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INCIDENCE OF HORMONAL GROWTH STIMULANT AND ANTIBIOTICS RESIDUES IN CHICKEN MEAT

Zhanar Akhmet, Gulshat Zhaxylykova, Rashidah Sukor, Assiya Serikbayeva, Karima Myrzabek

ABSTRACT
The purpose of this study is to determine the level of antibiotic residues in poultry meat sold in the city of Almaty, which is a megacity of Kazakhstan, and compare it with the Minimum Residue Level set by World Health Organization and Food and Agriculture Organization. Determination of hormonal growth stimulators (progesterone, testosterone, estradiol-17β) and antibiotics (tetracycline, chloramphenicol, and streptomycin) in poultry was carried out using immunoassay according to the manufacturer's instruction. The results of monitoring showed that in the Almaty region annually wholesale deliveries of meat products from the USA, Belarus, Ukraine, and Russia are carried out regularly. On average in the region from 2016 to 2019, the specific weight meat imports averaged 47.9% of total consumption. A total of 105 samples were examined by us between 2019 and 2020, including 63-import meat and 42 samples of the meat of local production. Due to the particular importance of this problem, the main focus of the article`s goal is to conduct monitoring studies on imported and domestic meat for the residual content of hormones and antibiotics in poultry meat. As a result of the enzyme-linked immunosorbent assay of poultry meat, an excess level of maximum residue was detected in eight brands of imported meat.

Keywords: growth promoters; ELISA; level of maximum residue; animal products; import

INTRODUCTION
Meat is an integral part of the traditional dishes of the Kazakh people. Every citizen of Kazakhstan consumes an average of 78 kg of meat and meat products per year. According to the Ministry of Agriculture, in 2018, Kazakhstan 12 thousand tons of beef imported from Ukraine, Paraguay, and Belarus, 17 thousand tons of horsemeat brought from Argentina and Uruguay, 13 thousand tons of pork and 132 thousand tons of chicken from Russia and the USA. 7.8 thousand tons of lamb came to Kazakhstan from Russia and Mongolia, and almost 30 thousand tons of sausage and meat products were put on store shelves by Russia and Belarus. According to the chairperson of the Meat Union Maksut Baktibaev, the need for poultry meat in Kazakhstan is very difficult to provide. Imported meat is cheaper than domestic if, in Paraguay, a kilogram of meat costs two dollars, and in Kazakhstan, it costs five dollars. But most often this meat does not go to the shelves, but to the sausage production, which is bought by socially vulnerable segments of the population – students and retirees **(Kuchma, 2016; Aitzhanova, 2019)**.

Antibiotics are widely used for various purposes, including therapeutic and preventive, as well as growth stimulants. There is a risk that the infection will spread very quickly among birds; so many farmers use the antibiotic in large quantities, without any prescription, without a system. In poultry farming, antibiotics are given with drinking water or food, which makes their use even more affordable. Dangerous residues of the drug accumulate in the edible parts of food animals, for example, in the pectoral muscles of chickens **(Kadim et al., 2020)**. High levels of maximum residues (MRL) pose a serious threat to public health and the development of antibiotic resistance. When consuming meat with antibiotic residues, the work of the human intestinal microflora is disrupted, pathogenic bacteria increase, this leads to hypersensitivity of the body and a violation of the normal intestinal microflora. Growth promoters can cause the accumulation of residues in animals (meat, milk, and eggs), and the environment (water and soil contamination) and wastewater treatment systems are other important routes through which antibiotics and hormones can enter the environment with negative consequences **(Al-Doski et al., 2015; Gómez-Pérez et al., 2015; Parr et al., 2015; Akhmet et al., 2019)**. A key goal of protecting the planet through a more sustainable diet is to reduce the number of antibiotics and synthetic growth promoters, in particular, to reduce antibiotic resistance and allergies. Analytical methods play a crucial role in food analysis to determine the presence of antibiotics and other additives. Modern methods based on liquid chromatography with ultraviolet, fluorescent, or mass spectrophotometry detection, which can identify more than 300 compounds in samples, but requires a lot of time and cost. In General, there is a need for a monitoring program aimed at informing the public about the dangers associated with residues of antibiotics and synthetic stimulants in animal products and an accelerated method for determining them **(Sokolova et al., 2015; Robert et al., 2015)**.

