



Meat in human nutrition, a review of topical issues and scientific answers to them

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Abstract. The article covers the following topics: the most useful way to cook meat, artificial meat, 5 types of meat with the least amount of cholesterol, whether it is necessary to wash the meat before cooking, whether it is possible to eat raw meat or fish.

Key words: meat, artificial meat , raw meat, cholesterol, beneficial properties, contraindications, composition, calorie content, cooking methods

What is the healthiest way to cook meat: science-based facts

Meat is a valuable source of vitamins, useful trace elements and animal proteins - organic substances that play an important role in human life. Scientists say that this product must certainly be present in the diet of both adults and babies. But in order for meat to bring maximum benefit to the body, special attention should be paid to the method of its preparation.

The main methods of cooking meat: which is healthier

Consider the most popular methods of cooking meat, find out which one is the most useful.

- **Boiling**

Thermal treatment of meat by boiling in water makes it possible to obtain a dietary product rich in animal protein. But it should be borne in mind that with this method of preparation, a large amount of water-soluble vitamins is lost. They are boiled into broth (however, like harmful substances, in particular, chemistry, which the animal was fed and injected with during life). Therefore, the first water that formed immediately after boiling must be drained. It is also not recommended to use rich broths for people suffering from gout due to the high concentration of purines in them. ^[1] As for the benefits of boiled meat, taking into account the absence of most of the vitamins and nutrients in it, there is not so much of it here. Such food can only fully saturate the body with the proteins it needs.

- **Roasting and baking**

This cooking method allows you to maximize the preservation of most of the vitamins contained in meat, except for those that belong to group B (they disappear from prolonged exposure to high temperatures). At the same time, under the influence of high temperatures, the structure of the protein changes, which negatively affects its digestibility. ^[2] Therefore, excessively overcooked meat not only loses its taste and becomes drier, but also loses its beneficial properties, is less digestible, and can even be dangerous to health. A dark and burnt crust indicates the formation of a dangerous carcinogen, acrylamide, in the product. Therefore, such parts should never be used for food.

- **Grilling**

Such meat does not contain excess fat, which drains during the cooking process. In addition, it cooks much faster than when frying or baking, that is, it is less exposed to high temperatures, which contributes to the preservation of most of the vitamins and minerals. But there are nuances in this method of preparation. In addition to the fact that grilled foods should also not be baked to the formation of a dark crust that is unhealthy, it should also be borne in mind that fat dripping onto burning coals forms carcinogenic fumes. Therefore, for cooking dishes, including meat, it is better to use a modern electric grill, choose parts that are not too fatty, and also reduce the thickness of the fried pieces in order to reduce the time of thermal exposure to the product.

- **Extinguishing**

In the process of stewing, the meat does not lose as many nutrients as when cooked, it does not form a dark baked crust that is harmful to health (of course, if it does not burn during the cooking process). To obtain the most useful product, it is recommended to stew meat at low temperatures (up to 100 degrees Celsius), without the use of additional fats (vegetable oil, etc.), with the addition of water or broth, if the meat's own juice is not enough.

- **sous vide**

Sous vide or vacuum cooking. A fairly young cooking technology invented by a French chef in the 70s of the last century. With the Sous Vide method, products, in this case meat, are placed in a plastic bag, from which air is pumped out (a vacuum is created), and then cooked in a water bath at a temperature of 55-70°C. With this method of cooking, the meat is homogeneous, retains most of its moisture - very juicy and tender due to the slow dissolution of collagen. It preserves to the maximum all vitamins, microelements and amino acids - they are not destroyed under the influence of high temperatures. The cooked dish is absolutely safe - the heat treatment temperature is high enough to kill parasites and harmful microorganisms.

Based on this list of ways to cook meat, nutritionists have distributed them as follows, starting from the most useful to the least. Sous-vide technology was put in first place, stewing in second, grilling in

third, and boiling in fourth. The last place was taken by the roasting method due to the high risk of carcinogenicity.

