

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## Veterinary and Sanitary Examination of Meat of the Animals Subjected To Physical and Biological Effects.

**Nikitin Andrey Ivanovich\*, Konyukhov Gennadiy Vladimirovich, Tarasova Natalya Borisovna, Aslanov Rashid Mikhailovich, Gayzatullin Rinat Raufovich, Nizamov Ramzi Nizamovich, and Velikanov Valerian Ivanovich.**

Federal Center for Toxicological, Radiation and Biological Safety, Russia, 420075, Kazan, Nauchny Gorodok-2.

### ABSTRACT

The received results on studying of the radio modifying influence of a microbic polyantigene on an organism of the irradiated pigs expand ideas of a possibility of receiving safer, from the point of view of radiation ecology, livestock production. On organoleptic indicators, degree of an draining of blood, a bacterial semination, the content of flying fatty acids, amino-ammoniac nitrogen, reaction to products of primary disintegration, meat of pigs, the immunized microbic polyantigene and subjected to prevention before radiation, conforms to requirements of state standard specifications and Rules of veterinary and sanitary examination to good-quality meat. Meat irradiated in semi-lethal and lethal doses and the immunized a radio protectant of animals had previously the same stability at storage in the conditions of the household refrigerator (0÷4<sup>0</sup>C), as well as the meat received from healthy pigs. Long feeding to infant rats and mice of the meat received from, LD<sub>50</sub> and LD<sub>100</sub> imparted by a microbic polyantigene and irradiated in doses in 30 days after immunization of animals, didn't exert negative impact on kliniko-hematologic indicators, and also at the same time gonadotropin, embryotoxic and teratogenic effects, indicating that the safety and purity of the product.

**Keywords:** radiation, prevention, veterinary and sanitary examination, quality of meat, microbic semination

*\*Corresponding author*

## INTRODUCTION

Some researchers consider the meat and meat products received from the irradiated animals and birds, harmless to food use, others claim that it on sanitary and hygienic indicators is less permanent at storage because of neutral value pH that favors to development of putrefactive microflora and a considerable microbic semination of muscular tissue [4,7,5].

At radiation defeat of an organism in high doses there are violations in all bodies and systems [8, 11, 9, 10, 12]. Synthesis of amino acids and proteins is slowed down, and also disintegration of proteins of fabrics, especially muscles amplifies. A lethal exit of meat while at the hulks irradiated in small doses weight and her category considerably I surpassed their level decreases [2]. It can lead to reduction of maintenance of a glycogen in muscular tissue and to violation of process of maturing of meat after slaughter of animals. In the irradiated organism the toxic products of fabric disintegration which are negatively influencing quality of production received from the animals struck with radiation collect.

At radiation defeat in high doses in bodies and tissues of animals the microbic semination amplifies, and increase in a bacterial semination can lead to the accelerated decomposition of meat after slaughter of animals and to reduction of his resistance to storage. According to V.M. Karavaeva [1, 13], meat of the animals killed for the 5th day after a radiation injury practically doesn't ripen. On 2-3 days of storage pH such meat is reached by only 6,3-6,4.

Results of researches testify to high quality and a possibility of use of meat of the animals struck with radiation in food in experiences on a small cattle and a bird at slaughter in different terms after radiation of V.A. Makarov, etc. [3], Shuklina N.F. [4], Karavaeva V.M. [1].

Requirements to quality and safety of food staples and foodstuff are defined in a complex: microbiological, parasitological and radio biological indicators, and also on indicators of a nutrition value of production.

The purpose of the real researches was the veterinary and sanitary assessment of meat of the pigs irradiated and subjected to prevention by a microbic polyantigene.

## MATERIALS AND METHODS

Modeling of sharp radiation sickness at pigs of average and heavy severity carried out by external radiation them on a gamma-ray irradiation plant «Puma» with a radiation source caesium-137 at the power of an exposition dose of radiation of  $3,13 \times 10^{-5}$  Kl / kg\*s in doses of 3,5 and 4,2 Gr.

Prevention of radiation sickness was carried out by single hypodermic introduction of a radio protective microbic polyantigene.