The main danger is the risk of health effects on human residual amounts of these substances in livestock products. Numerous studies have proven high toxicity and the danger of steroid hormones when they enter the human body. The action of exogenous hormones can cause endocrine disorders balance in the body, which is expressed by unpredictable remote effects of steroid exposure at prepubescent age on reproductive function through a mechanism called "hormonal imprinting" **(Gómez-Pérez et al., 2015; Summary report, 2015; Van Boeckel et al., 2015)**. The scientific Veterinary Committee of the European Commission notes that there is a relationship between the use of steroid hormones and some cancers that meat consumption may increase the risk of breast and prostate cancer, and cites as an example North America, where the volume of consumption of meat produced from using hormones, the largest, and where the incidence of breast cancer and the prostate is also the highest **(Codex texts, 2015)**. Oncological diseases have a great impact on society in Kazakhstan and around the world. In 2018, 32.228 new cases of cancer were diagnosed in Kazakhstan, and 14.369 people died from this disease **(Kaidarova et al., 2020; Indicators of the Oncological Service, 2021)**. The most common cancers in both sexes (listed in descending order according to estimates of new cases in 2018) are breast cancer, lung, and bronchial cancer, colorectal cancer, stomach, cervical, esophageal, prostate, kidney, ovarian, pancreatic, endometrial, and liver cancers **(Wild et al., 2020)**. Unsafe food is associated with the death of approximately 2 million people each year, mostly children **(Afshin et al., 2019; James, 2019)**. Pathogenic bacteria, viruses, parasites, or chemicals found in food cause more than 200 diseases, from diarrhea to cancer. New threats to food safety are constantly emerging. Changes in food production technology, distribution, and consumption; environmental changes; new and emerging pathogens; bacterial resistance all these factors create problems for national food safety systems **(Khan et al., 2015)**.

At the first stage of the study, the analysis of the receipt of various imported types of meat in the Republic of Kazakhstan was carried out. The top ten countries importing meat and offal include Brazil, Argentina, the United States, Canada, Poland, Paraguay, Uruguay, Australia, Mongolia, India, and others, according to the customs control Committee, the United States is the largest supplier of meat in Kazakhstan. Poultry producers of the United States of America in the period from 2016 to 2019 are poultry meat for more than half of all imported meat to Kazakhstan. The traditional product supplied to Kazakhstan from the United States is chicken meat or chicken meat, so-called "Bush legs". For example, the share of poultry imports exceeds 51%. Last year, more than 191 thousand tons were imported to the country and three years ago, there were more than 165 thousand tons **(Mamyshev, 2019)**.

Scientific hypothesis

The purpose of this study is to determine the level of antibiotic residues in poultry meat sold in the city of Almaty, which is a megacity of Kazakhstan, and compare it with the Minimum Residue Level set by World Health Organization (WHO) and Food and Agriculture Organization (FAO).

MATERIAL AND METHODOLOGY

Samples

Chicken samples (n = 105) (three replicate each) represented fresh, frozen, broiler chicken meat of local and international brands was collected from major supermarkets in Almaty, Kazakhstan. Samples of local production belong to brands such as Ala-Tau Kus, Alel Agro, and Sarybulak, and imported chicken samples were from Ukraine, Russia, and the United States of America (USA).

Instruments

The method of enzyme-linked immunosorbent assay (ELISA) was used to determine the number of hormonal stimulants and antibiotics. To determine the content of hormones, various instrumental research methods are used (radioimmune, chromatographic, spectrometric, etc.), which are labor-intensive, require expensive equipment, are difficult to set up, and can only be used in laboratory conditions. From a practical point of view, the most acceptable method is ELISA, which has a high sensitivity, low time, and cost.

Laboratory Methods

According to different methods of sample preparation, analyses were performed for three various hormones and antibiotics. The purpose of preparing the sample for research was to transform the sample put the meat in a suitable form for subsequent analysis – a solution, as well as for concentration and dilution of the analyte and getting rid of interfering analysis components. Preparation of meat samples for research consisted of a set of actions: grinding, homogenization, extraction, hydrolysis, and sample deposition. Test principle: the basis of the test is the antigen-antibody reaction. The microtiter wells (lunula) are coated with capture antibodies directed against the antigen (chloramphenicol, tetracycline, streptomycin, progesterone, testosterone, estradiol-17β). The microtiter plate (pallet) is already functionalized with antigen antibodies, which are bound by the immobilized capture antibodies. Any unbound conjugate is then removed in a washing step (at the stage of flushing). The Conjugate converts the chromogen into a blue product. The addition of the stop solution (inhibitor removal buffer) leads to a color change. The measurement is made photometrically at 450 nm.

