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Sanitary-hygienic evaluation of meat processing enterprises productions and their sanation

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The results in the determination microbiocinosis level of the objects of veterinary supervision at meat processing enterprises are presented. It was experimentally established that in 3 hours of the slaughter workshop working process, the total number of microorganisms is higher more than 5 times of the established standard, and by the end of the working shift the amount of MAFAnM on the floor and walls is $(1.6 \pm 0.23)\times10^6$ and $(8.2 \pm 1.1)\times10^5$ CFU/cm^2, respectively, which is significantly more of the regulated indicators. It is determined, that the most contaminated in the production process is the table to wash stomach, the gutter to move off stomach, the table to disassemble intestinal kit and the gutter to move off intestinal kits. The gained results indicate the necessity for thorough and timely sanitization of contaminated surfaces. It has been established that the daily use of «Anti-Jermi SR S 25» detergent (2.0 % – 30 minutes) provides the high level of sanitation in the meat industry enterprises. The disinfectant «Germicidan FF Plus» ensures the complete destruction of sanitary-indicative microorganisms at veterinary supervision sites of meat-processing plants when applied at 0.5 % concentration with an exposure of 60 minutes. The obtained results broaden the spectrum of highly active antimicrobial agents, which are promising to use in the processing and food industries.
Key words: microbial contamination; MAFAnM; disinfection; disinfectant preparation; concentration; exposure

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Санітарно-гігієнічна оцінка об’єктів м’ясопереробних підприємств та засоби їх санації

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Представлено результати з визначення рівня мікробіоценозу об'єктів ветеринарного нагляду м'ясопереробних підприємств. Експериментальним шляхом встановлено, що через 3 години роботи цеху з переробки забійних тварин загальна кількість мікроорганізмів більш ніж в 5 разів перевищує встановлену норму, а вже наприкінці робочої зміни кількість МАФАнМ на підлозі й стінах становить $(1,6 \pm 0,23)\times10^6$ та $(8,2 \pm 1,1)\times10^5$ КУО/см^2 відповідно, що суттєво більше регламентованих показників. Визначено, що найбільш забрудненими у процесі виробництва є стіл мийки шлунків, жолоба для спуску шлунків, стіл розбору кишкового комплекту та жолоб для спуску кишкових комплектів. Отримані результати вказують на необхідність ретельного і вчасного проведення санітарної обробки забруднених поверхонь. Встановлено, що щоденне використання мийного засобу «Анти-Джерм SR S 25» (2,0 % – 30 хвилин) забезпечує високий санітарний рівень на підприємствах м'ясної промисловості. Дезінфікуючий препарат «Гермицидан ФФ плюс» забезпечує повне знищення санітарно-показових мікроорганізмів на об'єктах ветеринарного нагляду м'ясопереробних підприємств при застосуванні у концентрації 0,5 % за експозиції 60 хвилин. Отримані результати розширюють спектр високоактивних протимікробних препаратів які є перспективними при застосуванні у переробній та харчовій промисловості.

Ключові слова: мікробна контамінація; МАФАнМ; дезінфекція; дезінфікуючий препарат; концентрація; експозиція

Introduction

Correct and timely veterinary and sanitary treatment of all objects of meat processing enterprises, which is an integral part of technological processes of production, has a large and indisputable value for the production of high-quality and safe products. It is important to make the correct choice of detergents and disinfectants for modern technological equipment, used in the latest technologies in high-temperature processing of meat raw materials, with the use different types of fats and plant additives, stabilizers and flavors (Lammerding et al., 2000; Rodionova et al., 2016).

Any technological object could be an important source of microbiological contamination in case of absence of proper sanitation, microbiological and technological control, and environmental protection at meat processing plants (Syne et al., 2013; Rodionova et al., 2017).

Veterinary and sanitary control of production conditions is carried out by providing of microbiological analysis of the sanitary state of the technological equipment, tools, packaging, overalls and the hands of staff, air of industrial premises and water (Kirby et al., 2003; Jeon et al., 2011).

