CHAPTER «VETERINARY SCIENCES»

RISK-BASED CONTROL OF THE SAFETY AND QUALITY OF RABBIT MEAT DURING PRODUCTION AND CIRCULATION

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Abstract. In order to establish the quality and safety of rabbit meat, veterinary medicine inspectors conduct a veterinary and sanitary examination of rabbit slaughter products at facilities for the production and circulation of rabbit meat. *The aim of the study* was to investigate the safety and quality of rabbit carcasses to determine pathological changes in internal organs and meat, as well as the fatness category of rabbits at slaughter, analyzing organoleptic, chemical, and microbiological indicators of rabbit meat and fat to determine the degree of freshness. *The subject of the study* was rabbit slaughter products, meat and adipose tissue. *The methodology* for carrying out veterinary and sanitary examination and fattening of rabbits was carried out visually in accordance with the requirements of the national standard DSTU 4293; the organoleptic characteristics of rabbit meat in terms of appearance and color, muscle condition on the cut, consistency, smell, transparency, and aroma of the broth were determined according to GOST 20235.0; chemical indicators of rabbit fat quality were determined using patented methods for determining the acid and peroxide values of fat; microbiological indicators, in particular KMAFAnM, were determined by inoculating the studied rabbit meat sample on nutrient media at temperatures not lower than (34–37)°C and subsequently calculating their content; hygienic criteria of the technological process

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for rabbit meat for storage and sale at appropriate temperature regimes in refrigeration chambers – (–2…–3) °C and (0…6)°C were determined by calculating the daily average logarithm (log) of meat according to the methodology of EU Regulation No. 2073/2005. *Results of the study:* it was found that rabbits aged 3-4 and 4-7 months had no pathological changes in internal organs and muscles; rabbits aged 3-4 months had a higher fatness category with well-developed muscles, minor subcutaneous fat deposits in the form of thickened, 5 to 10 mm wide strips located along the body, and rabbits aged 4-7 months had the first fatness category – well-developed muscles, minor subcutaneous fat deposits in the form of thickened, 11 to 30 mm wide strips located along the body. According to the organoleptic assessment, rabbits of two age groups (3-4 months and 4-7 months) had organoleptic indicators of a fresh degree in appearance and color – pale pink, the condition of the muscles on the cut – juicy, the consistency – elastic, the smell – pleasant and fresh, characteristic of this type of animal, the broth – transparent, without sediment and turbidity, with a pleasant aroma. According to the developed patented methods, the acid number of fresh rabbit meat was determined, depending on age, to be 0.65±0.04 – 0.72±0.03 mg NaOH and the peroxide number was 0.108±0.023 and 0.113±0.010% iodine. The content of KMAFAnM in rabbit meat was determined to be (1.23±0.12)x102 CFU/g at a temperature of (–2…–3) and (1.03±0.02) x102 CFU/g at a temperature of (0…6)ºC. Daily logarithm log: m= from 4.2 to 1.5 and M= from 5.3 to 3.2; for rabbit meat during storage at a temperature of (–2…–3) ºC; logarithm log: m= from 2.7 to 1.2 and M= from 4.2 to 1.6 at a temperature of (0…6) ºC. *Practical implications.* For proper risk-based control of the safety of rabbit slaughter products, use a comprehensive veterinary and sanitary assessment of by-products and rabbit meat, organoleptic indicators, patented methods for determining the acid and peroxide values of fat to determine freshness and establish microbiological indicators and criteria of the technological process. *Value/originality*. The effectiveness of the use of veterinary and sanitary examination of rabbit slaughter products, in particular meat, and organoleptic evaluation of rabbit carcasses provides valuable experience and materials for practicing veterinary doctors who exercise proper control during rabbit slaughter. Patented methods for determining the acid and peroxide values of fat have a reliability in tests of 99.9% compared to the

indicators of generally accepted methods for determining the degree of freshness of rabbit meat.

1. Introduction

Market operators of rabbit slaughter products are obliged to comply with sanitary legislation during the production and circulation of environmentally safe rabbit meat [1, p. 59; 2, p. 78].