For studying of veterinary and sanitary qualities of the meat received from the prevented and irradiated pigs, they were killed during various periods of development of radiation sickness. Postlethal veterinary and sanitary survey was carried out according to "Rules of veterinary survey of lethal animals and veterinary and sanitary examination of meat and meat products" (1988). Definition of freshness of meat and meat products carried out on organoleptic, biochemical and bacteriological indicators. Defined an exit of meat and internals.

Degree of an draining of blood of hulks was determined by Zagaevsky, concentration of hydrogen ions - on an ionomer universal EV-74.

In muscular tissue the content of the general nitrogen determined by Kyeldal, fat - zhiromery, waters, mineral and solids, caloric content - the standard methods.

The biological value of the meat received from the irradiated and prevented animals, was determined in experiences on the growing infant rats males, mice, feeding him ispytuyemy meat within 28 days according to recommendations of VASHNIL (1977). At an assessment of biological full value of examinees of samples of

meat at experimental animals considered the general state and rosto-weight indicators, survival, hematologic indicators, and at mice and reproductive function, defined fertility, viability, an oplodotvoryaemost, a teratogennost. The assessment of the genetic effects of long feeding of meat irradiated and the immunized to radiation of animals was carried out by method of studying of chromosomes of cells of peripheral blood according to «Methodical recommendations about an assessment of the remote consequences of ionizing radiation» (2000).

### RESULTS OF RESEARCHES

Organoleptic researches have shown that carcasses of animals have been well bloodless, in 1 days they had a dry crust of drying of pale white color, a muscle dense, an elastic consistence, on a section damp, not sticky, color from light pink to dark red smells are specific and correspond to this species of animals. Fat from white till light pink color, soft, without foreign smell. Sinews are elastic, dense, a surface of joints smooth and brilliant. Lymph nodes without visible changes. At test statement by cooking – broths were fragrant, transparent, their fat gathered for surfaces in the form of large drops.

The meat received from control, the animals irradiated and imparted for 30 days before radiation by a radio protective polyantigene, were investigated on freshness, studied an exit of hulks and internals. At survey of hulks and internals of the control and imparted MPAG of pigs, irrespective of terms of slaughter, any aberrations haven't revealed.

At slaughter of the animals irradiated in a dose of 3,5 Gr for the 15th day after radiation observed dot hemorrhages on an epicardium and under a liver capsule. Besides, increase in lymph nodes, especially that which are located in chest and belly cavities was noted. At the pigs irradiated in a dose of 4,2 Gr in 10-14 days after radiation came to light various size of hemorrhage in hypodermic cellulose, skin and muscles. Multiple hemorrhages observed in internals: in heart (under epicardium and in a myocardium), lungs, a liver, a spleen, a digestive tract, especially, in thick and thin departments of intestines. Necrotic sites on mucous membranes of a mouth, a throat, a throat, intestines and a liver were in some cases observed. Noted hypostasis of lungs. Lymph nodes were bulked up, juicy and with hemorrhages. Noted changes at animals of this group gradually disappeared only by the end of the 2-nd month after radiation.

When studying meat efficiency of animals, considered the live and lethal mass, an exit of hulks, fat raw, an offal (table 1).

**Table 1: Exit of products of slaughter of the irradiated and prevented pigs**

Group	Indicator (kg, %)				
	live weight, kg	lethal weight	exit of hulk	fat raw exit	exit of an offal
Control	76,1±6,10	<u>54,4±5,30</u> 71,50	<u>45,3±3,10</u> 59,50	<u>1,9±0,10</u> 2,50	<u>7,2±0,60</u> 9,5
Irradiated (3,5 Gr)	67,9±5,20	<u>46,95±2,50</u> 69,14	<u>39,93±2,13</u> 58,8	<u>1,43±0,23</u> 2,10	<u>5,89±0,57</u> 8,67
Irradiated (4,2 Gr)	62,3±5,30	<u>43,59±2,70</u> 69,96	<u>37,12±2,86</u> 59,58	<u>1,28±0,10</u> 2,05	<u>5,40±0,54</u> 8,66
Prevented before radiation in a dose of 3,5 Gr	74,4±5,80	<u>53,9±4,70</u> 72,55	<u>44,31±2,78</u> 59,55	<u>1,54±0,28</u> 2,06	<u>6,18±0,51</u> 8,3
Prevented before radiation in a dose of 4,2 Gr	73,0±5,90	<u>51,7±4,90</u> 70,80	<u>43,9±3,40</u> 60,10	<u>1,2±0,20</u> 1,60	<u>6,6±0,40</u> 9,1

