

SOURCES OF MEAT CONTAMINATION IN ROMANIA

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***Abstract:** This paper aims to trace the sources of meat contamination. The types of contamination are external and internal. In addition, there will be information on physical and chemical factors leading to meat spoilage. After processing the information found, we found out that chicken, pork and fish meat are good for your health, but must be processed in the best condition. If contamination occurs, the properties of the meat can be destroyed. In other words, what we discovered is useful for consumers, but also for producers.*

***Key words:** meat contamination, internal contamination, external contamination, physical factors, chemical factors.*

INTRODUCTION

Meat is a valuable food product and represents a very favourable environment for micro-organisms that benefit from pH 6.4-6.5, easily assimilable substances (glycogen and lactic acid), and assimilable nitrogenous substances [1,2].

Meat is the edible body part of mammals, birds, fish, crustaceans and molluscs. Meat generally consists of the skeletal muscle and connective tissue of the animal and some fat. The term does not include organs, horny parts (such as hooves, horns, feathers), cartilage or bone tissue. In accordance with health and veterinary regulations, meat must be inspected by a qualified person before consumption. Once the expiry date has passed, the meat can be fresh or preserved. Preservation can be done by high temperature (boiling or roasting) or by salting, drying or smoking. The meat also depends on its origin, depending on the species of animal obtained after slaughter [3,5,7].

According to a study by the market research company, more than 90% of Romanians eat meat at least once a week, and 49% of them include meat in their daily menu. The majority of young people (18-24 years old) prefer chicken meat, while 72% of respondents aged 45-59 eat more pork [4,6,8].

How harmful is meat? Is it healthier to give it up? Are plant sources of protein healthier? Is it unjustified to choose the vegetarian or vegan route?

These are just some of the questions we can ask ourselves when we want to eat meat. But another question on the lips of Romanians is about meat contamination. What are the most common ways of contamination?

We will discuss all these things in this research paper, and along the way we will discover the most common ways of contaminating meat. Of course, there are many types of meat, but we have chosen to investigate contamination [10,11]:

- Poultry meat
- Pork meat
- Fish meat

So the reason we chose to talk about these issues is as simple as it gets. It is important for Romanians to know the benefits of meat, but at the same time to check its quality and how it has been processed.

MATERIALS AND METHODS

In order to carry out this work and to achieve its purpose we used several types of materials and methods to find out more about meat consumption and how it is contaminated before it is consumed by Romanians. The data obtained from the research was noted, analysed and then interpreted.

The role of the authors was to critique and analyse the information found from several sources to follow the subject of the paper.

RESEARCH RESULTS

Our paper looks at some aspects of meat contamination. This can be of several types and takes place at several stages, before it is consumed by humans or while it is being cooked by them. Meat contamination can cause several illnesses due to the consumption of meat preparations, the cause being micro-organisms present in the intestinal flora of healthy or sick animals but not detected during routine veterinary inspections [12,14,16].

Microbial contamination of meat can be [13,15]:

- ✓ Internal contamination - causes disease in animals and is caused by pathogenic micro-organisms present in muscle and organ tissues. Pathogenic micro-organisms that can be transmitted through the gastrointestinal tract by eating contaminated meat include:
 - Mycobacterium tuberculosis type bovis the agent of tuberculosis is inactivated by heat treatment of meat at 80°-85°C for 10 minutes.
 - Bacillus anthracis, the agent of anthrax, can be transmitted through sheep meat.
 - Other species may belong to the genera Leptospira, Brucella, Coxiella etc. which are transmitted via the skin.
- ✓ External contamination - Can also occur during slaughter. When the knife comes into contact with the wound on the neck, the microbes are removed from the surface of the skin and hair and transferred to the body via the bloodstream. Starvation and evisceration immediately after slaughter can lead to migration of microbes from the gut and contamination of meat with enteric bacteria containing facultative/pathogenic agents: Escherichia coli, Salmonella typhi, Klebsiella, Listeria monocytogenes, Proteus[17,18,19].

Factors favouring the contamination of meat with microorganisms

1. Physical factors: sand, dust, radiation, temperature, humidity, pressure, pH, air. [20,21]
 - To maintain normal sensory conditions, the temperature must be lowered rapidly. Therefore, keeping meat cold suppresses the growth of mesophilic micro-organisms (clostridia, Enterobacteriaceae), psychrophilic and lactic acid bacteria. Lowering the temperature below the optimal limit (0° C + 4° C) can lead to changes such as freezing and swelling of moist products.
 - Increasing the optimum temperature causes changes due to the action of micro-organisms (bacteria, moulds), leading to certain decomposition processes (moulds, fermentation, putrefaction, changes in appearance, taste, smell and aroma), air circulation.
 - The air in the warehouse is constantly agitated, the resistance of which depends on the temperature difference between the various points in the work and storage rooms. As a result, dust and germs are attracted from the air and adhere to the housing, workers' hands and storage rooms. equipment and tools.
 - Air circulation is controlled by ventilation. This can be done naturally by opening a window or door, mechanically using a fan or fanless mechanism, or by using a fan.