According to the Law of Ukraine "On Basic Principles and Requirements for the Safety and Quality of Food Products", it is necessary to carry out inspections regarding compliance with sanitary and hygienic requirements for the production and circulation of rabbit meat at facilities and wholesale bases, supermarkets, and shops, as well as to comply with the requirements of the new European food regulations, the Codex Alimentarius Commission, and to organize their work based on a risk assessment for the sanitary safety of food products [3, p. 12; 4, p. 29; 5, p. 5047; 6, p. 12; 7, p. 5].

The issue of implementing the HACCP system at facilities for the production and circulation of rabbit meat in accordance with the requirements of DSTU is relevant. ISO 22000:2019 (ISO 22000:2018, IDT) [8, p. 236; 9, p. 140; 10, p. 1087; 11, p. 29].

Proper risk-based control by veterinary medicine inspectors of rabbit slaughter products will guarantee a high level of hygiene and food safety, effective functioning of the supply chain management system, reduction of the number of audits by government agencies and partners, and reduction of the release of unsafe meat raw materials [12, p. 283; 13, p. 1148; 14, p. 169; 15, p. 1107]. Food market operators, by implementing a food safety management system, health and welfare of rabbits, during the production of rabbit meat, ensure a new formation of international legislation on obtaining safe rabbit products under the supervision of a veterinary medicine specialist [16, p. 27; 17, p. 356; 18, p. 127].

Conducting veterinary and sanitary inspection of rabbit slaughter products, establishing the fatness category, analyzing sensory indicators of rabbit meat and chemical tests to establish the freshness of rabbit meat at production and distribution facilities is relevant, because this prevents a negative impact on the safety and quality of rabbit meat during its shelf life and prevents harm to the health of the average consumer and makes it possible to prevent food poisoning and food-borne toxicoinfections [19, p. 549; 20, p. 301; 21, p. 89].

2. Veterinary and sanitary examination of rabbit carcasses and organs and establishment of the category of rabbit carcasses

For convenient veterinary and sanitary examination of slaughter products of rabbits aged 3-4 and 4-7 months, after removal of the stomach and intestines, the spleen was not removed together with them, but was left on the epigastrium, not separated from the carcass. The kidneys with peri-renal fat were also left on the carcass. The heart, lungs, and liver were prepared for veterinary and sanitary examination as follows: after cutting the diaphragm, the liver was removed from the thoracic cavity and left unseparated from the carcass on the outside of the chest.

Veterinary and sanitary examination was carried out in the following sequence: carcasses of rabbits aged 3-4 and 4-7 months and the head were examined externally, incisions were made of the external chewing muscles (examined for cysticercosis), then the internal organs were examined, and if there is suspicion of infectious diseases, the lymph nodes should be opened.

The most important for the examination are the following lymph nodes: submandibular, cervical, mediastinal, bronchial, inguinal, popliteal. During the external examination of the rabbit carcasses, a good degree of exsanguination was determined, the presence of ruptures of subcutaneous fat and muscles was not detected, hemorrhages and tumors, abscesses and other pathological changes were not detected.

When examining the internal organs, the heart with the cardiac jacket was examined first, then the lungs, liver, spleen and kidneys. When examining the heart, the physiological state of the cardiac jacket and heart muscle was determined, no hemorrhages and changes in color and consistency were found: the consistency is elastic, there are no hemorrhages, tumors, etc. in the heart, no signs of parasites were detected.

The lungs were examined from the surface, palpated and checked the condition of the mediastinal lymph nodes, which were not enlarged, had no signs of parasitic diseases, no pathological changes were detected, on section the lungs were pale pink, without hemorrhages. The surface of the liver, spleen, kidneys was unchanged, the color was natural, without pathological changes, on section the liver was light brown in color, did not flow from the section, no signs of parasitic diseases were detected, the consistency of the organs was elastic, the color was natural, typical of healthy rabbits.

After slaughtering the rabbits, the stomach, intestines with lymph nodes, and internal organs were subjected to veterinary examination, which were in a normal physiological state, not enlarged, without pathological changes, juicy on section, and light pink in color.