How to cook healthy meat: expert advice

- Watch the temperature. Avoid using large fires - high temperatures provoke the formation of dangerous chemical compounds, carcinogens.
- Do not bake or fry the meat until golden brown. Perhaps this dish looks more appetizing, but it produces a hazardous substance, acrylamide. ^[3]
- Install a good range hood in your kitchen. Studies show that constant exposure to fumes emitted during cooking, especially when using an electric stove, is unfavorable for health - they have carcinogenic risks ^[4], which can lead to the formation of cancer.
- Marinate the meat before frying. The acidic environment accelerates the process of protein breakdown, which reduces the cooking time (the product is less heat treated), the meat is tender and juicy.
- Cover the pot while cooking. When products come into contact with air, more advanced glycation end products are formed. When ingested (including by inhalation), such substances provoke the development of degenerative diseases: Alzheimer's disease, diabetes ^[5], atherosclerosis, etc., accelerate the aging process of the body.
- Use antioxidant spices in the cooking process: cloves, oregano, rosemary, thyme, turmeric, etc.

Expert comment

Tatyana Eliseeva, nutritionist, nutritionist

Experiment, use different ways of cooking meat to find the perfect technique for yourself and diversify your diet. But don't forget the above recommendations to avoid health risks and prepare the most delicious and healthy meals.

Literature

1. Villegas, R., Xiang, YB, Elasy, T., Xu, WH, Cai, H., Cai, Q., ... & Shu, XO (2012). Purine-rich foods, protein intake, and the prevalence of hyperuricemia: the Shanghai Men's Health Study. *Nutrition, Metabolism and Cardiovascular Diseases*, 22(5), 409-416. DOI: 10.1016/j.numecd.2010.07.012
2. Bhat, ZF, Morton, JD, Bekhit, AEDA, Kumar, S., & Bhat, H.F. (2021). Thermal processing implications on the digestibility of meat, fish and seafood proteins. *Comprehensive Reviews in Food Science and Food Safety*, 20(5), 4511-4548. DOI: 10.1111/1541-4337.12802
3. Koszucka, A., Nowak, A., Nowak, I., & Motyl, I. (2020). Acrylamide in human diet, its metabolism, toxicity, inactivation and the associated European Union legal regulations in the food industry. *Critical reviews in food science and nutrition*, 60(10), 1677-1692. DOI: 10.1080/10408398.2019.1588222
4. Gorjinezhad, S., Kerimray, A., Amouei Torkmahalleh, M., Keleş, M., Ozturk, F., & Hopke, PK (2017). Quantifying trace elements in the emitted particulate matter during cooking and health risk assessment. *Environmental science and pollution research*, 24, 9515-9529. DOI: 10.1007/s11356-017-8618-0
5. Kellow, NJ, & Coughlan, M.T. (2015). Effect of diet-derived advanced glycation end products on inflammation. *Nutrition Reviews*, 73(11), 737-759. DOI: 10.1093/nutrit/nuv030

Artificial meat: harmful or useful? Scientific evidence

In the struggle for ecology and the preservation of the environment, an increasing number of scientists propose to abandon animal husbandry in favor of creating artificial meat that is harmless to nature. But how safe is such an artificially created product for the human body, and can “test-tube meat” become a full-fledged replacement for natural pork or beef? We will study these issues in more detail, based on scientifically substantiated facts and evidence.

Why are they looking for analogues of natural meat?

The world's population is growing inexorably. It needs to be fed, including such an important source of protein and useful trace elements as meat. ^[1] For these purposes, it is necessary to constantly increase the number of livestock, which, in turn, requires huge costs - an increase in pasture areas, a significant consumption of drinking water, etc. In addition, animals exhale large volumes of carbon dioxide, which aggravates an already difficult situation. with greenhouse effect.