By results of studying of indicators of the meat received from the irradiated animals decrease in live weight on 8,2 (at 3,5 Gr irradiated in a dose) and on 13,8 kg (at 4,2 Gr irradiated in a dose), lethal on 7,45 and 10,81 kg, a hulk exit to 5,37 kg and 8,18 kg respectively is established.

At the pigs sick with radiation sickness of average degree, the amount of internal fat was 24,7% less, heavy degree - for 32,64% in comparison with that at control animals. The similar tendency was observed also at the accounting of an exit of an offal (a liver, kidneys, lungs, heart).

When studying properties of the hypodermic and internal fats including determination of color, transparency, a smell, a look and a consistence, indicators of acid and peroxide numbers it has been revealed that immunization of pigs for 30 days before radiation exerted corrective impact on the studied indicators (table 2).

**Table 2: Influence of single hypodermic immunization on indicators of subcutaneous and internal fat of the intact and irradiated pigs**

Indicator	Unit of measure	Group			
		Control	immunizirovanny polyantigenome	irradiated	Prevented before radiation in a dose of 4,2 Gr
acid number					
Subcutaneous fat	mg KON	1,01± 0,21	1,03± 0,14	1,05± 0,17	1,03± 0,23
Internal fat	mg KON	1,06± 0,09	1,05± 0,11	1,08± 0,15	1,5± 0,25
peroxide number					
Subcutaneous fat	iodine (g)	0,017± 0,003	0,016± 0,005	0,019± 0,002	0,018± 0,008
Internal fat	iodine (g)	0,021± 0,005	0,020± 0,002	0,028± 0,005*	0,020± 0,003

From data of table 2 it is visible that immunization of pigs a microbic polyantigene didn't cause essential changes in a chemical composition of fat in experimental animals. The dense consistence, lack of a foreign smell and taste testifies to high quality of fat. Single hypodermic introduction of a microbic polyantigene didn't change pigs value of acid and peroxide numbers of fat – he was characteristic of the fat suitable in food without restrictions.

At the pigs irradiated in a dose of 4,2 Gr observed certain changes of properties of subcutaneous and internal fat (table 2). These changes were followed by doubtful increase acid (in 1,03 and 1,01 times) numbers of subcutaneous and internal fat respectively. Changes of peroxide number of internal fat had reliable distinctions in comparison with control.

Unlike only irradiated, at the animals irradiated against prevention with a microbic polyantigene the studied indicators of meat efficiency slightly differed from control indicators, conceding to that no more, than for 4,7-8,4%.

Studying of degree of an draining of blood of the hulks received from the immunized and the radio prevented animals for 30 days before radiation in doses of 3,5 and 4,2 Gr in dynamics has shown that irrespective of slaughter terms, their indicators slightly differed from control animals. Draining of blood than carcasses of the pigs irradiated in a dose of 4,2 Gr was 1,5 times lower, than in control that testifies to smaller high quality of meat of the animals irradiated in average and lethal doses.

Immunization of pigs a microbic polyantigene didn't lead to essential changes in a chemical composition of meat. Meat of the irradiated animals contained more water (for 1,9 and 3,01%), mineral substances (for 16,8 and 18,8%), it is less than protein (for 9,5 and 13,0%), fat (for 43,0 and 45,7%), had smaller power value for 4,13 and 27% respectively.

Meat of the prevented pigs on the studied indicators didn't differ from control, conceding to them no more than for 4,9-4,66%.

When studying biochemical indicators of meat of the irradiated and prevented animals also certain changes from outside pH, coefficient of acidity oxidability and reaction with sulfate copper and on peroxidase (table 3) have been revealed.

