# STUDY OF THE INFLUENCE OF HEAT TREATMENT ON MICROBIOLOGICAL CONTAMINATION OF LIVER PATE IN ARTIFICIAL MEMBRANES

**Gorneţ V.**

Technical University of Moldova
**Gorneţ Viorel, e–mail: goviorel@rambler.ru**

**Abstract:** The formation of the finished product type liver pate with membrane packing and treatment in thethermal room at 70 – 80 °C. Influence of heat treatment on liver pâté microbiological contamination in artificial membrane is accomplished by the following tasks: obtain the finished product of liver pate by artificial polyamide membrane packing, studying the dynamics of liver pâté stability changes over time at different temperatures.

**Key words:** pate, microbiota, sowing, temperature, storage.

## Introduction

Such as sausages so and canned meat are of great importance in the daily ration for meat production, most often besides meat as raw material there are used animal byproducts and organs [1].

The quality, nutritional value, the physico–chemical stability of the product based on liver largely depends on the liver properties and its microbiological [2, 3].

In the modern technology of meat, the focus is on the use of cheap raw materials, which would also increase the biological and nutritional value of the product [4, 5].

The purpose of this research was to obtain a liver pate with optimized biological value packed into artificial membrane and microbiological investigations to verify the microbial stability of the product, and establish both physical and chemical indicators of liver pâté.

## Materials and methods

As raw material was used the beef liver, pork breast, mechanically deboned chicken meat, soy protein isolate, skim milk [5]. The analyzed by–products were used chilled and thawed. Raw material was processed using the following procedures: washing, blanching, coarse grinding.

The meat used to make pâté was crushed in the grinder with 3 mm diameter. Pig liver was subjected to steaming for 10 minutes at T = 95…100ºC, then subjected to grinding. The emulsion was prepared using the cutter for 8–10 minutes by two cautery. Initially was dosed the Pork and liver, after two minutes added soy isolate, skimmed milk, starch, salt and broth in 3 steps. Fat raw material was added to final stage of grinding [10, 12].

Mass of pate obtained was introduced into artificial membranesand subjected to heat treatment in the boiling and roasting universal chamber up to the temperature of the thermal center of the bar 72 ± 1°C. Bars with pate were subjected to microbiological analysis after heat treatment and after storage at 0° C, 20° C and 40°C.

Microbiological analysis consists in applying microbiological methods and techniques for observation, isolation and identification of microorganisms existing in

the examined product in order to determine the presence or absence of organisms harmful to consumer's health or to preserve the value of food products.

The determination of the total number of microorganisms consists in determining the organotroph aerobic mesophilic bacteria and is based on the fact that the microbial cells present in the analyzed sample in contact with the solidified nutrient, will form each of the colonies visible to the eye after incubation at 30°C for 48–72 hours [8, 9].

**Results discussions and blank sowing**

To assess the microbiological quality of liver pâté with artificial membrane is required to analyze the initial sowing of the blank before pasteurisation.

Blank of the analyzed product is an emulsion obtained in cutter drum from pork liver, fat and mechanically deboned poultry meat. As a source of contamination of future product could serve all types of raw and auxiliary materials.

The liver is an organ of the body involved in metabolic reactions, decomposition reactions of nutrient keeps in its composition toxins, compounds of non–food nature and sources such as microbial seed. Liver metabolic products may decrease both microbiological status and overall quality of the product type liver pate artificial membrane.

Fat raw material is a product of choice of swine meat which is also a source of microbial seeding because today lard is very thin and at pâté production it was used without removing the rind. The rind is in direct contact with the environment and presents major source of contamination.

Mechanically deboned poultry meat used in a ratio of 40% is obtained from the land birds reared under intensive technologies nutrition feed additions, which require an intensive growth. The fact that birds are covered with feathers, require that at the slaughtering process to be an advanced sowing compared to animals meat.

Mechanically deboned poultry meat is a source of contamination higher than manually deboned poultry meat due to the passage of bone chips and marrow in the meat mass.