- The pH of the meat. The pH of the meat is usually around 5.5. This pH is unfavorable for microbial growth, while a pH of 6-7 favors microbial growth, thus exposing the meat to microbial growth. Meat spoils when its pH reaches 7.

2. Chemical factors: water, water vapour, oxygen, carbon dioxide. [22,24]

- Of the chemical factors, water plays the most important role in contaminating meat. During finishing, the fuselage is supported from top to bottom with water under pressure.

- The use of only pure water reduces the elimination of micro-organisms from the body. To achieve this, chloramines with antibacterial effects are introduced into the water. The water in the pig's kettle tank should also be changed more often to achieve the same effect.

Microbiology of chicken meat

Poultry meat has a high nutritional value and a variable water content from 58% in turkey meat to 71% in chicken meat, so it is an easily alterable product. Live poultry meat can suffer internal contamination with bacteria of the Salmonella, Corynebacterium and Moraxella genera. Internal contamination is occasional and limited, while external contamination is difficult to avoid and occurs at different technological stages.[23]

Poultry meat spoilage occurs faster than beef and is caused by bacteria of the genera Pseudomonas and Moraxella. When the concentration of Pseudomonas reaches a value of 108/cm², mucus formation is observed. The rate of slime formation depends on temperature and storage time.

In vacuum-packed chicken meat, the activity of facultative anaerobic bacteria of the genera Lactobacillus and Brocotrix can cause the meat to turn sour.

Pathogenic Salmonella bacteria can be transmitted through chicken meat and as more than 40% of birds are able to excrete these bacteria through faeces, it is difficult to avoid contamination of poultry. Clostridium perfringens, Clostridium botulinum and Staphylococcus aureus can also be detected. Microbiological control of chicken requires 50 g Salmonella-free and 1 g Clostridia-free. (Figure 1)



Figure 1. Preparation of chicken meat

Source: <https://laprovincia.ro/retete-cu-pui/>

Microbiology of fish meat

Live fish have a surface mucus that has bactericidal properties that prevent them from getting sick during growth. resembles a plexus. The microbiota of saltwater fish includes G bacteria. Flavobacterium and Achromobacter, while the microbiota of freshwater fish includes G. Alcaligenes and Pseudomonas.[12,13]

Fish spoilage occurs first in the head area, as the bronchi that filter the water retain large amounts of molecules that are activated after the fish dies. The hard stages occur after

removal from the water. The flesh is firm and firmness is maintained at 0°C with an acidic pH that prevents bacterial growth.

If the fish is not gutted, the source defect is caused by the growth of anaerobic bacteria of the genus *Clostridium*. When eviscerated and kept in the fridge or at 20°C, the defect is caused by *E. coli*, *Pseudomonas* and *Achromobacter*. Severe poisoning occurs when eating spoiled fish, as toxic amines accumulate as a result of spoilage bacteria activity. Fish can only be preserved frozen or dried, salted or smoked. (Figure 2)



Figure 2. Fish meat

Source: <https://labucatarie.ro/lifestyle-main/tema-saptamanii/carnea-de-pest-pericolul-ascuns-in-alimentul-benefic-pentru-sanatate>

Microbiology of pork

Fresh pork is perishable. Deterioration in meat quality is primarily due to microbial contamination and biochemical reactions in the meat. Food safety during the storage period of pork is therefore of great importance. The spoilage of pork is a complex process involving changes in chemical composition as well as colour and texture indicators.[12,13,14]

The smell of meat changes with storage and is an important factor in maintaining freshness. Some biogenic amines, such as cadaverine, putrescine, tryptamine and tyramine, have been shown to be highly correlated with the above quality indicators. Several studies have been carried out to develop methods to express meat freshness based on electronic noses, GC-MS, colorimetric sensors and optoelectronic noses. However, these reference methods are destructive for testing samples. (Figure 3)

What can you do to prevent meat contamination? [13]

- Never mince cooked and raw meat on the same mincer.
- Do not handle raw food, then cooked food, without washing your hands.
- Do not touch garbage cans with your hands.
- Never use the same knife for raw and cooked ingredients without washing it first.



Figure 3. Pork preparations

Source: <https://sanatatesinatura.info/carnea-de-porc-beneficii-nutrienti-dezavantaje/>

CONCLUSIONS

This paper aims to inform and understand the concept of meat contamination. As we could observe in the above information, meat is a food consumed by most Romanians. This food is rich in protein, but it is necessary to be careful when consuming it. Meat contamination can be internal or external. Some of the chemical and physical factors that contribute to its deterioration can be observed. Moreover, the paper gives some useful tips to prevent meat contamination.

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