After examining the organs with their lymph nodes, all carcasses of rabbits aged 3-4 and 4-7 months were examined – the carcasses were well-formed anatomically, without damage and pathological changes in the meat, no depletion of the carcasses was detected, the internal fat was white, evenly distributed on the back of the carcasses.

After conducting a veterinary and sanitary examination of the carcasses of rabbits aged 3-4 and 4-7 months, it was found that they were obtained from healthy animals, no pathological changes were detected [22, p. 32].

The studies established the category of rabbit carcasses [23, p. 2], which is presented in Table 1.

Table 1

Requirements for the category of rabbits for slaughter

Category	Age, in months	Cultivation technology, type of feeding	Characteristics of rabbit carcass fatness
Higher	3 – 4	Intensive, dry type of feeding	The muscles are well developed; the spinous processes of the spinal vertebrae are significantly filled with muscles, do not protrude, they can be barely felt; the rump, sacrum and thighs are filled with muscles, rounded; on the back of the neck, belly and in the groin area, you can feel slight subcutaneous fat deposits in the form of thickened, 5 mm to 10 mm or more wide strips located along the body
First	4 – 7	Extensive, combined type of feeding	The muscles are well developed; the spinous processes of the spinal vertebrae are quite fully filled with muscles, do not protrude, they can be barely felt; the rump, sacrum and thighs are well filled with muscles, rounded; on the back of the neck, belly and in the groin area, more significant subcutaneous fat deposits can be felt in the form of thickened, 11 mm to 30 mm or more wide strips located along the body

From the data in the table, it was established that the carcasses of rabbits aged 3-4 months belonged to the highest category in terms of indicators, and the carcasses of rabbits aged 4-7 months belonged to the first category in terms of indicators, which indicated an increase in the productivity and quality of rabbit meat due to high-quality feeding of rabbits of the following types: intensive, dry type of feeding and extensive feeding (combined type of feeding with the addition of vegetables).

2. Analysis of organoleptic parameters of rabbit meat

Organoleptic indicators of rabbit meat carcasses aged 3-4 months of the highest category and aged 4-7 months of the first category corresponded to the fresh grade. Determination of the appearance and color of the carcass surface, integumentary and internal fatty tissue and thoracoabdominal serous membrane was carried out by external examination [24, p. 6].

In appearance – the surface of the carcass had a crust of drying pale pink; the integumentary and internal abdominal cavity was yellowish-white; the serous membranes of the abdominal cavity were moist and shiny.

Determination of the condition of the muscles on the cut. The thigh muscles were cut across the direction of the muscle fibers. To determine the moisture of the muscles, filter paper was applied to the surface of the muscle cut for 2 seconds. To determine the stickiness of the muscles, a spatula was touched to the surface of the muscle cut. The color of the muscles was determined visually in diffuse daylight.

The muscles on the cut were slightly moist, did not leave a wet spot on the filter paper, pale pink with a reddish tint.

Determination of consistency. On the surface of the rabbit carcasses in the thigh muscle area, a pit was formed by lightly pressing a finger and the time of its leveling was monitored: the pit leveled quickly – up to 1 minute.

The consistency of the muscles is dense, elastic, when pressed with a spatula, the formed pit quickly leveled. The fat of the rabbit carcasses is dense, does not crumble, white.

Determination of the smell of meat and fat. To establish the smell on the surface of the carcass, the sensory method was used. To determine the smell of fat, at least 20 g of internal adipose tissue was taken from each sample. Each sample was chopped with scissors, melted in a chemical beaker on a

water bath and cooled to a temperature of 20 °C. The smell of internal fat was determined organoleptically by stirring it with a clean glass rod.

The smell of the surface of the carcass and the abdominal cavity was determined organoleptically. To determine the smell of the deep layers, a cut was made in the muscles with a clean knife. Particular attention was paid to the smell of the layers of muscle tissue adjacent to the bones. The smell on the surface of the carcass is natural, specific, characteristic of fresh rabbit meat.

Determination of broth transparency and aroma. From a rabbit carcass sample, pieces of muscle tissue weighing 25 g each were cut from the thigh, shoulder blade, back, and flank and were minced twice in a meat grinder. The minced meat was thoroughly mixed and a 20 g portion was taken. The degree of broth transparency was determined visually by inspecting 20 cm^3 of broth prepared in a ratio of 1:3, poured into a measuring cylinder with a capacity of 20 cm^3.