Determination of hormonal growth stimulators (progesterone, testosterone, estradiol-17β) and antibiotics (tetracycline, chloramphenicol, and streptomycin) in poultry was carried out using immunoassay according to the manufacturer's instruction. RIDASCREEN® ELISA kits purchased from R-Biopharm AG (Darmstadt, Germany) were used for the immunoassay determination for the quantitative determination of growth stimulators and antibiotics in animal products. Research on the definition of antibiotics and hormonal stimulants in poultry meat was conducted in the laboratory "Antigen", located in Almaty, Kazakhstan.

Sample preparation

Samples were collected from major supermarkets in Almaty, Kazakhstan. Permissible levels for antibiotics tetracycline, chloramphenicol in meat is not allowed (<0.01 mg.kg^{-1}), streptomycin (<0.5 mg.kg^{-1}). For meat, the level of progesterone and testosterone is not more than 0.015 mg.kg^{-1}, for estradiol-17β no more than 0.0005 mg.kg^{-1}. All samples were kept in plastic bags and transferred in a special cool box to the laboratory for analysis.

Number of samples analyzed

To determine the residual amounts of hormonal growth stimulants, progesterone, testosterone and estradiol, and antibiotics of tetracycline, chloramphenicol, and streptomycin, total number 105 chicken meat samples were examined, including 42 samples of local brands and 63 samples of imported chicken meat (four brands from each country).

Statistical Analysis

The statistical analysis data were produced by Microsoft Excel. Limit detection of the RIDASCREEN TC test (in terms of standard substance) about 1.5 µg.L^{-1} for tetracycline, about 28 mcg.kg^{-1} for streptomycin, about 5 ng.kg^{-1} for chloramphenicol, 50 ng.kg^{-1} for testosterone, 500 ng.kg^{-1} for estradiol-17β, 200 ng.kg^{-1} for progesterone.

RESULTS AND DISCUSSION

The results obtained were compared with the maximum permissible levels of hormones (MRLs), adopted by the Directives of the European Union (EU) and Russian Regulations. According to the results of the analysis of domestic meat, there is absolutely no residue of hormonal stimulants. A value of less than 0.6 absorbance units (A450 nm ≤0.6) for the zero standards. The zero standard is thus made equal to 100%, and absorbance values are quoted in percentages. The authors' findings showed that out of 64 analyzed samples of imported chicken meat, the amount of at least one of the identified anabolic hormones was determined in 11 forms, which is 18.3%.

The excess of the maximum permissible level of testosterone over the indicators is seen in 7 samples of poultry meat (11.6%) produced in the United States. The level of testosterone in the studied samples of birds increased from the maximum permissible level to 1.0 – 1.9 times. For the estradiol-17β, 11 samples were found to exceed the permissible level, which was 18.3% of the total number of detected hormones. Excess of MRLs was detected in 15 samples (4 brands) of chicken meat produced in the United States.

Table 1 provides a comparative analysis of the results of determining hormone residues in meat from different countries. The minimum traces of testosterone in all local brands of 0.000 mg.kg^{-1}and 0.005 mg.kg^{-1}in Russia do not reach the MRLs and acceptable daily intakes (ADI). Maximum testosterone traces exceeding MRLs brands of the USA are 0.029 mg.kg^{-1} and Ukraine 0.018 mg.kg^{-1}. According to FAO and who, the ADI of testosterone should not exceed 0.002 mg.kg^{-1} per day. If the US samples exceed the MRLs of testosterone by 93% and ADI by 45%, the results of the Ukrainian samples exceed 20%. Estradiol ADI of 0.00005 mg.kg^{-1}. The lowest level of estradiol exceeding the ADI and MRLs in the samples of local production 0.000 mg.kg^{-1}, and Russian 0.002 mg.kg^{-1}. Indicators of meat brands in Ukraine are slightly less than MRLs by 20%. The largest indicator of the US brand 0.022 exceeds the MRLs four times. Progesterone in both local and imported brands does not exceed the MRLs, although the results exceed the ADI of 0.03 mg.kg^{-1}, the highest indicator of the US brand is four times less than the MRLs. MRLs of these hormones in meat according to FAO and WHO is undesirable Joint FAO/WHO Expert Committee on Food Additives **(JECFA, 2000)**. Indicators of testosterone brands in the USA and Ukraine exceeded the ADI, the expected effect is the androgenic effects when receiving a regular dose of testosterone **(Kim et al., 2021)**.