Contamination of meat-carcasses at meat processing enterprises is due to disorder of sanitary norms during their processing and low-quality disinfection of premises, which worsens the meat quality and could lead to outbreaks of food toxicoinfections during its implementation (Gill, 1995). The conducted researches have established high bacterial contamination of the floor (13–20 %) and the lower parts of the walls in the raw material and machine-technological premises (6,6–13,2 %) in the meat processing enterprise (Kipin, 2011). Microbiocenoses of the production area objects in meat processing enterprises and slaughter premises are represented by different types of microorganisms: *E. coli, Pr. vulgaris, E. faecium, St. aureus, St. epidermidis, St. saprophiticus, St. agalactiae, B. subtilis, B. cereus* (Argakov et al., 2004).

In order to disinfect the objects of veterinary supervision, a wide range of effective disinfectants and detergent–disinfectants was developed, tested and proposed for application. Use of these drugs allows maintaining a high level of veterinary and sanitary state of processed objects. However, most of the existing agents, according to their physico-chemical and toxicological properties, do not meet the current requirements, especially when they are applied in the food industry.

In this regard, an argumentative search of environmentally friendly and highly effective sanitary measures is necessary (Salvat et al., 1995; Paliy et al., 2017).

Today, in spite of the large arsenal of modern disinfectants, unceasing searches of new effective drugs are continuing, by the synthesis of new chemical compounds and the creation of compositions from existing substances as well. In compositional means it is possible to supplement the functional properties of each component, as well as to achieve a mutually reinforcing of component activity (synergy). Creation of composite disinfectants that have much higher activity compared to the individual components is only possible after the detailed study and in-depth analysis of the antimicrobial action of these components and their chemical properties as well (Rutala et al., 2013; Paliy et al., 2016).

It is also should be noticed about the change in the microbial background, as a consequence of the adaptation to the used drugs. The microorganisms' strains which are resistant to traditional disinfectants are increasingly appear. Also, scientists have recently raised environmental safety problems. The use of disinfectants should not be accompanied by an increase in emissions of hazardous chemicals into the environment. Optimal solution of the mentioned above problems associated with the need of disinfection in veterinary practice, requires modern high–effective disinfectants and antiseptics. Without modern disinfectants, it is impossible to provide the necessary sanitary-epidemic regime and reliable protection against infections (Vasilev, 2003; Weber et al., 2007; Zavgorodnii et al., 2012).

The analysis of the nomenclature and active substances of the veterinary market disinfectants, which are registered on the territory of Ukraine, shows that the main active ingredients of disinfectants are quaternary ammonium compounds (QAC), aldehydes, oxygen compounds, organochlorine compounds, guanidine and their combinations. The part of domestic

production is only 45,5 % (Dimko et al., 2015). However, in spite of the practical significance of such results, the question of the effectiveness use of these drugs in meat processing enterprises is not considered adequately.
Thus, disinfection at meat processing enterprises is an integral part of the sanitary-and-epidemic regime in the industry, which is realized through the development of a complex of disinfection measures. Only the high level of modern clearance and sanitation technologies ensure the perfect quality and safety of food products (Broda et al., 2002; Hinton et al., 2002; Isonhood et al., 2002).
Therefore, there are reasons to believe that poor quality of disinfection and low-efficiency measures and technologies at the enterprise is a prerequisite for lowering the product quality; therefore there is the necessity to conduct research to determine the effectiveness of the use of modern disinfectants in the production conditions.

