids can also be produced industrially by heating and using oils at very high temperatures over long periods of time, and by industrial hydration of unsaturated vegetable oils in the production of semi-solid or solid fats used in the production of food products. Industrially produced trans fats can be found in margarine, cakes, and biscuits, fast food, and snacks. Trans fatty acid content is limited by EU regulation and must not exceed 2 g per 100 g of fat in food.

Fat content in 100 g of raw beef

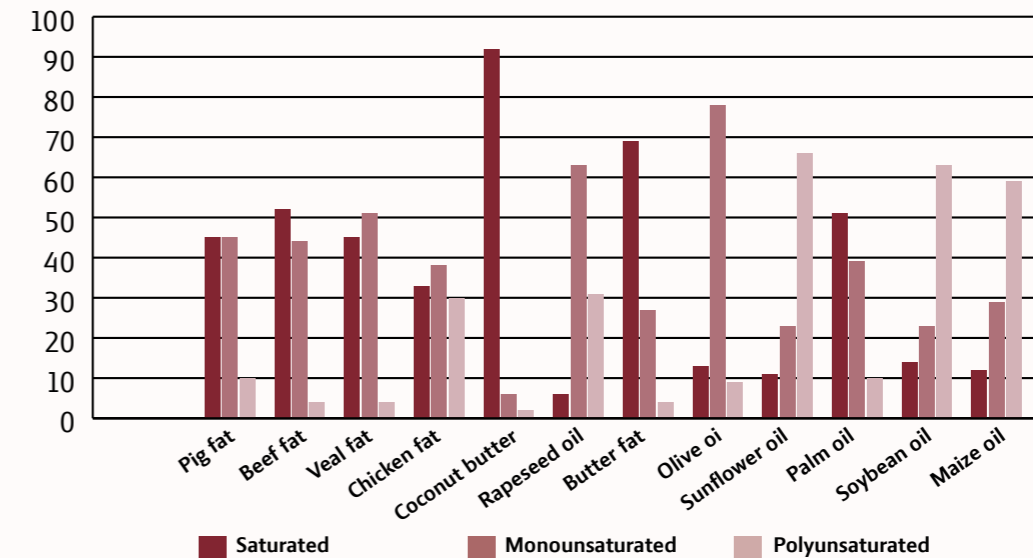
Beef topside, with no subcutaneous fat	2 g
Osso Buco	4 g
Full rib fillet, trimmed	5 g
Fillet of beef	6 g
Silverside	7 g
Minced beef (10-15% fat)	10 g
Beef culotte	15 g
Brisket	16 g
Full rib fillet with subcutaneous fat	17 g
Entrecote	21 g
Thin flank	28 g
Short rib	30 g

Fat content in different types of meat, per 100 g raw meat

- Completely lean meat
- Lean meat
- Medium fat and fatty meat

Source: Food database Frida.

Fat distribution in different products



Iron

Iron is a micronutrient, with performing numerous important functions in the body. It produces haemoglobin, which carries oxygen from the lungs and on to the tissue. Iron helps maintain the immune system and prevents fatigue.

Iron is found in our food as either heme iron or non-heme iron. Heme iron is mostly obtained from animal products such as beef, liver pâté (liver), eggs, and fish. Heme iron is most bioavailable - 15-35% is absorbed into the body. Non-heme iron is found in dark green vegetables, cereals, and fruit. The absorption rate is affected by what you otherwise eat and therefore fluctuates from 2-20%.

Absorption increases if non-heme iron from, e.g., kale, is eaten together with meat, fish, or vitamin C-rich foods, fruit, or vegetables. The effect of meat on the absorption of iron from the other elements of a meal is called the 'meat factor'. In contrast, absorption is reduced if non-heme iron is eaten together with calcium from, e.g., dairy products.

Iron deficiency

If you don't get enough iron from food, you risk developing iron deficiency – the most common deficiency in the global population. In Denmark, approximately 40% of women have low iron intake. Among 18-35-year-old women, 75% fall below the average recommended intake.