After analyzing the results for the number of excess hormone residues in the meat of different areas, the authors analyzed the accumulation of residues in parts of the poultry carcass. In Table 2, if you look at the results of an enzyme-linked analysis of US meat, you can see the largest accumulation of testosterone residues in chicken legs 0.029 mg.kg^{-1}, then 61% less in wings and brisket 0.018 – 0.02 mg.kg^{-1}. The remainder of the hormone testosterone in Ukrainian meat brands is the largest amount in only one brand 0.018 mg.kg^{-1}in chicken legs, and 12% less in other parts of meat. Although Russian meat remains more than local, as well as local does not exceed the MRLs for all hormones and this minimum amount is evenly distributed in all parts of the meat **(Sokolova et al., 2015)**.

Table 1 The content of the residual amount of hormone in meat.

	Brand	Local	USA	Russia	Ukraine	MRLs
Testosterone	1	0.000	0.029	0.005	0.018	0.015 mg.kg^{-1}
	2	0.000	0.027	0.002	0.016	
	3	0.000	0.022	0.001	0.005	
	4	0.000	0.021	0.000	0.002	
Estradiol-17β	1	0.000	0.022	0.002	0.004	0.005 mg.kg^{-1}
	2	0.000	0.0099	0.001	0.002	
	3	0.000	0.0047	0.001	0.0018	
	4	0.000	0.0044	0.001	0.0016	
Progesterone	1	0.000	0.005	0.001	0.002	0.015 mg.kg^{-1}
	2	0.000	0.005	0.001	0.002	
	3	0.000	0.005	0.001	0.002	
	4	0.000	0.005	0.001	0.002	

Table 2 Content of the residual amount of the hormone in imported meat samples.

Type of meat		USA				Russia				Ukraine			
		1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Testosterone	Leg	0.029	0.022	0.027	0.021	0.005	0.002	0.001	0.000	0.018	0.016	0.005	0.002
	Wings	0.018	0.02	0.018	0.018	0.005	0.002	0.001	0.000	0.016	0.01	0.002	0.01
	Brisket	0.02	0.021	0.018	0.02	0.005	0.002	0.001	0.000	0.016	0.01	0.03	0.02
Estradiol-17β	Leg	0.022	0.0099	0.0047	0.0044	0.002	0.001	0.001	0.001	0.004	0.0022	0.0018	0.0016
	Wings	0.004	0.004	0.0044	0.004	0.002	0.001	0.001	0.001	0.002	0.002	0.0016	0.001
	Brisket	0.0047	0.003	0.0045	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.0016	0.0016
Progesterone	Leg	0.005	0.005	0.005	0.005	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002
	Wings	0.003	0.005	0.003	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001
	Brisket	0.005	0.002	0.005	0.005	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002

Table 3 Antibiotic residues in raw chicken meat from local and imported samples, which exceeded the maximum allowable level.

Sample	Brand	Tetracycline	Chloramphenicol	Streptomycin
	MRLs	**0.01 mg.kg^{-1}**	**0.01 mg.kg^{-1}**	**0.5 mg.kg^{-1}**
Local samples	1	0.002 ±0.002^{cdC}	0.007 ±0.002 ^{cdB}	0.000025 ±0.000 ^{aA}
	2	0.003 ±0.002^{cB}	0.005 ±0.001 ^{dB}	0.000025 ±0.000 ^{aA}
	3	0.003 ±0.002 ^{cdC}	0.007 ±0.002 ^{cdB}	0.000025 ±0.000 ^{aA}
	4	0.002 ±0.002 ^{cdB}	0.002 ±0.002 ^{eB}	0.000025 ±0.000 ^{aA}
Russia	1	0.001 ±0.001 ^{dC}	0.007 ±0.001 ^{cdB}	0.000025 ±0.000 ^{aA}
	2	0.001 ±0.001 ^{dC}	0.008 ±0.001 ^{cB}	0.000025 ±0.000 ^{aA}
	3	0.001 ±0.001 ^{dC}	0.007 ±0.001 ^{cdB}	0.000025 ±0.000 ^{aA}
	4	0.001 ±0.001 ^{dC}	0.007 ±0.002 ^{cdB}	0.000025 ±0.000 ^{aA}
Ukraine	1	0.011 ±0.000 ^{bC}	0.018 ±0.001 ^{bB}	0.000025 ±0.000 ^{aA}
	2	0.011 ±0.000 ^{bC}	0.017 ±0.001 ^{bB}	0.000025 ±0.000 ^{aA}
	3	0.011 ±0.000 ^{bC}	0.017 ±0.001 ^{bB}	0.000025 ±0.000 ^{aA}
	4	0.011 ±0.000 ^{bC}	0.016 ±0.001 ^{bB}	0.000025 ±0.000 ^{aA}
USA	1	0.018 ±0.001 ^{aC}	0.022 ±0.001 ^{aB}	0.000025 ±0.000 ^{aA}
	2	0.018 ±0.001 ^{aB}	0.022 ±0.002 ^{aA}	0.000025 ±0.000 ^{aA}
	3	0.018 ±0.001 ^{aC}	0.021 ±0.001 ^{aB}	0.000025 ±0.000 ^{aA}
	4	0.018 ±0.001 ^{aC}	0.021 ±0.000 ^{aB}	0.000025 ±0.000 ^{aA}