Materials and methods

The experimental part of the work was carried out on the basis of meat processing enterprises of Luhansk, Kharkiv, Kirovograd and Volynsk oblast of Ukraine and in the laboratory of veterinary sanitation and parasitology of the National Scientific Center "Institute of Experimental and Clinical Veterinary Medicine" (Kharkiv).
To make swab it was made tampons on the wire rods, placed in a cotton–gauze stopper, which were used to cover the tube with prepared beforehand distilled water in 2.0 cm^2 volume and sterilized in an autoclave for 30 minutes. Collection of the swab-samples from the surfaces of technological equipment and tools was carried out on the area of 100 cm^2 by means of the metal stencil frame in size 10 × 10 cm that limited the required area. Before each overlay on the surface of the studied object, the frame of the stencil was flamed above the fire of the spirit lamp.
On the limited of 100 cm^2 area they wiped the test surface by the swab on the rods, which was soaked in distilled water, and brought it back into the test tube. It was poured over 8,0 cm^3 of sterile distilled water into test tubes with tampons after collection swabs in aseptic conditions. A well-squeezed tampon was removed and sent for disinfection. The obtained suspension in the test tubes was considered as initial (initial) dilution. Furthermore the series of sequential dilutions was done in accordance with DSTU ISO 21528-1: 2014.
Bacteriological studies of sanitary-hygienic swabs were carried out in accordance with the "Recommendations on the sanitary-microbiological study of the swabs from the test objects surfaces and the objects of veterinary supervision and control" (2004).
In the experiments, the following measures were used:
"Anti-Jerem SR S 25" is a liquid alkaline foaming detergent which contains complexing and surfactants.
"Germicidan FF Plus" is a disinfectant that includes disedicyldimethylammonium chloride, glutaraldehyde, propan-2-ol, fetal-alcohol polyglycolletter, nitrilotrimethylene thryside, water.
Clearance, disinfection and control of its quality were carried out in accordance with the methodological recommendations "Disinfection of technological equipment and industrial premises of meat processing enterprises" (2016) and other current methods (Iacubchak, 2010).
All experiments were carried out in triplicate. Statistical processing of the results was carried out with traditional methods of variation statistics using the program Exel and Statistica 10.

Results and discussion

Primary cattle processing at meat processing enterprises is carried out in the slaughter, intestinal and by-product department of the meat and fat bay. In these departments there are works in which the veterinary-sanitary and hygienic rules must be strictly kept. The contamination of meat raw materials by various microorganisms, including pathogens is not excluded in the other case.
At the first stage, the level of microbial contamination of the contact surfaces of meat raw materials with the conditional pathogenic and pathogenic microflora in the conditions of meat processing enterprise was studied.
According to the research results it was found that during the working hours, disinfection of technological equipment, walls and floors is not carried out. In the interval between the slaughter of each batch of slaughter cattle and before the break of the working personnel, there is only washing with a jet of warm water under pressure. The floor is washed during the working shift if necessary to remove any residues of blood and other technological dirt. Preventive disinfection of the shop is carried out at the end of each working shift. Forced disinfection is carried out in case of technological needs (after slaughter of a batch of forced slaughter animals). The assessment of the sanitary condition of the shop is carried out by the veterinary medicine doctor of the Department of Industrial Veterinary Control after each disinfection with the further registration in the corresponding journal.
The control of the sanitary-microbiological condition of the shop by the method of swab sample is conducted by the employees of the bacteriological department of the production laboratory once a week.
It should be noted that when analyze of the results of a microbiological study against the determination of the total number of microorganisms (MAFAnM) per 1 cm^2 of the experimental area from the surfaces of the technological equipment, walls and floors, it is established high level contamination of walls and floor of the meat-and-fat shop during the work shift, which is given in Table. 1

Table 1. Results of the determination of MAFAnM from the experimental objects of the meat and fat shop