The materials used such as soy isolate, skimmed milk powder, spices are purchased from specialized companies and basically they should not present a source of contamination. The potable water provided by the municipal aqueduct can serve as a source of microbiological sowing due to waste pipes.

Following the microbiological analysis of the sample blank subjected to sowing on peptone – agar substrate was found bacteria genus Streptococcus and total germs – 7000 (Figure 1). The results showed that the blank was produced in hygienic conditions favorable, as per the norms in raw minced meat is allowed microbiological load of up to 104 ufcg–1 [6,7]. Genera as Staphylococcus aureus, Escherichia coli, Listeria monocytogenes were not detected Salmonella, (Figure 1b).

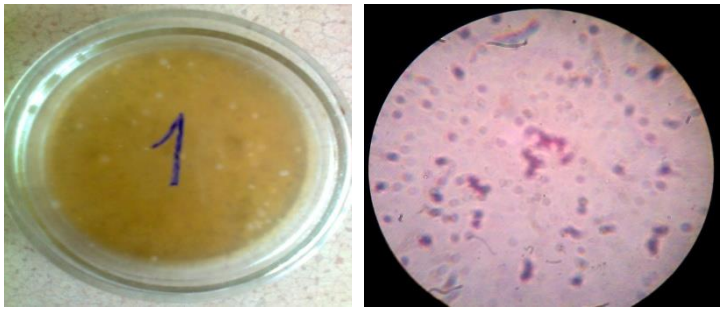


***Fig. 1.*** a) The blank microbiological sowing b) *streptoccocus lactis*

**The sowing after treatment**

Pasteurization is one of the traditional methods of preserving food. After heat treatment of pâté in the membrane at TCB = 72ºC is reached the effect of pasteurization and remain viable only spore forms of microorganisms.

For the product type liver pate immediately after the heat treatment tests were carried out samples with a mass of 1 g, made dilution 1:100, and their sowing on peptone–agar nutrient medium in a Petri dish (Figure 2a).

The samples were left in the thermostat at 37°C for 48 hours. The analysis of the sample after heat treatment showed a decrease of NTG from 7000 cfu/g to 100 cfu/g, being present several forms of spores, and bacteria of the genus Streptococcus (Figure 2b).

The samples were left in the thermostat at 37°C for 48 hours. The analysis of the sample after heat treatment showed a decrease of NTG from 7000 cfu/g to 100 cfu/g, being present several forms of spores, and bacteria of the genus Streptococcus (Figure 2b). According to the results was observed the decrease of microbial load of pâté after subjecting the blank to pasteurization.

After the heat treatment there has been a decrease in the NTG 7000 cfu/g to 300 cfu/ . As a result of smear analysis under microscope were observed several forms spores of microorganisms, and bacteria of the genus Streptococcus.

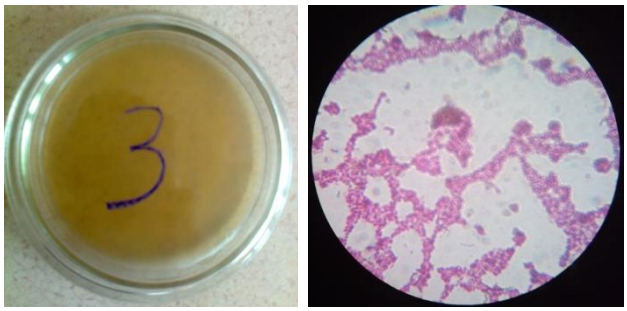


***Fig. 2.*** a) The sample microbiological sowing after heat treatment, b) *streptoccocus lactis.*

According to the results was observed the decrease of microbial load of pâté after subjecting the blank to pasteurization. Results fall within the requirements of HG

221 – rules on microbiological criteria for foodstuffs [11] which states limit of $1 \cdot 10^3$ mesophilic aerobic and facultative anaerobic microorganisms cfu/g.

**Dynamic change of microbial stability while**

Samples of liver pate packed in artificial membranes were stored at three different temperature in order to determine the microbial stability of the product. Because of this we determined microbial load of the product during storage and shelf life of liver pâté packaged with artificial membrane.