Note: data are expressed as mean ± SD of triplicates.

Estradiol residues in chicken legs are 0.022 mg.kg^{-1}, 0.0099 mg.kg^{-1}, which is four times higher than residues in other parts of meat of the same brand. Hormone-like progesterone that does not exceed the MRLs **(Sánchez-Salazar et al., 2019; Kadim et al., 2020)** in all samples are distributed evenly in all parts of the bird. Table 3 shows the results of an enzyme immunoassay for three antibiotics. In the first column, the tetracycline residue in local meat does not exceed the MRLs level and is 0.003 mg.kg^{-1}, and does not exceed the ADI of 0.03 mg.kg^{-1}. Traces of tetracycline residues are less than the MRLs level and are 0.001 mg.kg^{-1} in Russian brands. In Ukrainian brands, tetracycline is 0.011 mg.kg^{-1}, which exceeds the MRLs by 10%. The remaining tetracycline in US meat is 0.018 mg.kg^{-1} and exceeds the MRLs level by 80%. In local meat brands, even the highest value of 0.007 mg.kg^{-1}of chloramphenicol is less than the MRLs. The Russian results for chloramphenicol as well as local ones do not exceed the MRLs and the result is 0.008 mg.kg^{-1}. The level of chloramphenicol residue 0.016-0.018 mg.kg^{-1}, in all brands exceeds the MRLs by 60-80%. The highest amount of chloramphenicol in US meat brands is 0.022 mg.kg^{-1} and exceeds the MRLs twice. In all samples, the level of streptomycin is less than MRLs and is 0.000025 mg.kg^{-1}. Table 4 shows the results of both hormones and antibiotics. In the United States, the most polluted brands were found in the US brand No. 1 for the hormones testosterone, estradiol, and the antibiotics tetracycline and chloramphenicol **(Khan et al., 2015; Yang et al., 2019; Kim et al., 2021)**. US Brands No. 2, No. 3, and No. 4 also exceed these indicators by a difference of 10 – 20%. No. 1 brand of Ukraine for testosterone, tetracycline, and chloramphenicol exceeds MRLs and ADI.

In all samples, the levels of progesterone and streptomycin do not exceed MRLs and ADI. Small concentrations of antibiotics were found in local samples. Additionally, when processing the data obtained, the authors compared each peak of the standard mixture of antibiotics regulated by EU standards with the peaks obtained during the analysis of meat samples to determine whether the analyzed samples contain antibiotics with concentrations higher than those declared by EU standards. From the data presented in Table 4, it is clear that out of 12 brands of imported meat, the highest content of tetracycline was observed in all meat brands from the United States and Ukraine.

Table 4 The content of the residual amount of hormone and antibiotic that exceeded the maximum allowable level