During the cooking test, it was established: broth from fresh rabbit meat is pleasant, specific, aromatic, transparent, the meat is well distributed into muscle bundles, on the surface of the broth there are fat balls of the same size.

3. Chemical indicators of the quality of rabbit meat for determining the acid and peroxide numbers of fat

The basis for the development of the methodology was the task of developing a method for determining the acid number of rabbit fat by the titrimetric method by treating the studied sample of internal fat with a neutralized alcohol-benzene mixture, titrating free fatty acids with a sodium hydroxide solution with a mass concentration of 0.1 mol/dm^3 until a stable pink color appears and calculating the acid number in mg NaOH (mg sodium hydroxide) according to the formula, which ensured the reliability of the results when determining the quality of rabbit meat for establishing its freshness. [25, p. 3].

To develop the method, a sample of rabbit internal fat in the amount of 10.0–15.0 g was used, melted in a water bath in a porcelain cup at a temperature of 100 °C for 4.0–5.0 min. Then, a 50.0–100.0 cm^3 sample of the melted fat under study in the amount of 2.0–2.1 g was weighed into a flask, 20.0–21.0 cm^3 of neutralized alcohol-benzene mixture in a ratio of 1:2 was added (0.4–0.5 cm^3 of an alcoholic solution of phenolphthalein

with a mass concentration of 1.0% was added to 75 cm^3 of the mixture, and neutralized with a sodium hydroxide solution (0.1 mol/dm^3) until a pale pink color appeared). The contents of the flask were stirred in circular motions and subsequently titrated with a sodium hydroxide solution with a mass concentration of 0.1 mol/dm^3 until a persistent pink color appeared, which did not disappear within 0.5–1.0 min. The volume of sodium hydroxide solution used was recorded with an accuracy of 0.05 cm^3.

In this case, the neutralized alcohol-benzene mixture consisted of: 25 cm^3 of ethyl alcohol with a mass concentration of 96% and 50.0 cm^3 of benzene (ratio 1:2) with the addition of an indicator of an alcoholic solution of phenolphthalein with a mass concentration of 1.0% in an amount of 0.4−0.5 cm^3 when neutralized with a sodium hydroxide solution with a mass concentration of 0.1 mol/dm^3 to a pale pink color.

And subsequently, the acid number of rabbit fat was calculated in mg NaOH according to the formula (1):

$$X = \frac{V \cdot K \cdot 4{,}00}{m} \quad (1)$$

X – acid value of rabbit fat, mg NaOH;

V – volume of sodium hydroxide solution with a mass concentration of 0.1 mol/dm^3 used to titrate the test sample, cm^3;

K – correction factor for sodium hydroxide solution with a mass concentration of 0.1 mol/dm^3;

4,00 – the number of mg of sodium hydroxide contained in 1 cm^3 of a sodium hydroxide solution with a mass concentration of 0.1 mol/dm^3;

m – mass of the rabbit fat test sample, g.

The results of tests on rabbit meat storage at a temperature of (0−4)°C are presented in Table 2.

The basis for the development of the methodology was the task of developing a method for determining the peroxide value of rabbit fat by treating the studied sample of internal fat with a mixture of glacial acetic acid and chloroform in a ratio of 1:1 in the presence of an indicator of a saturated solution of potassium iodide with a mass concentration of 50% and subsequent titration of the released iodine in the presence of an indicator of a starch solution in the amount of 0.6−0.8 cm^3 with a mass fraction of 1%, a solution of sodium thiosulfate with a mass concentration of 0.01 mol/dm^3 ($Na_2S_2O3 \cdot 5H_2O$) until the blue color disappears and the

amount of peroxide value in % iodine (% J) is calculated according to the given formula, which ensured the reliability of the results when determining the quality and safety of rabbit fat for establishing its freshness [26, p. 3].

