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MONITORING THE CONTENT OF THE RESIDUAL AMOUNTS OF ANTIBIOTICS IN POULTRY PRODUCTS

Annotation

The widespread use of antibiotics as therapeutic and growth-stimulating agents has led to the fact that the products of animal origin obtained often contain residual amounts of these preparations. The aim of study is to monitor the content of the residual amounts of antibiotics in poultry products of domestic production and provide a veterinary and sanitary assessment.

The results of the monitoring to identify poultry products containing antibiotics have shown the need to improve the methodology for detecting antibiotics in food, expanding the range of detected antibiotics and veterinary and sanitary assessment of raw materials and poultry products containing residual amounts of antibiotics.

Key words: monitoring, antibiotic residues, poultry, bacterial strains, diffusion method.

Introduction

An important role in the growth of food production belongs to poultry farming, as the most intensive livestock sector. [1] Poultry products are reasonably priced and easy to prepare, moreover they provide high level of essential fatty acids, high quality protein, minerals and vitamins [2].

Rapid growth in the consumption of agricultural products requires an increase in productivity and a reduction in the cost of production, which is achieved through the rational use of hormonal drugs, antibiotics, etc., for the treatment of animals, for prevention of infectious diseases, to accelerate their growth, improve the quality of productivity and conservation of fodder [3, 4].

Antibiotics survive long enough in animal products and along with food chain, they enter the human body and can cause various allergic reactions, toxicity, suppress enzyme activity, change the microflora of the organism, promote the spread of resistant microflora species, cause pathological defects [2,3].

To date, a number of papers published concerning mainly of residues of antibiotics when used to stimulate growth [2, 5]. World Health Organization (WHO) Expert Committee in 1962, considering the health issues associated with the use of antibiotics in animal nutrition, concluded that antibiotics applied at doses that promote the growth that is about 20 ppm, do not accumulate in the meat in detectable quantities. With increasing doses up to 100-200 ppm, antibiotics can be detected in tissues. However, using methods that are more sensitive and improving methods of preparing test samples, some researchers have found that the use of even small doses of tetracycline, penicillin and other antibiotics can lead to their accumulation in meat, as well as in other products of animal origin [6].

Concerns about the risk of antibiotic residues has led to the establishment the Maximum Residues Limit (MRL) [1, 2].

The presence of antibiotics in meat of birds, eggs and other products adversely affects the technological processes, also makes it difficult to conduct bacteriological studies in the veterinary and sanitary assessment of poultry products. Determination of the content of antibiotics is necessary to prevent the entry of antibacterial substances into human food [7].

There are several methods and screening analytical techniques developed to monitor and determine the presence of antibiotic residues in poultry products, tissues, eggs, such as

microbiological method like agar gel diffusion, immunochemical method and chromatography methods [4]. Because of economic efficiency, ease of implementation and the ability to measure a large number of samples, microbiological methods are the methods of choice [2].

The purpose of this study is to monitor the determination of contamination degree with antibiotics of raw materials and poultry products of domestic production with the use of current control methods, and provide a veterinary and sanitary assessment.

Materials and methods

The subjects of the research were samples of chicken breasts, chicken liver, minced chicken and muscular turkey, chicken eggs of domestic producers purchased in trade outlets and markets of Almaty, Kazakhstan. Laboratory investigations were carried out in the laboratory of microbiological safety of the Kazakhstan-Japan Innovation Center (KJIC) at the NAO Kazakh National Agrarian University (KazNAU).

Antibiotics used in this study are tetracycline, levomycetin and grisin. To determine the residual amounts of these antibiotics we examined totally 60 samples of poultry products, including 12 samples of chicken breast, 12 liver samples, 8 samples of minced meat and 13 samples of turkey muscular tissue and 15 chicken eggs. Sample were stored at -20^{0}C, eggs were kept in cold before being tested.

As an assay microorganisms, to detect the antibiotics tetracycline and grisin in the substrate was used a strain of *Bacillus subtilis* B-0366, a strain *Micrococcus luteus* 9341 B-0368 was used to detect levomycetin.