	Brand	Local sample	USA	Russia	Ukraine	MRLs
Testosterone	1	0.000	0.029	0.005	0.018	0.015 mg.kg^{-1}
	2	0.000	0.027	0.002	0.016	
	3	0.000	0.022	0.001	0.005	
	4	0.000	0.021	0.000	0.002	
Estradiol-17β	1	0.000	0.022	0.002	0.004	0.005 mg.kg^{-1}
	2	0.000	0.0099	0.001	0.0022	
	3	0.000	0.0047	0.001	0.0018	
	4	0.000	0.0044	0.001	0.0016	
Progesterone	1	0.000	0.005	0.001	0.002	0.015 mg.kg^{-1}
	2	0.000	0.005	0.001	0.002	
	3	0.000	0.005	0.001	0.002	
	4	0.000	0.005	0.001	0.002	
Tetracycline	1	0.002	0.018	0.001	0.011	0.01 mg.kg^{-1}
	2	0.003	0.018	0.001	0.011	
	3	0.003	0.018	0.001	0.011	
	4	0.002	0.018	0.001	0.011	
Streptomycin	1	0.000025	0.000025	0.000025	0.000025	0.5 mg.kg^{-1}
	2	0.000025	0.000025	0.000025	0.000025	
	3	0.000025	0.000025	0.000025	0.000025	
	4	0.000025	0.000025	0.000025	0.000025	
Chloramphenicol	1	0.007	0.022	0.007	0.018	0.01 mg.kg^{-1}
	2	0.005	0.022	0.008	0.017	
	3	0.007	0.021	0.007	0.017	
	4	0.002	0.021	0.007	0.016	

Exceeding the MRLs tetracycline, chloramphenicol, streptomycin was not observed in the samples from Kazakhstan and Russia (Figure 1).

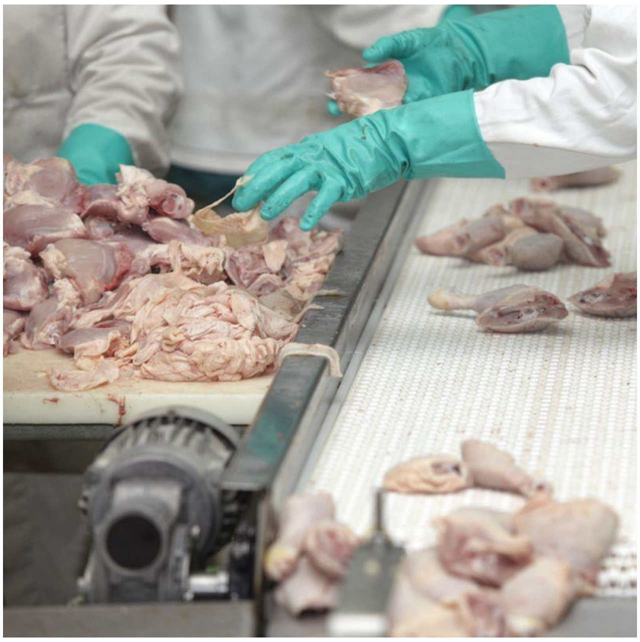

Figure 1 The study tested 105 chicken meat samples from Kazakhstan, Russia, Ukraine, and the USA.

The level of tetracycline in the studied meat samples from the USA (80%) and Ukraine (10%) exceeded MRLs. The lowest concentration of the antibiotic was observed as a result of the determination of streptomycin in poultry samples and averaged 0.000025 mg.kg^{-1} (25.10^{-6}) mg.kg^{-1} with a norm of 0.5 mg.kg^{-1}. Thus, the concentration of streptomycin in the samples did not exceed the maximum permissible value. Following the technical regulations of the Customs Union (TR CU) 021/2011 “on food safety” **(Technical Regulations of the Customs Union, 2011)** and TR CU 034/2013 “on the safety of meat and meat products” **(Technical Regulations of the Customs Union, 2013)**, the content of tetracycline’s in food products should not exceed 0.01 mg.kg^{-1} **(Law of the Republic of Kazakhstan, 2019)**. Antimicrobials are used as growth promoters, especially in poultry farming. To increase the efficiency of fattening, feeding is practiced in relatively small doses of antibiotics over a long period **(Qiu et al., 2021)**. Antibiotics used in feeding birds have a stimulating effect on their growth, productivity, and reproduction, which leads to an average of 4 – 5% increase in live weight gain animals compared with control groups, feed costs per unit of growth are reduced by 5 – 8 %, the body resistance is activated, the period of the feeding of birds is reduced **(Robert et al., 2015; Saksrithai and King, 2018)**. Residual amounts of antibiotic substances are capable of the pass into the meat and eggs of birds and have a toxic effect on the body of man **(Sang-Hee et al., 2010)**.