**Table 3: Biochemical indicators of muscular tissue of the irradiated and radio prevented pigs**

Indicator	Term of slaughter (days)	Group			
		Control	immunized	irradiated in a dose 4,2 Gr	prevented for 30 days before radiation in a dose of 4,2 Gr
pH	15	5,73± 0,04	5,73± 0,05	5,99± 0,05	5,75± 0,05
	30	5,72± 0,05	5,74± 0,03	5,98± 0,03	5,74± 0,03
Coefficient "acidity oxidability" (ed.)	15	0,47± 0,04	0,46± 0,03	0,49± 0,05	0,47± 0,01
	30	0,46± 0,01	0,47± 0,05	0,48± 0,05	0,46± 0,03
Reaction to peroxidase	15	+	+	+	+
	30	+	+	+	+
Amino-ammoniac nitrogen (mg/ KON)	15	0,99± 0,02	0,98± 0,05	1,22± 0,11	1,03± 0,33
	30	0,97± 0,03	0,97± 0,03	1,14± 0,25	1,06± 0,25
LZK (mg/KON)	15	2,0±0,2	2,1±0,5	3,6±0,8	2,4±0,8
	30	2,1±0,3	2,05±0,3	3,4±0,5	2,3±0,7
Reaction with sulfate copper	15	b/t	b/t	b/t	b/t
	30	b/t	b/t	b/t	b/t

+ - reaction is positive; b/t - broth transparent

From materials of table 3 it is visible that meat the immunized and the prevented animals had no reliable differences from control.

Content of flying fatty acids and aminoammoniac nitrogen in muscular tissue of the pigs sick with sharp radiation sickness, was in 1,8 and 1,23 times is higher, than at control animals. The indicator pH meat after 72 h maturing corresponded to a similar indicator of meat of healthy animals, however it by 1,04 times exceeded control values. The similar tendency was noted also from coefficient «acidity oxidability»: this indicator exceeded control values by 1,08 times. At pigs of all groups reaction to peroxidase of muscular tissue was positive, and broth from test cooking - transparent.

Researches of meat were conducted right after slaughter of pigs and within 12 days with an interval at 48 o'clock. Organoleptic indicators in 24 h after slaughter were within norm, meat had well expressed drying crust. On a section hulks had muscular tissue of light pink color from the control, prevented animals, and 3,5 and 4,2 Gr irradiated in doses had dark pink her color. Section surface damp, meat juice transparent. The smell on a surface and at a depth of a section was fresh, specific. The meat consistence elastic, a pole when pressing is leveled quickly. Marrow, sinews and sinovialny liquid without deviations. Broth was transparent, fragrant, fat gathered for surfaces big spots, had a pleasant smell. However with increase in period of storage of hulks signs of doubtful freshness have appeared: on hulks there were places of moistening, there was no drying crust. On color they were more dark, a surface sticky. On a section - muscles damp, sticky, meat juice rather turbid. The consistence is less dense, the pole which is formed when pressing by a finger was leveled slowly, surface fat soft, friable and sticky, a grayish shade. Meat had slightly musty and sourish smell, especially, it has been expressed in the group irradiated in a dose of 4,2 Gr. Sinews were less dense, opaque, articulate surfaces contained slime. Broth was translucent, with poorly expressed aroma.

The analysis of physical and chemical indicators of the meat received from the pigs sick with sharp radiation sickness at average extent of defeat has shown that in 24 h after slaughter of animals all studied indicators were in limits of norm and authentically didn't differ from meat of intact pigs, i.e. have defined him as is fresher, received from healthy animals. The similar picture has been revealed also in the meat received from the pigs prevented for 30 days before radiation. However the meat received from the pigs irradiated in a dose of 3,5 Gr already to 6 days became doubtful on freshness, products of disintegration of protein have appeared what confirmed reaction with sulfate copper, formal test and the increased amount of flying fatty acids which in comparison with control made 4,21±0,23 mg / KON. At the same time in meat activity of

peroxidase has decreased. At the same time the indicator pH slightly raised on 6 days and by the end of researches (12 days) made 6,55 against 6,35 in control.

Bacterioscopy researches of dabs prints from muscular tissue have shown that the quantity of microbic flora both kokkovy, and rhabdoid, increased and to 9 days made  $23,23 \pm 0,25$  m.k. in sight of a microscope against  $12,1 \pm 0,3$  m.k. in control.