The scientists came to the conclusion that by finding an alternative to natural meat, it is possible not only to solve the problem of the greenhouse effect, to save the planet's diminishing drinking water reserves every year, but also to find additional useful use for land now used for pastures and meadows. ^[2]

What is artificial meat and its varieties

Currently, researchers have found two main types of replacement of natural meat with artificial.

vegetable

A product made from vegetable ingredients: rice or soy protein with the addition of coconut or rapeseed oils and natural dye in the form of beetroot juice. A patty made from vegetable minced meat contains more protein than a real meat patty, and it is also guaranteed to be free of antibiotics, cholesterol, GMOs and other harmful additives. Semi-finished products from vegetable meat have been present on the shelves of specialized supermarkets for a long time. This is a great alternative for people who have excluded food of animal origin from their menus, that is, vegetarians. But, when planning to completely switch to a diet of plant origin, it should be borne in mind that the biological value of animal protein is higher and it is better absorbed than vegetable protein.

cultivated

It is this product that is called "meat from a test tube." This name is explained by the fact that it is grown in laboratory conditions using a 3D printer ^[3] from natural animal muscle stem cells. Cells grow and develop in a favorable environment and gradually turn into muscle fibers, and then into a whole piece of meat. ^[4] That is, it is, as it were, real meat, but it does not contain harmful additives (drugs, antibiotics, hormones, etc.) and obtained without the process of killing animals. In addition, its production does not harm the environment: there is no greenhouse effect, there is no need to use a huge amount of drinking water, etc. True, such a steak is currently much more expensive than an ordinary piece of meat and it is not yet available for free sale. But perhaps the situation will change very soon.

What is healthier: natural or artificial meat?

When betting on a plant-based product derived from soy protein, users should be aware that such a choice will not be a full replacement for natural meat. Of course, it does not contain harmful ingredients (antibiotics, cholesterol dangerous for blood vessels, etc.), it contains fewer calories (due to

the reduced amount of fat), but it should also be borne in mind that it does not contain many useful amino acids and trace elements necessary for a complete body development. Therefore, in order to compensate people who have replaced natural meat with a vegetable analogue, nutritionists recommend adding as many fruits and vegetables to the diet as possible, including eating avocados, nuts, dairy products and cereals (rice, barley, wheat, rye). etc.).

Meat in vitro, or cultured, is closer in composition to natural meat. That is, it is also an animal protein (although artificially created), but at the same time it does not contain harmful impurities that are often present in industrially grown analogues: antibiotics, hormones, growth stimulants, parasites, etc., it would seem, synthesized meat is an ideal invention for the salvation of mankind. But so far, this product is only at the development stage and requires more thorough scientific research to ensure its guaranteed safety for the human body.

Expert comment

Tatyana Eliseeva, nutritionist, nutritionist

Perhaps, in a very short time, artificially created meat will fully replace the natural analogue grown naturally. But until this happens, we advise you not to exclude real meat from your diet. We simply recommend choosing the safest varieties of it, containing a lower percentage of cholesterol, as well as preparing it correctly in order to bring maximum benefit to the body.

Literature

1. McAfee, AJ, McSorley, EM, Cuskelli, GJ, Moss, BW, Wallace, JM, Bonham, MP, & Fearon, AM (2010). Red meat consumption: An overview of the risks and benefits. *Meat science*, 84(1), 1-13. DOI: 10.1016/j.meatsci.2009.08.029
2. Rust, N.A., Ridding, L., Ward, C., Clark, B., Kehoe, L., Dora, M., ... & West, N. (2020). How to transition to reduced-meat diets that benefit people and the planet. *Science of the Total Environment*, 718, 137208. DOI: 10.1016/j.scitotenv.2020.137208
3. K. Handral, H., Hua Tay, S., Wan Chan, W., & Choudhury, D. (2022). 3D Printing of cultured meat products. *Critical Reviews in Food Science and Nutrition*, 62(1), 272-281. DOI: 10.1080/10408398.2020.1815172
4. Kadim, IT, Mahgoub, O., Baqir, S., Faye, B., & Purchas, R. (2015). Cultured meat from muscle stem cells: A review of challenges and prospects. *Journal of Integrative Agriculture*, 14(2), 222-233. DOI: 10.1016/j.meatsci.2012.04.008

What 5 types of meat can be eaten with high cholesterol: recommendations from a nutritionist

Experts say that malnutrition is one of the main causes of the development of cardiovascular diseases, including the occurrence of heart attacks and strokes. The relationship lies in the consumption of high amounts of cholesterol along with unhealthy foods. But, as studies show, not all cholesterol is bad, and not all seemingly “unsafe” foods are so in practice. For example, many types of meat are absolutely harmless to vascular health. Moreover, their consumption helps to improve metabolism, and sometimes reduce the risk of atherosclerosis.