Table 2

Indicators of the acid number of rabbit fat and the quality of rabbit meat according to generally accepted methods at different degrees of freshness (M±m, n=26)

Safety indicators	Fresh fat and meat of rabbits of all ages	
	rabbits age 3-4 months, n=14	rabbits age 4-7 months, n=12
Acid value of rabbit fat, mg NaOH	0.65±0.04	0.72±0.03
Amount of VFA (volatile fatty acids) in rabbit meat, mg KOH	1.04±0.04*	1.11±0.05*
Smear microscopy (number of bacteria in rabbit meat), number of bacteria	1−2**	6±2**
Reaction with copper sulfate (evaluation of rabbit meat broth after addition of copper sulfate solution)	clear broth	clear broth

Note: * the norm of indicators for fresh fat is up to 2.25 mg KOH; of dubious freshness of fat is 2.25−9.00 mg KOH; of stale fat is more than 9.00 mg KOH; ** the norm of indicators for fresh meat is single microorganisms or up to 10; of dubious freshness of meat is from 11 to 30 microorganisms; of stale meat is more than 30 microorganisms.

To develop the method, a sample of rabbit internal fat in the amount of 10.0–15.0 g was used, which was melted in a water bath in a porcelain cup at a temperature of 100 °C for 4.0–5.0 min. Then, the investigated sample of rendered fat in the amount of 0.20−0.25 g was weighed into a flask with a capacity of 50.0−100.0 cm^3 and treated with a mixture of glacial acetic acid and chloroform in the amount of 10.0−10.5 cm^3 and in a ratio of 1:1 in the presence of 0.5−0.6 cm^3 of a saturated potassium iodide solution with a mass concentration of 50.0%, and subsequently the iodine released was titrated in a dark place for 3−4 min in the presence of a starch solution indicator in the amount of 0.6−0.8 cm^3 with a mass fraction of 1.0%, which was added to 25.0−26.0 cm^3 of distilled water, with a sodium thiosulfate solution with a mass concentration of 0.01 mol/dm^3 until the blue color disappeared. The volume of sodium thiosulfate solution used was recorded to the nearest 0.05 cm^3.

And further, the peroxide value of rabbit fat was calculated in % iodine (% J) according to the formula (2):

$$X = \frac{(V - V_1) \cdot K \cdot 0{,}00127 \cdot 100}{m} \quad (2)$$

X – peroxide value of rabbit fat, % J;

V – volume of sodium thiosulfate solution with a mass concentration of 0.01 mol/dm^3 used to titrate the test sample, cm^3;

V_1 – volume of sodium thiosulfate solution with a mass concentration of 0.01 mol/dm^3 used for titration of the control sample (without fat sample; to check the quality of reagents), cm^3;

K – correction factor for conversion to an exact sodium thiosulfate solution with a mass concentration of 0.01 mol/dm^3;

0,00127 – the number of grams of iodine equivalent to 1 cm^3 of sodium thiosulfate solution with a mass concentration of 0.01 mol/dm^3;

m – mass of the rabbit fat test sample, g.

The results of tests on rabbit meat storage at a temperature of (0−4)°C are presented in Table 3.

Table 3

Indicators of the peroxide value of rabbit fat and the quality of rabbit meat according to generally accepted methods at different degrees of freshness (M±m, n=26)

Safety indicators	Fresh fat and meat of rabbits of all ages	
	rabbits age 3-4 months, n=14	rabbits age 4-7 months, n=12
Peroxide value of rabbit fat, % iodine (% J)	0.108±0.023	0.113±0.018
Amount of VFA (volatile fatty acids) in rabbit meat, mg KOH	1.16±0.08*	1.20±0.12*
Smear microscopy (number of bacteria in rabbit meat), number of bacteria	1−3**	5±1**
Reaction with copper sulfate (evaluation of rabbit meat broth after addition of copper sulfate solution)	clear broth	clear broth

Note: * the norm of indicators for fresh fat is up to 0.120% iodine; for doubtful freshness of fat is 0.121–0.145% iodine; for stale fat is more than 0.146% iodine; ** the norm of indicators for fresh meat is single microorganisms or up to 10; for doubtful freshness of meat is from 11 to 30 microorganisms; for stale meat is more than 30 microorganisms.