In the meat received from the pigs sick with sharp radiation sickness of heavy degree pH made  $6,3 \pm 0,03$ . To 3 days there was a peroxidase decrease of the activity that was characteristic of meat of sick animals. At storage of meat of pigs of this group it is established that on 3 days the amount of aminoammoniac nitrogen made  $1,29 \pm 0,03$  mg / KON, LZK –  $4,20 \pm 0,29$  mg / KON that exceeded indicators of control group respectively on 1,45 mg / KON and 1,43 mg / KON and defined his doubtful freshness. Analyzing the received results of researches it should be noted that the cooled meat of the studied groups of animals at observance of the mode of storage kept freshness till 6 days, meat of 4,2 Gr irradiated in a dose – till 3 days.

Thus, results of comparative studying of the meat received from control (healthy) and prevented for 30 days before radiation of pigs, have shown that at survey of hulks and internals, irrespective of terms of slaughter, any aberrations it isn't revealed [14].

At the animals irradiated in doses defiant average (3,5 Gr) and heavy degree (4,2 Gr) of sharp radiation sickness, hemorrhages in lungs, on an epicardium, in a myocardium and a cortical layer of kidneys found, necrosis sites on a mucous membrane of a mouth, a throat, intestines, a liver that will be coordinated with data of A.Hurwitz [6].

Meat of the irradiated animals on degree of an draining of blood conceded to that control and prevented by a microbic polyantigene as a result of violation and weakening of activity of cardiovascular system owing to damage of a myocardium.

Meat exit at the animals irradiated in lethal doses was lower in comparison with the control and prevented animals that is explained by reduction of live weight owing to functional insufficiency of digestive organs.

Radiation of animals caused dose-dependent change of a chemical composition of meat that was followed by reliable increase in content of water and mineral substances, reduction of amount of protein, decrease in power value. Meat of the prevented animals on the studied indicators of reliable differences from control and prevented by a microbic polyantigene, had no.

When studying biochemical indicators meat of the prevented animals had no reliable differences from healthy. In meat of the irradiated pigs the maintenance of LZK and aminoammoniac nitrogen and coefficient of «acidity oxidability» in muscular tissue, the peroxide number, content of subcutaneous and internal fat were higher, than at healthy.

It is shown what at storage of the meat received from healthy, the irradiated and prevented pigs during 18 days after slaughter, on organoleptic indicators of essential group distinctions isn't revealed. However with increase in period of storage in carcasses of the animals irradiated in a dose of 3,5 Gr, by 9th days, 4,2 Gr irradiated in a dose - by 6th days signs of doubtful freshness have appeared what reactions to peroxidase, with sulfate copper, the LZK level formal test testified to; at the same time there was a decrease of the activity of peroxidase and increase pH (for 9,1%) by the end of researches (18 days). Bacterioscopic researches of dabs prints from muscular tissue have shown more than double increase in kokkovy and rhabdoid microflora by 15th days after slaughter.

Results of the physical and chemical researches of meat received from pigs, sick OLB in heavy degree (4,2 Gr) have shown that meat of the irradiated animals is exposed to an autoliz quicker.

Analyzing the received results of researches it should be noted that the cooled meat of the studied groups of animals at observance of the mode of storage kept freshness not equally: the meat received from the pigs irradiated in a dose of 3,5 Gr kept freshness till 9 days, from 4,2 Gr irradiated in a dose – till 6 days.

The meat received from prevented for 30 days before radiation in doses of 3,5 and 4,2 Gr by a microbic polyantigene of pigs, on the studied indicators in the course of storage of reliable distinctions from control tests had no that demonstrates corrective action of a radio protective preparation on veterinary and sanitary qualities of meat of the irradiated animals.

### CONCLUSION

As a result of the conducted researches on an assessment of sanitary and hygienic properties of meat and the meat products received from the prevented animals it has been established that application of a microbic polyantigene had the modifying effect on the current and an outcome of sharp radiation sickness that was followed by restoration of a chemical composition of meat and its biological qualities.

The results of work which are convincingly proving compliance of meat of the animals prevented and irradiated in doses of LD<sub>50</sub>-LD<sub>100</sub> to requirements of state standard specification are important for the theory and practice, in GOST.

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