Cholesterol is good and bad: we understand the concepts

In fact, there is only one cholesterol. This is an important organic compound belonging to the class of lipids (fats), involved in the structure of cell membranes, the synthesis of hormones and vitamins. It

becomes “bad” or “good” depending on the type of transport apolipoprotein to which it is attached to move through the blood vessels. There are 2 main groups of lipoproteins:

- Low density lipoproteins (LDL). They are formed in the liver cells, and then carry cholesterol from it to all other organs and easily give it away along the way. It is this cholesterol that belongs to the category of "bad" - it forms plaques on the vessels, which are the cause of atherosclerosis, stroke and heart attack [1].
- High-density lipoproteins (HDL) are classified as "good" cholesterol. It is they who collect excess cholesterol through the bloodstream, clearing the walls of blood vessels from it and returning it back to the liver.

Only 1/5 of cholesterol enters the body from food. The remaining 80% we produce ourselves. If you sharply reduce the amount of incoming cholesterol from the outside, its independent production can increase the body itself, sometimes in excessive amounts, which can be harmful. Therefore, you should not completely refuse food containing cholesterol. You just need to choose the foods you add to your diet more carefully and consume them in moderation. This also applies to meat.

5 Healthy Meats That Are Low in Cholesterol

- **Rabbit**

Rabbit meat has excellent nutritional and dietary properties - it contains a high percentage of protein (more than chicken) and is almost completely absorbed by the human body (by 90%, while in beef this figure is only 60%). In addition, rabbit meat contains a large amount of polyunsaturated fatty acids (they protect the liver from inflammation, the risk of developing fibrosis and cirrhosis, have antiepileptic properties [2]), and it also contains relatively little cholesterol [3].

- **Turkey**

Turkey meat is the most dietary and high-protein, contains a minimum of fat and a small amount of cholesterol (109 mg per 100 grams of product). In addition, it is a source of peptides with antioxidant properties [4], in particular, carnosine (improves metabolism and helps in the fight against hypoglycemic syndrome), the amino acid tryptophan [5] eliminates signs of depression, improves mood and sleep.

- **Chicken**

Chicken meat is quite a bit inferior in benefits to turkey, but is also an excellent source of lean healthy protein, which the body needs to build cells. Especially white meat - breast. It contains only 85 mg of cholesterol per 100 grams of the product, as well as a lot of [B vitamins](#) (improve cognitive functions [6], help strengthen the body's defenses) and iron (participates in the process of DNA repair, prevents the development of anemia [7]). But before cooking, it is recommended to remove the chicken skin, which contains much more cholesterol and harmful trans fats.

- **Quail**

Quail meat also belongs to the category of easily digestible dietary and most beneficial products for the body. It has a minimum of cholesterol (86 mg per 100 g), but it contains many vitamins [8], minerals, and other useful trace elements. In particular, quail meat is a source of the amino acid tyrosine, which helps improve attention and memory [9], helps fight stress and depression, and improves thyroid function.

- **Mutton**

Many people think that lamb belongs to fatty types of meat and therefore is categorically not suitable for people who monitor cholesterol levels. This is wrong. Cholesterol in this type of meat contains only 97 mg / 100 g. Moreover, it contains a fat-like substance lecithin, a complex of phospholipids that control the breakdown of cholesterol, normalize its level in the blood and prevent atherosclerosis.

Expert comment

Tatyana Eliseeva, nutritionist, nutritionist

Meat is a useful source of protein, vitamins, unique trace elements and amino acids. Therefore, this product must be present in the human diet - even those people who have problems with high blood cholesterol or even suffer from atherosclerosis. To eat healthily and safely, choose the healthiest low-cholesterol meats, cook them properly, and stick to healthy and reasonable portion sizes throughout your meals.