***Table 1.*** Liver pâté microbial load stored at t=40ºC

| Nr. | Storage time t=40ºC, days | Microbiological indicators | | |
|---|---|---|---|---|
| | | Sample weight, g | Dilution | NTG/g |
| 1 | 0 | 1 | 100 | 300 |
| 2 | 2 | 1 | 100 | 800 |
| 3 | 5 | 1 | 100 | 2300 |
| 4 | 6 | 1 | 100 | 3600 |

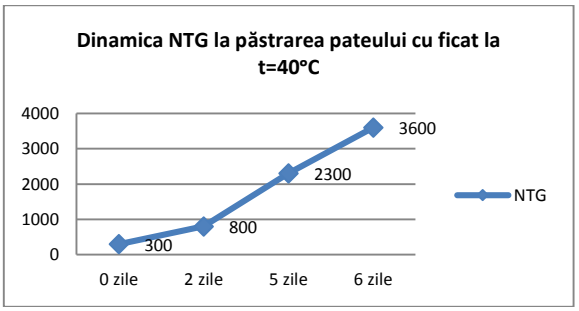


***Fig.3.*** NTG dynamics at the preservation of liver pâté at t=40ºC

From the analysis of Liver pate samples stored at 40°C (Table 1), from the point of view of the the microbial stability, in accordance with the obtained results the product is available 2 days, showing a microbial growth from the 300 cfu/g initial to 800 cfu/g on 2–nd day (figure 3). But although it is stable it manifests significant organoleptic changes due to high temperature of storage, which causes proteins degradation, fat rancidity which apears shortly due to the high content of oleic acid which has low stability. These amendments are due to $NH_3$ and $H_2S$ intense smell, malodorous volatile products, color changes with the formation of sponge structure of the composition. At the 6th day of storage NTG = 3600 cfu/g, the microbiota is represented by the Proteus vulgaris and Bacillus subtilis which are mesophilic aerobic and facultative anaerobic microorganisms, NTG = 3600 cfu/g is an inadmissible value in acordance with normatifs HG 221 [11].

***Tabelul 2.*** Liver pâté microbial load stored at t=20ºC

| Nr. | Storage time, days t=20ºC | Microbiological indicators | | |
|---|---|---|---|---|
| | | Sample weight, g | Dilution | NTG/g |
| 1 | 0 | 1 | 100 | 300 |
| 2 | 5 | 1 | 100 | 700 |
| 3 | 6 | 1 | 100 | 0 |
| 4 | 7 | 1 | 100 | 900 |
| 5 | 8 | 1 | 100 | 100 |
| 6 | 10 | 1 | 100 | **1200** |
| 7 | 12 | 1 | 100 | **32000** |
| 8 | 14 | 1 | 100 | **19500** |
| 9 | 17 | 1 | 100 | **16300** |
| 10 | 19 | 1 | 100 | **40000** |
| 11 | 21 | 1 | 100 | **11000** |
| 12 | 23 | 1 | 100 | **10000** |

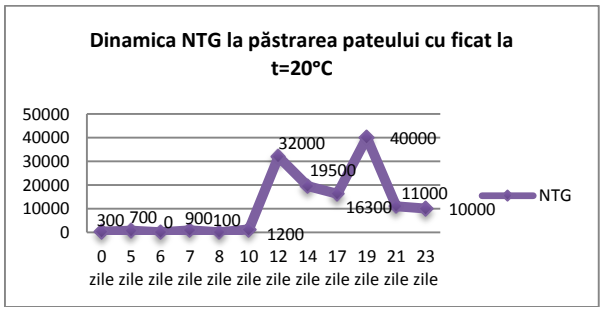


***Fig. 4.*** NTG dynamics at the preservation of liver pâté at t=20ºC

Liver pate packed in artificial membrane according to the results (table 2) is stable for 8 days – 100ufc/g (see Figure 4), after which the 10–day of storage is an key increase in microbial putrefaction bacteria, Proteus vulgaris and Bacillus subtilis – 1200 cfu/g, this value exceeding the time limit of $1 \cdot 10^3$ mesophilic aerobic and facultative anaerobic microorganisms cfu/g. Although that microbiologically the NTG product exceeded, in the next 4 days it didnt have bad–altered smell.