Studies to determine the residual amounts of antibiotics in the samples were carried out according to the diffusion method according to Methodical Instruction 3049-84 [8]. The test principle is to prepare Petri plates sown with sensitive bacteria under certain conditions that can presumably indicate the presence of antibiotic residues, depending on the presence or absence of inhibition zones on the seed plates. Basic data entry and handling were done using MS Excel 2010.

Results and discussion

The sensitivity of microorganisms to the main antibiotics used in veterinary medicine and poultry farming was studied with the aim of selecting unified test cultures for the broadest spectrum of antibiotics. The index of the sensitivity of the microorganism to the antibiotic was the diameter of the microbial growth delay zone around the paper disk saturated with antibiotics. The results of the study of the sensitivity of the strains are shown in Table 1.

The essence of the method is that adsorptive paper disks moistened with the studied substrate and antibiotic solution of various concentrations are placed on the surface of an agarized different concentration containing test cultures to the antibiotic under study. The growth of the test culture in thermostating leads to turbidity of the agar. The absence of turbidity around the disc with the sample being studied (the zone of absence of growth, the zone of growth retardation) indicates the presence of an antibiotic substance in the substrate under study. The size of the zone of absence of growth is compared with the size of the zone of non-growth around disks containing different concentrations of antibiotic.

Table 1. Growth of strains of *Bacillus subtilis* B-0366 and *Micrococcus luteus* 9341 B-0368 around paper discs impregnated with various concentrations of antibiotics

Antibiotics	The diameter of the delay zone			
	0.001 μg/ml	0.01 μg/ml	0.1 μg/ml	1.0 μg/ml
Bacillus subtilis B-0366				
Tetracycline	9.3±1.0	17.2±0.5	23.5±0.4	23.5±0.4
Grisin	10.2±0.5	14.3±0.6	20.3±0.2	22.5±0.6
Micrococcus luteus 9341 B-0368				
Levomycetin	10.5±0.6	18.6±0.5	21.1±0.2	27.2±0.5

As can be seen from Table 1, the diameters of the growth inhibition zones of the *Bacillus subtilis* B-0366 strain around paper disks impregnated with tetracycline of 0.1 μg/ml and 1.0 μg/ml are same (23.5 ± 0.4 mm). The similarity of diameters in delay zoneы can mean that strain *Bacillus subtilis* B-0366 is sensitive to tetracycline in these two concentrations.

The growth retardation zones of *Micrococcus luteus* 9341 B-0368 strain around paper disks impregnated with levomycetin with a concentration of 1.0 μg/ml showed the highest result (diameter of delay zone was 27.2±0.5 mm).

Based on the data obtained in the study of the sensitivity of strains *Bacillus subtilis* B-0366 and *Micrococcus luteus* 9341 B-0368 to the growing concentrations of antibiotics (tetracycline, grisin and levomycetin) studied, a method has been developed to identify antibiotics in food.

Monitoring studies were conducted to detect residual amounts of antibiotics in raw materials and poultry products. Table 2 shows the frequency of detection of residual amounts of antibiotics in the muscle tissue of the turkey, chicken breast, liver, minced meat, and in egg samples.

Table 2. Frequency of detection of residual amounts of antibiotics in poultry products

Object of study	Antiobiotics	Number of samples	From them positive	
			Quantity	%
Chicken breast	Tetracycline	12	3	5
Chicken liver	Tetracycline	12	4	6.66
Minced poultry meat	Tetracycline Grisin	8	4 1	6.66 1.66
Muscle tissue of the turkey	Tetracycline	13	7	11.66
Eggs	Tetracycline Levomycetin	15	3 1	5 1.66
TOTAL		60	23	38.3

The positive results for the content of antibiotic residues were determined in 23 (38.3%) samples from all tested 60 samples of poultry products, but the most detected residues were in muscle tissues of the turkey. The levomycetin residues were detected only in 1 sample (1.66%) of muscle tissues of the turkey. Table 2 shows that of the 12 test chicken breast samples, an elevated tetracycline was detected in 3 samples, which is 5% of the total number of test samples. In minced poultry meat, 1 sample (1.66%) of the 8 test samples showed a positive result on grisin. In the muscle tissue of a turkey of 13 test samples, an increased amount of an antibiotic of the tetracycline group was found in 7 samples (11.66%). Of the 15 test samples of chicken eggs, elevated levels of tetracycline were detected in 3 samples, which is 5%, and a positive result for levomycetin from the number of samples was found in 1 sample (1.66%).