100 g kale
2mg iron



78 g cooked lentils
2mg iron



65 g rump steak
2mg iron



22 g sesame seed
2mg iron



91 g wholegrain rye bread
2mg iron



113 g eggs (2 small eggs)
2mg iron



83 g raisins
2mg iron



33 g unsalted cashew nuts
2mg iron



900 g farmed salmon
2mg iron

The indicated amounts of nutrients are based on data from the Food Database FRIDA and do not take bioavailability into account.

[Link to more information about iron in the diet:](#)

Dietary habits of the Danes 2011 – 2013

The nutritional importance of meat, Danish Agriculture & Food Council, 2019

Vitamins and minerals

Lean meat is packed with nutrients and contains B vitamins, iron, zinc, and selenium. Less lean cuts contain saturated fat and are an important source of vitamin D.

Meat is an important source of many different vitamins and minerals. Meat and offal contain almost all types of B vitamins. They are important for the functioning of the immune system, the nervous system and the enzyme system and are necessary for the conversion of fat, protein, and carbohy-

drates. According to the table below, 100g of beef, for example, provides 56% of the recommended daily intake of Vitamin B12. Food of animal origin is one of the most valuable sources of vitamin B12. A low level in the diet and a poor absorption level can lead to B12 deficiency, which is particularly widespread among the elderly.

The table shows how 100 g of various types of meat contribute in percentage terms to the recommended daily intake.

Nutrients	Pork (3.3 % Fat)	Beef (4.3 % Fat)	Veal (5.2 % Fat)	Lamb (5.5 % Fat)	Chicken (5.6 % Fat)	Liver pâté (18.7 % Fat)
Protein	79 %	74 %	64 %	66 %	62 %	20 %
Vitamins						
Vitamin A						494 %
Vitamin C						36 %
B ₁ , Thiamin	103 %			16 %		
B ₂ , Riboflavin	18 %			22 %		73 %
B ₃ , Niacin	26 %	39 %	39 %	27 %	52 %	28 %
B ₅ , Pantothenic acid			15 %		18 %	27 %
B ₆ , Pyridoxine	27 %	23 %	29 %		28 %	15 %
B ₇ , Biotin						48 %
B ₉ , Folate						85 %
B ₁₂ , Cobalamin	24 %	56 %	52 %	48 %	17 %	396 %
Minerals						
Potassium	24 %	18 %	16 %	18 %		
Phosphorus	31 %	24 %	25 %	30 %	25 %	23 %
Iron		15 %	15 %	16 %		40 %
Zinc	18 %	36 %	43 %	33 %		25 %
Copper						41 %
Manganese						
Selenium	19 %		15 %		23 %	35 %
Chromium				20 %		

The following designations from the Food Database FRIDA are used to calculate nutrient content: Pork: tenderloin, trimmed, raw (3.3% fat), Beef: Beef, unsp., lean, raw (4.3% fat), Veal: lean, raw (5.2% fat), Lamb: Leg of lamb, trimmed (5.5% fat), Chicken: Chicken meat, raw (5.6% fat) and Liver pâté (18.7% fat)

Population groups benefiting from beef and veal

The elderly - need a little more protein. From age 65 years and up, 15-20E% protein is recommended, corresponding to an average of 1.2 g per kg body weight. Many elderly people move less than when they were younger and have less appetite. When you eat less, you get less protein, which affects your ability to maintain your muscle mass. Therefore, the protein content in your diet should be slightly higher.

Read more here:
altomkost.dk/raad-om-mad-naar-du-er-over-65-aar

Children - should not have extra protein. Only 1% of Danish children get less protein than recommended. Infants below the age of 1 even risk getting too much. Their kidneys are not fully developed to excrete the waste products quickly enough.

Risk groups

Your body is in particular need of iron during growth and when replacing blood loss. Therefore, infants, teenagers, pregnant women and women of childbearing age, blood donors and people who practice extreme sports are particularly vulnerable to iron deficiency.