***Table 3.*** Liver pâté microbial load stored at t = 0°C

| Nr. | Storage time t=0ºC, days | microbiological indicators | | |
|---|---|---|---|---|
| | | Sample mass, g | Dilution | NTG/g |
| 1 | 5 | 1 | 100 | 100 |
| 2 | 6 | 1 | 100 | 0 |
| 3 | 7 | 1 | 100 | 700 |
| 4 | 10 | 1 | 100 | 400 |
| 5 | 14 | 1 | 100 | 1000 |
| 6 | 19 | 1 | 100 | 8000 |
| 7 | 23 | 1 | 100 | 2700 |

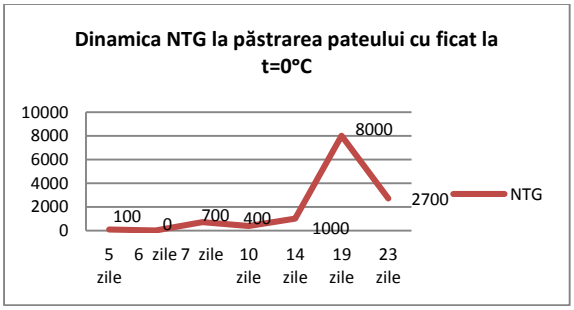


***Fig. 5.*** NTG dynamics at the preservation of liver pâté at t = 0°C

Based on the obtained results from the performed analysis on samples of liver pate obtained under semi–industrial conditions, it was noted that liver pate has a microbiological stability high enough if maintaining it at t = 0 ... + 6ºC. The product is valid for 14 days (Table 3), where we see an increase in the microbial load to 1000 cfu/g being a permissible value. The maximum value of microbial load is in the 19– th day – 8000 cfu/g, in the 23–day – 2700 cfu/g (Figure 5). Microbiota is represented by psychrophilic microorganisms of the genus Pseudomonas resistant to low temperature storage.

According to the obtained results it can be noted that products liver pate packed in artificial membrane obtained by thermal treatment tc.b. = 72 ± 1°C can be stored in a refrigerator at temperature 0... + 4°C with a security on a period up to 14 days, in the conditions when the membrane manufacturer ensures a warranty of 10 days.

## Conclusions

Following the study of the influence of heat treatment on microbiological contamination of liver pâté packed in artificial membrane was determined:

The microbial load of blank is $7 \cdot 10^3$ cfu/g, this value falls within the normative values on microbiological criteria for foods that are $1 \cdot 10^4$. The determined value demonstrates that the product was manufactured under good hygienic conditions.

After heat treatment product has been subject to pasteurisation process which ensures a longer stability to liver pâté and promotes significant decrease of pâté microbiota to NTG = 300 cfu/g, a value which falls within the regulatory norms $1 \cdot 10^3$ cfu / g specified in GD 221 of 16.03.2009 [11].

Due to keeping pâté at different temperatures it was determined its microbiological behavior and shelf life depending on the temperature: at 40°C with liver pate cannot be kept for more than two days because its microbial load is $2.3 \cdot 10^3$ cfu / g in the 5th day, which determines that the product is altered, there was the appearance of bacteria genus and *Bacillus Proteus.*

At 20°C the liver pate can be stored for 8 days its microbial load being of $0.1 \cdot 10^3$ cfu/g of the product, starting with 10–th day the product exceeds the value of $1 \cdot 10^3$ cfu/g and there is occurrence of bacteria genus *Proteus* and *Bacillus*;

At 0°C the liver pate can be stored 14 days, this temperature is most favorable and recommended, NTG in the 14th day being $1 \cdot 10^3$ cfu / g but along the way and here is the increase in microbial load up $8 \cdot 10^3$ cFU/g.

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