Inhibiting substances in raw meat are contained in larger quantities than in meat, subject to heat treatment **(Sweileh, 2021)**. Heat treatment does not reduce antibiotic activity, but it is extracted from tissues and organs into the broth, while the antibiotic substance contained in the broth in amounts comparable to its level in poultry meat **(Zaugolnikova and Vistovskaya, 2016)**. The results of monitoring showed that in the Almaty region annually wholesale deliveries of meat products from the USA, Belarus, Ukraine, and Russia are carried out regularly. On average in the region from 2016 to 2019, the specific weight meat imports averaged 47.9% of total consumption **(Sokolova et al., 2015; Mamyshev, 2019)**. The main part of imported meat consumption is poultry – chicken legs.

The largest supplier of poultry meat to the Almaty market is the USA **(Tukusheva, 2014; Kaidarova et al., 2020)**. In particular, the poultry industry has been associated with the regular use of antimicrobials **(Gelaude et al., 2014; Van Boeckel et al., 2015; Yang et al., 2019)**. However, since a clear association has been established between the extent of antimicrobial use (AMU) in livestock and the development of antimicrobial resistance (AMR) **(Persoons et al., 2011; Chantziaras et al., 2014; Sánchez-Salazar et al., 2019)**, increased awareness is pushing the poultry sector towards reduced and rational use of antimicrobials **(Laxminarayan et al., 2013)**.

CONCLUSION

As a result of this work, a higher content of tetracycline and chloramphenicol was revealed compared to other antibiotics: the concentration of tetracycline in the samples is on average 0.018 $mg.kg^{-1}$at a rate of 0.01 $mg.kg^{-1}$, which is almost twice the norm; the concentration of chloramphenicol in the samples is 0.022 $mg.kg^{-1}$at a rate of 0.01 $mg.kg^{-1}$, which is more than twice the norm. According to the results of the study, imported meat from the United States for the remnants of hormonal stimulants and antibiotics showed the most excess of the MRLs 10 – 20% less than the US exceeds the permissible level of antibiotics in Ukraine's brand. Antibiotic streptomycin and the hormone progesterone in all samples do not exceed the norm. Kazakh and Russian samples of poultry meat meet the acceptable standards and the results show that it contains only traces of antibiotics chloramphenicol and tetracycline. The results of research on imported products indicate that the fact that problem of meat entering our country with increased content of hormonal growth stimulants and antibiotics exists. A total of 105 samples were examined by us between 2019 and 2020, including 63-import meat and 42 samples of the meat of local production. A significant share of contaminated meat, 62.7%, is produced in the United States and 31% in Ukraine. Exceeding the maximum, the acceptable level in the studied samples of meat was: testosterone from 1.0 to 2 times, estradiol from 1 to 4 times, antibiotics tetracycline from 1 to 1.8 times, chloramphenicol from 1.0 to 2.2 times. Due to the particular importance of this problem, the focus of our goal is to conduct monitoring studies on imported and domestic meat for the residual content of hormones and antibiotics in poultry meat.

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Contact Address:

Zhanar Akhmet, Almaty Technological University, Department of Food Safety and Quality, Tole bi Str., 100, 050012, Almaty, Republic of Kazakhstan, Tel.: +77272218808,
E-mail: zhan.ahmetova@nuos.pro
ORCID: https://orcid.org/0000-0003-0109-1410

Gulshat Zhaxylykova, Almaty Technological University, Faculty of Food Production, Tole bi Str., 100, 050012, Almaty, Republic of Kazakhstan, Tel.: +77273170053,
E-mail: gulshatzh@uohk.com.cn
ORCID: https://orcid.org/0000-0001-8960-6073

Rashidah Sukor, University Putra Malaysia, Laboratory of Food Safety and Food Integrity, 43400, Selangor Darul Ehsan, Serdang, Malaysia, Tel.: +60397691043,
E-mail: rashidah@nuos.pro
ORCID: https://orcid.org/0000-0001-6988-8624

*Assiya Serikbayeva, Kazakh National Agrarian Research University, Department of Technology and Food Safety, Abai Ave., 8, 050010, Almaty, Republic of Kazakhstan, Tel.: +77272618392,
E-mail: assiya.serikbayeva@nuos.pro
ORCID: https://orcid.org/0000-0003-4632-7343

Karima Myrzabek, Kazakh National Agrarian Research University, Department of Technology and Food Safety, Abai Ave., 8, 050010, Almaty, Republic of Kazakhstan, Tel.: +77272621108,
E-mail: myrzabek.karima@uohk.com.cn
ORCID: https://orcid.org/0000-0003-0588-6659

Corresponding author: *