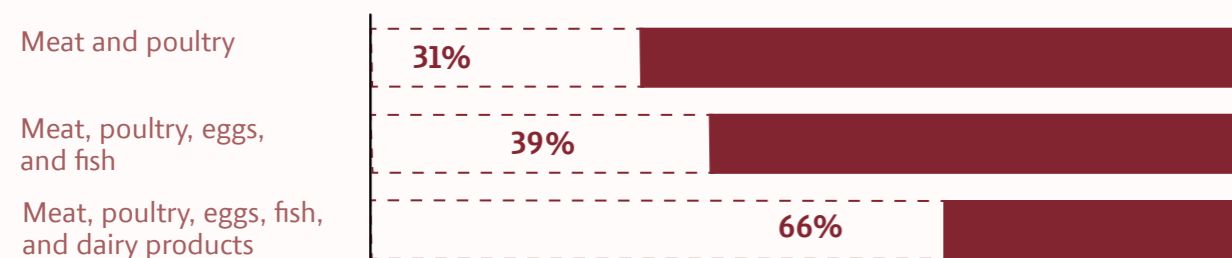
If you remove all meat incl. poultry from the average diet, 31% of the protein disappears.

If you also remove eggs and fish, a total of 39% of the protein is gone.

If, on top of that, you also remove all dairy products, a total of 66% of the average diet's protein is gone along with a number of vitamins and minerals. The Danish Veterinary and Food Administration therefore recommends that vegans take nutritional supplements to cover their nutrient requirements

Read more here:
altomkost.dk/raad-og-anbefalinger/vegetarer-og-veganere/

This is how much protein disappears from the average diet if you remove the following:



Red and processed meat

Red meat is the term for meat from four-legged animals. These are cows, calves, pigs, lambs, sheep, and goats.

Whether meat is categorised as red or white has nothing to do with how long it is cooked or what colour it had before or after cooking. It is a matter of origin. Processed meat, as an example, is smoked and cured, including cooked meat, sausages, and bacon.

A number of studies have been carried out on the importance of red and processed meat in the development of colon and rectal cancer. However, no unequivocal conclusion can be drawn, as some studies point in one direction, others in another.

The fact is that it's a complex issue to determine what causes what, and that singling out one factor as the cause of cancer is difficult. Many lifestyle factors contribute to an individual's risk of disease. Smoking, alcohol intake, the level of physical activity and how much wholegrain, fruit, vegetables and sweet things you eat all have an impact. Factors such as shift work, economic status, educational level, sleep, weight, age, sex, and genetic disposition are also important in the development of disease.

Read more here:
ernaeringsfokus.dk/foedevarer/koed/

If you want to know more

This material describes a number of the most important taste and nutritional qualities of beef and veal. If you are more curious, just dive into a world of knowledge, recipes, free material and inspiration, including:

Links to more resources

All about nutrition and health

ernaeringsfokus.dk

Recommendations, recipes, suggestions for daily meals and much more

ernaeringsfokus.dk/materialer/vda

More about cooking, taste and nutrition

goderavaarer.dk/koed/okse-kalv

Recipes with beef, veal and legumes

voresmad.dk/kokkeskole/opskrifter-med-oksekoed-og-baelgfrugter

The official Dietary Guidelines

altomkost.dk/raad-og-anbefalinger/de-officielle-kostraad

Cuts and nutrients, beef

frida.fooddata.dk/food/lists/grouped/56/58?#group58

Cuts and nutrients, veal

frida.fooddata.dk/food/lists/grouped/56/59?#group59

Fakta om fødevareklyngen Facts about the food cluster

lf.dk/tal-og-analyser/fakta-om-foedevareklyngen

Climate facts

lf.dk/viden-om/klima

The animal welfare label

bedre-dyrevelfaerd.dk/servicemenu/english

Danish Master Butchers

danskesslagtermestre.dk

Carving board

ernaeringsfokus.dk/media/puxp4fya/12904_dk_a4_okse_11_lf.pdf

Knowledge and education

madkundskabsforum.dk/madlavning-og-maaltider



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