Literature

1. Mohammed, S.R., Kevin, W., (2017) Atherosclerosis, 1003:121-144. DOI: 10.1007/978-3-319-57613-8_7
2. Farnen, A.H., Lossius, M.I., & Nakken, K.O. (2009). Flerumettede fettsyrer og epilepsi. Tidsskrift for Den norske legeforening. DOI: 10.4045/tidsskr.2009.34487
3. Kumar, SA, Kim, HJ, Jayasena, DD, & Jo, C. (2023). On-Farm and Processing Factors Affecting Rabbit Carcass and Meat Quality Attributes. Food Science of Animal Resources, 43(2), 197-219. DOI: 10.5851/kosfa.2023.e 5
4. Martini, S., Conte, A., & Tagliazucchi, D. (2019). Comparative peptidomic profile and bioactivities of cooked beef, pork, chicken and turkey meat after in vitro gastro-intestinal digestion. Journal of proteomics, 208, 103500. DOI: 10.1016/j.jprot.2019.103500
5. Parazzini, F. (2015). Resveratrol, tryptophanum, glycine and vitamin E: a nutraceutical approach to sleep disturbance and irritability in peri-and post-menopause. Minerva gynecologica, 67(1), 1-5. PMID: 25660429
6. Gil Martínez, V., Avedillo Salas, A., & Santander Ballestín, S. (2022). Vitamin supplementation and dementia: a systematic review. Nutrients, 14(5), 1033. DOI: 10.3390/nu14051033
7. Elstrott, B., Khan, L., Olson, S., Raghunathan, V., DeLoughery, T., & Shatzel, JJ (2020). The role of iron repletion in adult iron deficiency anemia and other diseases. European journal of haematology, 104(3), 153-161. DOI: 10.1111/ejh.13345
8. Quaresma, MAG, Antunes, IC, Ferreira, BG, Parada, A., Elias, A., Barros, M., ... & Roseiro, LC (2022). The composition of the lipid, protein and mineral fractions of quail breast meat obtained from wild and farmed specimens of Common quail (*Coturnix coturnix*) and farmed Japanese quail (*Coturnix japonica domestica*). Poultry Science, 101(1), 101505. DOI: 10.1016/j.psj.2021.101505
9. Hase, A., Jung, SE, & aan het Rot, M. (2015). Behavioral and cognitive effects of tyrosine intake in healthy human adults. Pharmacology Biochemistry and Behavior, 133, 1-6. DOI: 10.1016/j.pbb.2015.03.008

Should you wash meat before cooking? Understanding scientific research

Many housewives are sure that all products must be thoroughly washed before cooking to wash away dirt and germs from them. This statement absolutely does not apply to meat. Moreover, many experts categorically do not recommend washing raw meat before cooking. And there are scientifically sound arguments for this.

Some Good Reasons Not to Wash Meat Before Processing

- Dangerous

On the surface of raw meat, in fact, there are many bacteria and microorganisms ^[1], including dangerous ones such as Salmonella ^[2] and Listeria monocytogenes ^[3]. They are not afraid of water, but under pressure, liquids can be sprayed into the air, scatter on the walls of the sink, faucet, countertop, from where they can freely enter the human body and cause severe poisoning. This is called cross contamination. ^[4] In addition, on the surface of a washed piece of meat, which has been at room temperature for some time, pathogenic organisms begin to multiply even more actively, which increases the risks to others.

- Useless

As mentioned above, pathogenic bacteria are not destroyed by running water. But they die when exposed to high temperatures. ^[5] Roasted or baked meat will be absolutely safe, perfectly cooked and retain all its flavor without pre-rinsing. When cooking meat, nutritionists recommend simply draining the first broth. That is, you can start the cooking process immediately, taking the meat out of the package, without wasting time on disinfecting it.

- Spoils the taste of the finished dish

Water washes away the protective layer from the meat and deeply impregnates the fibers. In the process of frying on such meat, an appetizing crust will not appear - the juices in it are not sealed. The pieces will boil/stew rather than fry until all the liquid has evaporated from them. As a result of cooking, pre-washed meat will be overcooked, dry and not juicy.