The developed and patented methods for determining the acid and peroxide values of rabbit fat had an accuracy of 99.9% compared to the indicators obtained during the study using generally accepted standardized methods. These methods can be used by veterinary medicine specialists in determining the safety and quality of food products.

4. Microbiological indicators of rabbit meat

Risk-based control at production facilities during storage and sale of rabbit meat is carried out by leading veterinary doctors by determining the content of KMAFAnM in rabbit meat at different temperature regimes and determining the hygienic criterion of the technological process for the production of rabbit meat. During storage of rabbit meat at a temperature of (–2…–3) ºC, the content of KMAFAnM was established in the amount of $(1.23\pm0.12)x10^2$ CFU/g, which is 1.2 times ($p<0.001$) less compared to the indicators during the sale of rabbit meat at a temperature of (0…6) ºC.

The highest hygienic criteria of the technological process for rabbit meat have been established in terms of the content of colonies of aerobic microorganisms and bacteria of the genus Enterobacteriaceae during sale in cold rooms at a temperature of (0…6)ºC - with a daily average logarithm log: m= from 4.2 to 1.5 and M= from 5.3 to 3.2, as well as for rabbit meat during storage in cold rooms at a temperature of (–2…–3)ºC – with a daily average logarithm log: m= from 2.7 to 1.2 and M= from 4.2 to 1.6.

The content of KMAFAnM was determined by inoculating the studied sample of rabbit meat on nutrient media at temperatures not lower than (34–37) °C and further calculating their content [27, p. 13].

Hygienic criteria of the technological process for rabbit meat for storage and sale at appropriate temperature regimes in refrigeration chambers – (–2…–3) °C and (0…6)°C by calculating the daily average logarithm (log) of meat according to the methodology of EU Regulation No. 2073/2005 [28, p. 21].

One of the prerequisites for implementing the system of control of the safety of rabbit meat production at control points (HACCP) is microbiological testing of rabbit meat during storage and sale, which provides confidence that the meat is safe and of high quality for ordinary consumers. Also, in the production of rabbit meat and its circulation in modern conditions, the most demanded, in addition to GVP and GMP, are good hygienic practices – GHP [29, p. 164].

Veterinary specialists, guided by EU Regulation No. 2073/2005, must establish hygienic criteria for the technological process at the post-processing stage of rabbit carcasses before they are placed in cold storage at rabbit meat production facilities, and during their sale to consumers.

Microbiological control of the safety and quality of rabbit meat is carried out in order to identify violations of sanitary and hygienic requirements during the production, storage and circulation of rabbit meat at facilities for its production and circulation – wholesale bases, agro-food markets, shops, supermarkets, etc. [30, p. 969; 31, p. 22; 32, p. 26; 33, p. 13; 34, p. 123; 35, p. 78].

Therefore, it is currently relevant to carry out microbiological control of rabbit meat during its production and circulation in order to avoid spoilage of meat.

Rabbit meat, which was stored at capacity during storage at a temperature in refrigerators (–2…–3) ºC and sold at a temperature of (0…6) ºC, had organoleptic indicators of fresh meat: on the surface of the rabbit carcass there was a dry crust of drying, the smell was specific to this species of animal, without foreign odors, the consistency was elastic, the color was pale pink; internal fat was white, without foreign odors; after testing the cooking, the rabbit meat corresponded to the fresh grade: the broth was transparent, with a pleasant smell, on the surface of the broth there were fat balls of the same size; the cooked meat was divided into muscle bundles, with a specific pleasant taste and smell.

Subsequently, microbiological indicators of rabbit meat were determined.

Test results of the content of KMAFAnM in rabbit meat during storage and sale at appropriate temperature conditions (Table 4).