Conclusion

The results of the monitoring to identify poultry products containing antibiotics have shown the need to improve the methodology for detecting antibiotics in food, expanding the range of detected antibiotics and veterinary and sanitary assessment of raw materials and poultry products containing residual amounts of antibiotics. Proper management strategies to control the antibiotic usage in poultry, monitoring the withdrawal period for antibiotics, screening MRL in different poultry products can be recommended.

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МОНИТОРИНГ СОДЕРЖАНИЯ ОСТАТОЧНЫХ КОЛИЧЕСТВ АНТИБИОТИКОВ В ПРОДУКТАХ ПТИЦЕВОДСТВА

Аннотация

Широкое использование антибиотиков в качестве лечебных и ростостимулирующих средств привело к тому, что получаемые продукты птицеводства нередко содержат остаточные количества этих препаратов. Результаты исследования показали необходимость совершенствования методологии выявления антибиотиков в пищевых продуктах, ветеринарной и санитарной оценки сырья и продуктов из птицы.

Ключевые слова: мониторинг, остаточные количества антибиотиков, птицеводство, штаммы, диффузионный метод.

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ҚҰС ШАРУАШЫЛЫҒЫ ӨНІМДЕРІ ҚҰРАМЫНДАҒЫ АНТИБИОТИКТЕРдің ҚАЛДЫҚ МӨЛШЕРІнің МОНИТОРИНГІ

Аңдатпа

Антибиотиктерді емдік және өсуді ынталандыру мақсатында кеңінен пайдалануда құс шаруашылығы өнімдері құрамында антибиотиктердің қалдық мөлшерінің анықталуына алып келді. Зерттеу нәтижелері тағам өнімдерінде антибиотиктерді анықтаудың әдістерін, құс өшаруашыдығы өнімдері мен шикізаттың ветеринарлық және санитарлық бағалауды жақсарту керектігін көрсетті.

Кілт сөздер: мониторинг, антибиотиктердің қалдық мөлшері, құс шаруашылығы, бактерия штаммдары, диффузия әдісі.

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ИЗОЛЯЦИЯ ВИРУСА РЕПРОДУКТИВНО-РЕСПИРАТОРНОГО СИНДРОМА СВИНЕЙ СЕВЕРОАМЕРИКАНСКОГО ГЕНОТИПА В КАРАГАНДИНСКОЙ ОБЛАСТИ КАЗАХСТАНА

Аннотация

В статье приведены результаты выделения нового изолята вируса репродуктивно-респираторного синдрома свиней (РРСС), из свиноводческого хозяйства «Жана-Ай» Карагандинской области Казахстана. Сравнительные генетические исследования выделенного изолята со штаммом «Arterivirus/LKZ/2010» вируса РРСС, выделенным ранее в Жамбылской области показали 100% идентичность.

Ключевые слова: вирус, изолят, генотип, РРСС.

Введение

Репродуктивно-респираторный синдром свиней - вирусная болезнь, характеризующаяся наличием двух клинических форм (репродуктивные нарушения у взрослых свиней, пневмония у молодняка) с высоким уровнем смертности у молодых поросят [1]. Возбудителем болезни является РНК-содержащий вирус, относящийся к семейству Arteriviridae, роду Arterivirus, порядку Nidovirales. В 1990 году вирус РРСС установлен в Германии, а к середине 90-х годов им была охвачена почти вся Европа. С 1993 года он регистрируется в России и в других странах СНГ [2, 3].

Актуальность вируса РРСС для сельского хозяйства обусловлена тем, что данное заболевание приносит огромный экономический ущерб, состоящий из снижения репродуктивной способности маточного поголовья и продуктивности животных, недополучения приплода, а также затрат на проведение противоэпизоотических и профилактических мероприятий [4, 5]. Известно, что вирус РРСС подразделяется на две геногруппы: европейскую и североамериканскую, между которыми имеются определенная генетическая, антигенная связь и существенные отличия [6].