Research Object	Total amount of microorganisms, CFU cm^2				
	in 1 hour	in 3 hour	in 5 hour	in7 hour	in 9 hour
Floor	$(4.3\pm0.23)\times10^2$	$(5.8\pm0.15)\times10^3$	$(7.3\pm0.1)\times10^4$	$(2.3\pm0.1)\times10^5$	$(1.6\pm0.23)\times10^{6*}$
Walls	$(3.7\pm0.1)\times10^2$	$(5.1\pm0.25)\times10^3$	$(6.7\pm0.15)\times10^4$	$(3.1\pm0.1)\times10^5$	$(8.2\pm1.1)\times10^{5*}$
Overall (aprons)	$(1.4\pm0.14)\times10^2$	$(3.1\pm0.1)\times10^2$	$(1.5\pm0.04)\times10^2$	$(3.4\pm0.15)\times10^2$	$(5.0\pm0.25)\times10^{2*}$
Processing line of cattle and horses					
Table to wash stomach	$(6.4\pm1.1)\times10^2$	$(3.4\pm0.04)\times10^3$	$(5.2\pm0.2)\times10^{3***}$	$(7.1\pm1.1)\times10^4$	$(3.3\pm0.1)\times10^{5**}$
Gutter to move off stomach	$(6.7\pm1.3)\times10^2$	$(4.1\pm1.1)\times10^3$	$(5.5\pm1.0)\times10^3$	$(7.3\pm1.2)\times10^4$	$(1.6\pm0.15)\times10^{5*}$
Table to disassemble intestinal kit	$(7.1\pm0.5)\times10^2$	$(3.9\pm0.15)\times10^3$	$(6.1\pm0.21)\times10^4$	$(8.2\pm1.1)\times10^4$	$(1.8\pm0.15)\times10^{5*}$
gutter to move off intestinal kits	$(7.3\pm0.5)\times10^2$	$(4.9\pm0.25)\times10^3$	$(6.1\pm0.6)\times10^4$	$(8.2\pm1.2)\times10^4$	$(2.2\pm0.1)\times10^{5*}$
Bin to collect kidneys	$(2.3\pm0.1)\times10^2$	$(4.3\pm0.25)\times10^2$	$(6.1\pm0.15)\times10^2$	$(3.2\pm0.15)\times10^3$	$(8.3\pm1.2)\times10^{3*}$
Bin to collect diaphragm	$(2.5\pm0.05)\times10^2$	$(5.1\pm0.2)\times10^2$	$(6.9\pm0.15)\times10^2$	$(4.1\pm0.21)\times10^3$	$(9.1\pm0.3)\times10^{3*}$
Table to examine liver	$(1.9\pm0.04)\times10^2$	$(3.7\pm0.15)\times10^2$	$(5.3\pm0.15)\times10^2$	$(2.9\pm0.1)\times10^3$	$(7.4\pm1.1)\times10^{3*}$
Processing line of pigs					
Drum to clean heads	$(1.8\pm0.01)\times10^2$	$(2.6\pm0.04)\times10^2$	$(4.5\pm0.25)\times10^2$	$(3.2\pm0.15)\times10^3$	$(4.9\pm0.1)\times10^{3*}$
Table for heads	$(2.1\pm0.08)\times10^2$	$(3.9\pm0.04)\times10^2$	$(5.2\pm0.15)\times10^2$	$(4.5\pm0.15)\times10^3$	$(5.3\pm0.21)\times10^{3*}$
Table to disassemble liver	$(2.2\pm0.04)\times10^2$	$(3.7\pm0.25)\times10^2$	$(4.1\pm0.1)\times10^2$	$(2.3\pm0.08)\times10^3$	$(5.3\pm1.0)\times10^{3*}$
Hooks for liver	$(1.9\pm0.02)\times10^2$	$(3.3\pm0.2)\times10^2$	$(4.4\pm0.15)\times10^2$	$(2.1\pm0.04)\times10^3$	$(5.1\pm0.25)\times10^{3*}$
Table to wash stomach	$(5.3\pm0.2)\times10^2$	$(2.1\pm0.02)\times10^3$	$(4.2\pm0.15)\times10^3$	$(2.1\pm0.15)\times10^4$	$(8.1\pm1.1)\times10^{4*}$
Gutter to move off stomach	$(5.7\pm0.3)\times10^2$	$(4.1\pm0.1)\times10^3$	$(6.3\pm0.25)\times10^3$	$(9.1\pm1.2)\times10^3$	$(1.6\pm0.05)\times10^{4*}$
Table to disassemble intestinal kit	$(6.0\pm1.1)\times10^2$	$(5.2\pm0.5)\times10^3$	$(7.1\pm1.1)\times10^3$	$(1.2\pm0.05)\times10^4$	$(7.6\pm1.25)\times10^{4*}$
gutter to move off intestinal kits	$(6.1\pm1.5)\times10^{2*}$	$(5.4\pm0.25)\times10^3$	$(6.1\pm0.5)\times10^4$	$(7.2\pm0.3)\times10^4$	$(8.1\pm0.25)\times10^{4**}$
Bin to collect kidneys	$(2.5\pm0.5)\times10^2$	$(4.5\pm0.7)\times10^2$	$(5.9\pm0.25)\times10^2$	$(2.2\pm0.5)\times10^3$	$(4.1\pm0.2)\times10^{3*}$
Bin to collect diaphragm	$(2.5\pm0.4)\times10^2$	$(5.1\pm0.5)\times10^2$	$(5.8\pm0.15)\times10^2$	$(3.1\pm0.2)\times10^3$	$(5.3\pm0.15)\times10^{3*}$

Notes: *– P<0.05; **– P<0.01; ***– P<0.001 comparison of the amount of microorganisms in the air: after 3. 7 and 9 hours.