Washing meat before freezing is also not recommended. In addition to all of the above reasons, such a procedure will significantly reduce its storage time.

Recommendations for processing raw meat

1. If it becomes necessary to remove pieces of wrapper from a pork ham or chicken fillet, other rubbish - use tweezers, in extreme cases, rinse them slightly with water, and then blot thoroughly with a disposable paper towel.
2. Store-bought meat should be carried in a separate bag from other foods to avoid cross-contamination with meat juice. ^[6]
3. Use separate boards for cutting raw meat. After work, thoroughly wash your hands, the cutting board itself, knives, sink, countertop and adjacent wall with hot water and special detergents.
4. Use a cooking thermometer to monitor the cooking temperature of your food and be absolutely certain that all unsafe micro-organisms have been killed during the cooking process.

Expert comment

Tatyana Eliseeva, nutritionist, nutritionist

By breaking the habit of washing raw meat, you can avoid the risk of cross-contamination, learn how to create amazing-tasting dishes, and are guaranteed to save cooking time.

Literature

1. Rybak, Bartosz, et al. "Raw Meat Contaminated with Cephalosporin-Resistant Enterobacterales as a Potential Source of Human Home Exposure to Multidrug-Resistant Bacteria." *Molecules* 27.13 (2022): 4151. DOI: 10.3390/molecules27134151
2. Koh, Youngho, et al. "Prevalence and Characteristics of Salmonella spp. Isolated from Raw Chicken Meat in the Republic of Korea." (2022): 1307-1314. DOI: 10.4014/jmb.2207.07031
3. Bialvaei, Abed Zahedi, et al. "Epidemiological burden of Listeria monocytogenes in Iran." *Iranian Journal of Basic Medical Sciences* 21.8 (2018): 770. DOI: 10.22038/IJBMS.2018.28823.6969
4. Vatrál, Christopher D., Abigail D. Gilman, and Jennifer J. Quinlan. "Consumer Awareness of the Message Not To Wash Raw Poultry, Current Practices, and Barriers to Following That Message." *Journal of Food Protection* 85.6 (2022): 930-937. DOI: 10.4315/JFP-21-324
5. Gurman, PM, et al. "Thermal inactivation of Salmonella spp. in pork burger patties." *International Journal of Food Microbiology* 219 (2016): 12-21. DOI: 10.1016/j.ijfoodmicro.2015.11.014
6. Chen, Fur-Chi, et al. "Contamination by meat juice when shopping for packages of raw poultry." *Journal of food protection* 81.5 (2018): 835-841. DOI: 10.4315/0362-028X.JFP-17-467

Can you eat raw meat and fish? Expert opinion

Raw meat and fish dishes are present in the cuisines of different peoples of the world: stroganina, tartare, carpaccio, sashimi, sushi ... their absorption by the body. Is this really so and how safe are such unusual delicacies for human health? We will deal with these and other related issues in more detail, taking into account scientifically proven facts.

Benefits of raw meat and fish

Experts have a controversial opinion - whether it is worth including thermally unprocessed meat and fish in the diet of people. Although some scientific experiments and experiments prove that such a product contains more useful substances.

Studies show that under the influence of high temperatures, many of the nutrients and vitamins originally contained in meat are destroyed, their amount is significantly reduced. For example, fried beef contains 32% less vitamin B12 (cyanocobalamin, which the body needs for hematopoiesis and the normal functioning of the nervous system) than a raw product. ^[1] Experiments conducted with fish, in particular roach, also show a much higher content of beneficial omega-3 fatty acids in raw fillets than in thermally processed ones. Also, all cooking methods affect a significant decrease in vitamins A, [D](#), B1 in the product, and cooking additionally affects the decrease in the amount of useful minerals: sodium, potassium, zinc and phosphorus. ^[2]

Risks of eating raw fish and meat

But still, many doctors do not recommend using thermally unprocessed meat and fish for food.