Table 4

Content of KMAFAnM in rabbit meat during storage and sale, CFU/g (M±m, n=24)

Type of meat	Number of colonies of mesophilic aerobic and facultative anaerobic microorganisms, CFU/g
Refrigeration chambers at rabbit meat production facilities during storage at a temperature of (–2…–3) ºC	
Rabbit meat 3-4 months old	$(1.23\pm0.04)x10^2$
Refrigeration chambers at rabbit meat sales facilities at temperatures (0…6) ºC	
Rabbit meat 4-7 months old	$(1.03\pm0.02)x10^2$***

Note: *** – $p<0,001$

The results of Table 4 show that during storage of meat from rabbits aged 3-4 months at a temperature of (–2…–3) °C, the content of KMAFAnM was determined to be (1.23±0.12)x102 CFU/g, which is 1.2 times significantly ($p<0.001$) less compared to the indicators during the sale of meat from rabbits aged 4-7 months at a temperature of (0…6) °C – (1.03±0.02) x102 CFU/g.

Pathogenic microorganisms dangerous to average consumers – Listeria monocytogenes, Salmonella, coliforms BGKP, Staphylococci and others, – not detected in meat from rabbits aged 3-4 and 4-7 months.

We present the results of the hygienic criteria of the technological process for rabbit meat aged 3-4 and 4-7 months for storage and sale at appropriate temperature regimes in refrigeration chambers - (–2…–3) ºC and (0…6) ºC by calculating the daily average logarithm (log) in rabbit meat for storage and sale at appropriate temperature regimes (Table 5).

Table 5

Hygienic criteria of the technological process for rabbit meat for storage and sale at appropriate temperature conditions, CFU/cm² (M±m, n=24)

Type of meat	Number of colonies of aerobic microorganisms		*Enterobacteriaceae*		*Salmonella*	
	Daily average logarithm, CFU/cm²					
	m	M	m	M	m	M
Refrigeration chambers at rabbit meat production facilities during storage at a temperature of (–2…–3) ºC						
Meat of rabbits aged 3-4 months	2.7	4.2	1.2	1.6	–	–
Refrigeration chambers at rabbit meat sales facilities at temperatures (0…6) ºC						
Meat of rabbits aged 4-7 months	4.2	5.3	1.5	3.2	–	–

From the table it was established that the highest hygienic criteria of the technological process for rabbit meat in terms of the content of colonies of aerobic microorganisms and bacteria of the genus Enterobacteriacea during

sale in refrigeration chambers at a temperature of (0…6) ºC were at the daily average logarithm log: m= from 4.2 to 1.5 and M= from 5.3 to 3.2; for rabbit meat during storage in refrigeration chambers at a temperature of (–2…–3) ºC – at the daily average logarithm log: m= from 2.7 to 1.2 and M= from 4.2 to 1.6.

The daily logarithm (m and M) of the number of colonies of aerobic bacteria was, respectively, 1.2 and 2.0 times higher in rabbit meat aged 4-7 months, which was stored in refrigerators at rabbit meat sales facilities at temperatures of (0…6) ºC compared to the indicator in rabbit meat aged 3-4 months, which was stored in refrigerators at rabbit meat production facilities during storage at temperatures of (–2…–3) ºC.

The daily logarithm (m and M) of Enterobacteriaceae bacteria was, respectively, 1.6 and 1.3 times higher in rabbit meat aged 4-7 months, which was stored in refrigerators at rabbit meat sales facilities at temperatures (0…6) ºC compared to the indicator in rabbit meat aged 3-4 months, which was stored in refrigerators at rabbit meat production facilities during storage at temperatures (–2…–3) ºC.

Bacteria of the genus Salmonella, Listeria monocytogenes, coliforms BGKP, Staphylococci and others, – not detected in meat from rabbits aged 3-4 and 4-7 months.

5. Conclusions

1. The fat content of meat of rabbits aged 3-4 months of the highest category and rabbits aged 4-7 months of the first category was established, the organoleptic indicators of meat of rabbits of different age groups corresponded to the fresh grade, the acid number of fresh rabbit meat, depending on age, was: 0.65±0.04 - 0.72±0.03 mg NaOH and the peroxide number was 0.108±0.023 and 0.113±0.010% iodine.

2. For proper risk-based control, veterinary medicine specialists should be guided by laboratory tests of the content of KMAFAnM in rabbit meat during storage and sale in refrigerated chambers, respectively at temperatures of (–2…–3) °C and (0…6) °C. It is important for the safety and quality of rabbit meat to establish hygienic criteria for the technological process during storage and sale of products.

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