In the analysis of the materials presented in Table 1, it is evident that in 3 hours after the start of the workshop process, the total number of microorganisms exceeds more than in 5 times of the established norm (in the norm not more than 1000 CFU/cm^2), but already at the end of the work shift the number of MAFAnM on the floor and the walls is $(1.6 \pm 0.23) \times 10^6$ and $(8.2 \pm 1.1) \times 10^5$ CFU/cm^2, relatevly.

Comparing the sanitary-microbiological state of the technological equipment of the processing line of cattle, horses and the line of pig processing, we made the conclusion that at the beginning of the work shift the amount of MAFAnM of test surfaces corresponds to the established norm, and in 3 hours the sanitary condition of the equipment got worth significantly. Increase of MAFAnM by 4 times was observed almost in 50 % of the selected samples. The most contaminated are the gutter to move off stomach, the table to disassemble intestinal kit and the gutter to move off intestinal.

During the process of cattle and pigs slaughter in the meat processing enterprise, the gradual contamination of the technological equipment by the mesophilic microflora occurs. It was established that in 9 hours after the beginning of slaughter (by the end of the working shift) none of the experimental objects of the cattle and horses processing line and the pig processing line did not meet the requirements of the normative documentation. At the same time, technological equipment of the line of processing cattle and horses (table to wash stomach – $(3.3 \pm 0.1) \times 10^5$, gutter to move off stomach – $(1.6 \pm 0.15) \times 10^5$, table to disassemble intestinal kit – $(1.8 \pm 0.15) \times 10^5$ and gutter to move off intestinal kits – $(2.2 \pm 0.1) \times 10^5$ CFU/cm^2) was the most contaminated by MAFAnM.

Compulsory, timely cleaning and preventive equipment disinfection and tools which is used during the processing of meat raw materials are important elements of constant sanitary production control, which includes sanitary-microbiological control of

cleanliness of the objects, quality control of washing and disinfection. Due to this, it is necessary to find new, universal, easy to use, safe disinfectants, which, along with affordability and low cost, would have a high efficiency.

Before this time the preventive disinfection of technological equipment, tools and shop production premises of meat-enterprises was carried out according to the following scheme: mechanical cleaning, washing of objects with warm (40–50 °C) water, then hot (60–70 °C) washing solution, disinfection with a solution, containing chlorine, formaldehyde or caustic soda, washing with water to remove residual amounts of disinfectants. For this treatment, the water flow was 5,5–6,5 l liter/m^2 surface with significant workload of manual labor.

Two preparations "Anti-Jerem SR S 25"(detergent) and "Hermicidane FF plus" (disinfectant) were selected for the development of effective schemes of veterinary and sanitary measures at meat processing enterprises, and their efficiency was determined under the production conditions.

We used the preparation "Anti-Jerem SR S 25", against hot water with the purpose to wash up technological equipment and industrial premises. To obtain foam (head), dense foam, they used special foam-protecting equipment – foam gun, with which the drug was applied as a thin foam layer. The surface was then washed with water under pressure for 3–5 minutes until the drug final removal.

Hot water was use to control the treatment. The efficiency of processing was determined visually with the use of white paper napkins. The results of the conducted studies are presented in Table 2.