Risk of food poisoning

On the surface of meat over time or due to improper cutting, various pathogenic organisms multiply: viruses, bacteria, etc. In particular, parasites such as salmonella that are dangerous to health and life provoke damage to vital organs, the development of meningitis, vasculitis, reactive arthritis, etc. Most often, salmonella is found in poultry meat ^[3] and eggs. The bacterium is resistant to freezing, smoking and salting, it dies only with direct exposure to ultraviolet rays and boiling.

Parasitic infections

According to statistics, more than 90% of marine and freshwater inhabitants living in natural conditions are infected with helminths. Not all of them can infect people, but many of them carry a great danger to human health. The latter, for example, include the Siberian fluke. Parasitic worm larvae can be present in fish of the carp family: roach, carp, asp, rudd - they are the cause of the development of such a dangerous disease as opisthorchiasis. ^[4] The cleanest fish in terms of parasites are sturgeon, especially grown in artificial conditions. Sterlet and sturgeon fillets, purchased from a trusted supplier, can be consumed raw, provided they are fresh and immediately frozen after being caught.

Recommendations for eating raw fish and meat products

If you still want to enjoy exotic raw meat or fish dishes, follow these rules:

- **Use high quality fresh produce.** Buy products from trusted, trusted manufacturers with the Sushi-grade and Sashimi-grade labels - a sign that the product has passed quality controls for safety, and can be consumed raw.
- **Properly store fish and meat.** Keep them separate from other foods to avoid the risk of cross-contamination ^[5], store them in the refrigerator at the correct temperature to prevent bacteria from growing on them, wash hands, knives, cutting surfaces thoroughly after contact with raw meat and fish.
- **Pre-freeze foods.** Deep freezing meat and fish below -20 degrees Celsius for a week can kill many parasites.
- **Do not pierce the steak before cooking.** Pathogenic microorganisms formed on the surface of a piece of meat will get inside when punctured, leading to infection. If you process it entirely, then the high temperature will kill the microorganisms that are on top, and inside the meat will remain sterile, safe to eat.
- **Use a cooking thermometer.** According to experts, the internal temperature of chicken and turkey, safe for consumption, should reach 74°C, minced meat - 71°C, red meat - 63°C.

Expert comment

Tatyana Eliseeva, nutritionist, nutritionist

Raw meat and fish actually contain a higher percentage of useful vitamins and amino acids, they are better absorbed by the body. But keep in mind that the inclusion in the diet of dishes using such ingredients can lead to serious health problems. Also remember that people at risk who take immunomodulators, children under the age of 5, the elderly and pregnant women are strongly discouraged from eating raw fish and meat.

Literature

1. Czerwonka, M., Szterk, A., & Waszkiewicz-Robak, B. (2014). Vitamin B12 content in raw and cooked beef. Meat science, 96(3), 1371-1375. DOI: 10.1016/j.meatsci.2013.11.022

2. Hosseini, H., Mahmoudzadeh, M., Rezaei, M., Mahmoudzadeh, L., Khaksar, R., Khosroshahi, NK, & Babakhani, A. (2014). Effect of different cooking methods on minerals, vitamins and nutritional quality indices of kutum roach (*Rutilus frisii kutum*). Food chemistry, 148, 86-91. DOI: 10.1016/j.foodchem.2013.10.012
3. Antunes, P., Mourão, J., Campos, J., & Peixe, L. (2016). Salmonellosis: the role of poultry meat. Clinical microbiology and infection, 22(2), 110-121. DOI: 10.1016/j.cmi.2015.12.004
4. Saltykova, IV, Petrov, V. A., & Brindley, P. J. (2018). Opisthorchiasis and the Microbiome. Advances in parasitology, 102, 1-23. DOI: 10.1016/bs.apar.2018.07.001
5. Chen, F.C., Godwin, S., & CHAMBERS IV, EDGAR (2016). An immunoassay for quantification of contamination by raw meat juice on food contact surfaces. Journal of food protection, 79(11), 1971-1976. DOI: 10.4315/0362-028X.JFP-16-056

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