Table 2. Effectiveness of the agent "Anti-Jerem SR S 25" (n = 5)

Agent	%	Use regime Min.	t °C	Effectiveness of application
"Anti-Jerem SR S 25"	1.0	15	40±2.0	–
			50±2.0	–
			70±2.0	–
		30	40±2.0	–
			50±2.0	–
			70±2.0	–
	2.0	15	40±2.0	–
			50±2.0	–
			70±2.0	–
		30	40±2.0	–
			50±2.0	+
			70±2.0	+
	3.0	15	40±2.0	–
			50±2.0	+
			70±2.0	+
		30	40±2.0	–
			50±2.0	+
			70±2.0	+
Water		15	40±2.0	–
			50±2.0	–
			70±2.0	+
		30	40±2.0	–
			50±2.0	–
			70±2.0	+

Notes: "+" - is satisfactory; "–" - is not satisfactory.

According to the results of the scientific studies presented in Table 2, the "Anti-Jerem SR S 25" agent does not index its properties regardless of concentration and exposure at the temperature of 40 ± 2.0 °C. The effective degreasing of processed objects was no observed when it was used this preparation at a concentration of 1.0 % for 15–30 minutes at a temperature of (50–70) ± 2.0 °C, as well as at a concentration of 2.0 % with exposure for 15 minutes and the temperature of solution (50–70) ± 2.0 °C. In addition, it was determined that when use the "Anti-Jerem SR S 25" agent it provides careful removal of organic contaminants from surfaces of any type at a concentration of 2.,0 % for 30 minutes at a temperature of (50–70) ± 2.0 °C, and at a concentration of 3.0 % at exposure 15 minutes and the temperature of the solution (50–70) ± 2.,0 °C.

When washing the objects of veterinary supervision with water of different temperatures, we have found that the use of hot water 70 ± 2.0 °C allows to reduce the degradation of technological objects and premises, but this requires additional energy and water resources. In this regard, it is economically more advantageous for meat processing plants to use degreasing agents in comparison with the use of hot water.

Patent № 118874 "Method of Foaming of Veterinary Objects" was received according to the results of the research (Paliy et al., 2017).

In veterinary practice in Ukraine, a large number of various disinfectants are used, which are differing in chemical composition and release form. In general, preference is given to complex drugs that meet a number of existing requirements (universality

and stability during shipping, water or other liquids solubility, activity against a wide range of microorganisms because of a combination of several biocidal components, no corrosive effect and environmental safety). One of such preparations is a disinfectant "Germicidan FF plus", which was also used to disinfect in the production conditions of meat processing enterprises. The presence of MAFAnM and *E. coli* group bacteria in the swab samples was determined to assess the sanitary state of the meat processing enterprise. The technic of direct platting on growth medium was used to reach this purpose. The results of the experiment are presented in Table 3.

Table 3. Activity of "Gmicidad FF Plus" in production conditions for 60 minutes exposure (n = 5)

Object of Decontamination	Concentration	Examined Samples			% decontamination
		Totally	Including		
			decontaminated	not decontaminated	
Concrete	0.2 %	60	60	+	70
Wood		60	60	+	60
Tile		60	60	+	80
Metal		60	60	+	80
Plastic		60	60	+	80
Glass		60	60	+	80
Concrete	0.5 %	60	60	–	100
Wood		60	60	–	100
Tile		60	60	–	100
Metal		60	60	–	100
Plastic		60	60	–	100
Glass		60	60	–	100
Concrete	1.0 %	80	80	–	100
Wood		80	80	–	100
Tile		60	60	–	100
Metal		80	80	–	100
Plastic		80	80	–	100
Glass		80	80	–	100

According to the results presented in Table 3, it was carried out that the disinfectant "Germicidan FF plus" at a concentration of 0.2 % for 60 minutes exposure does not completely disinfect the treated objects. The least effective was the process of concrete and wooden objects, which was 70 % and 60 % relatively. The efficiency of the decontamination of all other surfaces was 80 %. At the same time, it has been determined that the preparation "Hermicidane FF plus" in the concentration of 0.5–1.0 % for 60 minutes exposure completely decontaminates the surface, made of different materials (concrete, wood, tile, metal, plastic, glass). The drug applications allowed realize 100 % disinfection of the objects of veterinary supervision of meat processing enterprises in the specified use regime.

The patent № 119095 "Method of Wet Disinfection of Livestock Objects" (was obtained according to the research results) (Paliy et al., 2017).

The obtained research results allowed clarify and correct the concentrations and exposures of the newest means of "Anti-Jerem SR S 25 and Germicidan FF plus", use them for veterinary and sanitary measures in meat processing enterprises. The research results broad the spectrum of highly active antimicrobial detergents which are promising to be used in the processing and food industry.

The obtained research results have been tested and implemented into production at meat processing enterprises of Ltd Olkhovskyi Meat Enterprise (Kharkiv, Kharkiv region) and Yatran Kirovohrad Meat-Packing Integrated Factory (Kropivnitskyi, Kirovograd region).

Modern requirements to the quality and safety of meat raw materials, semi-finished products and finished products require the constant necessity of sanitary-microbiological and hygienic monitoring of all critical points of production in accordance with the basic principles of HACCP (Megenska, 2014).

Production of high-quality and safe meat and meat products could be ensured only with the strict observance of sanitary and hygienic conditions of production, by use of effective regimes and measures to prevent the disinfection of technological equipment surfaces, as well as observance of stuff personal hygiene. Mandatory and timely cleaning and preventive disinfection of equipment and tools, which are used in the processing of meat raw materials, are important elements of continuous production veterinary and sanitary control, that includes sanitary and microbiological monitoring of equipment and inventory cleanliness, quality control of washing and disinfection (Lammerding et al., 2000).

To prove this, it should be noted that the level of contamination of meat raw materials directly depends on the sanitary state of the production objects. It is proved that the amount of MAFAnM and the *Enterobacteriaceae* family bacteria on the beef carcass surfaces varies during working hours. The highest value is recorded during the slaughter of animals in the second half of the working time. In addition, it is noted that the average amount of MAFAnM in the air at the slaughter and poultry processing area at the end of the working shift exceeds the established norm by 3.3 times (Paliy et al., 2017).

It has been established that microorganisms, including pathogens, could enter the carcass surface during its initial processing from the air, in contact with contaminated tools, hands, stuff overall, etc (Lammerding et al., 2000; Kvatirka, 2010).

Therefore, compliance with sanitary and hygiene requirements in meat processing enterprises during food production in the application of Good Manufacturing Practice (GMP), Good Hygienic Practice (GHP), and the implementation of the HACCP system is the condition and the guarantee for each company to make safe and competitive meat products (Wilhelm et al., 2011).
The scientifically based rotation of antimicrobial agents in the production is associated with the emergence of resistant microorganism forms and looking for more modern forms of chemical compounds as well (Argakov et al., 2004; Rutala et al., 2013). Combined use of detergents and disinfectants provides the faster effect and could reduce the rehabilitation timing of the objects (Paliy et al., 2015).
In particular, this may be directed to the need for constant sanitary-microbiological and hygienic monitoring of all critical production points (factors of influence) in order to ensure the quality and safety of meat and meat products. In addition, it is necessary to adhere to sanitary conditions of the production process with the use of effective regimes and measures to prevent disinfection of equipment technological surfaces, etc. Actuality and innovation of the conducted researches are confirmed by two patents of Ukraine on utility model, which are implemented in domestic manufacture.
From the point of view of the further research prospect, they consist of providing the theoretical and experimental substantiation of screening and the use of new washing-disinfecting agents at meat processing enterprises, the development of new recipes and technologies for their application, which will definitely have both theoretical and practical value.

Conclusions

The total number of microorganisms exceeds the established norms more than 5 times in 3 hours processing of the slaughtered animals workshop , and the number of MAFAnM on the floor and walls is already $(1.6 \pm 0.23) \times 10^6$ and $(8.2 \pm 1.1) \times 10^5$ CFU / cm^3, at the end of the working shift, that is significantly more than the regulated indicators. The most contaminated in the production process is the table to wash stomach, the gutter to move off stomach, the table to disassemble intestinal kit and the gutter to move off intestinal kits. The implementation of “Anti-Jerem SR S 25” detergent at 2.0 % concentration for 30 minutes exposure provides the high sanitary level in the meat production industry. The disinfectant “Germicidan FF plus” provides complete destruction of sanitary-indicative microorganisms at the veterinary supervision objects at meat processing enterprises in the application of 0.5 % concentration for 60 minutes exposure.

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