The Prevalence of Pathogens of Intestinal Zoonoses in Animals and in Environmental Objects

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Abstract
Data on the prevalence of intestinal pathogens among agricultural animals, birds, food and environmental objects are given. Our epizootological and epidemiological analysis of the prevalence of intestinal pathogens among animals and humans in 2012-2017 years testifies to the annual wide spread of intestinal infections, both among animals and humans. As a result of our studies, 607 salmonella cultures, 331-Escherichia, 257-staphylococcus, 87-listeria, 38-Campylobacter, 18-clostridia and 15-yersinia were isolated from healthy and compelled animals, birds also food and environmental objects. The biological properties of the isolated cultures were studied by their cultural, biochemical, antigenic properties.
Keywords: animals, birds, food, environment, intestinal pathogens, prevalence.

INTRODUCTION

Zoonotic diseases cause great economic losses from - for the loss of productivity of animals (meat, milk, eggs), case for veterinary inspection costs, microbiological tests, quarantine organization of transportation and slaughter of sick animals, meat culling, disinfection, protection of workers and the environment.

Bacterial contamination of the pathogen intestinal zoonosis occurs along the entire food chain (from feed for slaughter animals and to consumer products).

International organizations (World Health Organization (WHO), Food and Agriculture Organization (FAO), which coordinate problems of food intestinal infections, are among the most important pathogens of representatives of the following genera: Salmonella, Escherichia, Campylobacter, Enterobacter, Listeria, Yersinia, Staphylococcus, Clostridium and other microorganisms that under certain conditions, can cause intestinal toxic infections of food [1-3].

The control measures and prevention of intestinal infections is much more difficult than with other gastrointestinal infections. This is due to the wide circulation of numerous serovars of pathogens of entering infectious in nature, the polydeterminantity of the virulence factors of pathogens, polyethiologic nature, the variety of ways of introduction into the animal and human organism, as well as the selection and circulation of strains bearing R factors, formed under the influence of antibiotics and chemo preparation. All this complicates the prevention and treatment of intestinal infections in young animals of farm animals and birds [4, 5].

Epizootic and epidemiological tensions over intestinal infections caused by enteroinfectious pathogens have increased in recent years due to the development of the private sector in livestock production, uncontrolled migration of livestock, changes in methods of breeding and fattening cattle, as well as the rules of zootechnical and veterinary services for animals. Vaccination of animals and birds against intestinal diseases became optional, and it is not envisaged in the plan of anti-epizootic activities of the Veterinary Committee of the Ministry of Agriculture [6, 7].

Control measures cannot be considered absolutely effective if they are based on preliminary data, since in order to develop an acceptable system of disease control it is necessary to have data on the epizootiology and etiology of animal diseases [8, 9, 10].

MATERIALS AND METHODS

The issues of epizootiology and the prevalence of intestinal infections in young animals of farm animals and birds have been studied directly in the conditions of the farms of the Republic of Kazakhstan over the past ten years.

A study of the etiology of the disease of young agricultural animals and birds registered in the farms of the republic was carried out in the laboratory of antibacterial biotechnology of the Kazakh National Agrarian University, as well as in the regional veterinary laboratories of the Republic of Kazakhstan.

The work was performed with the application of the techniques used in international scientific practice and constantly improved due to patent information elaborations.

Standard methods for finding the mean values and their average error will be used for mathematical processing of results.

Metrological control of instruments and laboratory equipment was provided in accordance with the requirements of the State Standard of the Republic of Kazakhstan in the order established by regulatory documents.

RESULTS

Our research is devoted to the coverage of the specific composition of enteroinfective pathogens, most often excreted in animals, birds and humans, reflecting the relationship between the epizootic and epidemiological situation.

Our epizootological and epidemiological analysis of the prevalence of intestinal pathogens among animals and humans in 2012-2017 years testifies to the annual wide spread of intestinal infections, both among animals and humans.

In order to determine the extent of the spread of intestinal pathogens, more than 1,500 animals were examined (550- cattle, 450-sheep, 200-pigs, 100-horses, 200-domestic birds) in various farms of Kazakhstan. Various organs from healthy and compelled animals were taken for bacteriological research.

Primary selection of cultures was carried out on the basis of features of growth on media and microscopy of preparations from individual colonies (MPB, MPA, MPPA, mediums of Endo, Ploskirev, Levin, Muller, Kaufman). Identification of isolated emergent pathogens was carried out according to Bertuzzi's determinant [11].

As a result of investigations of organs from healthy and forcibly killed animals, 229 cultures of Salmonella, 129-Escherichia, 62-Listeria, 12-Yersinia, 33-Campylobacter, 100-Staphylococcus and 18-Clostridium, identified under emergency conditions, were elicited and identified infection and toxic infections (Table 1).

In the implementation of tasks facing the veterinary and public health authorities to prevent intestinal diseases, an important role is played by control over environmental objects.

The study was subjected to 200 samples of raw meat and meat products taken from the slaughterhouse during veterinary examination; 200 samples of poultry meat, 200 fish samples and 200 eggs taken in the market; 200 samples of flask milk and cream taken directly from the dairy farm, 100 samples of various feeds, 50 flushing samples from milking machines, 50 flushing

samples from the hands of workers (milkmaids) of the cattle breeding complex (Table 2).

As a result of studies of food and environmental objects, 378 cultures of Salmonella, 202-Escherichia, 25-Listeria, 5-Yersinia, 12-Campylobacter, and 157-Staphylococcus were isolated and identified. The results of the research showed that the greatest spread of pathogens of intestinal food infections was observed in dairy products (29.6%), in the meat of birds (28.8%) and in meat products (23.4%).

Thus, 607 Salmonella cultures were isolated from healthy and forcibly killed farm animals and birds, as well as from food and environmental objects. The biological properties of the isolated cultures were studied by their cultural, biochemical, antigenic properties.

The etiological structure of salmonellosis in the isolated cultures is represented by serological variants of 4 groups: B - 34.2, C - 10.5, D - 54.4 and E - 0.9%. Cultures belonged to 9 different serovariants.

The most common salmonella serovars were S. typhimurium (26.7%), S.dublin (22.4%), S.enteritidis (24.5%), S.gallinarum (20.5%), S. choleraesuis 10.0%).

The prevalence and frequency of the most important serotypes of salmonella are characterized by epidemiologically significant indicators, reaching 8.1% in raw milk, 20-30% in beef and poultry products.

When typing 331 cultures of Escherichia isolated from animals, in products of animal origin and in environmental objects, were assigned to the following serogroups: 08, 09, 015, 020, 026, 055, 078, 086, 0101, 0103, O111, 0115, 0117, 0119, 0137, 0138, 0139, 0141, 0142, 0147 0119, had adhesive antigens: K-99, K-88, F-41 and 87.3% produced hemotoxin, of which beta-hemotoxin was 77.8% alpha-hemotoxin -10.5%, delta-hemotoxin 1.1%, mixed type hemotoxin (beta and alpha-hemotoxin) - 6%. The presence in the cultures of the Escherichia of adhesive properties and the formation of hemotoxins, which are one of the factors of pathogenicity, can cause acute intestinal food infections.

From the healthy and forcibly killed agricultural animals and birds, as well as from products of animal origin, 257 strains of staphylococci, 87 listeria, 38 - Campylobacter, 18 clostridia, and 15 cultures of Yersinia were isolated. The interrelation of these pathogens in the development of intestinal infections in animal husbandry and human gastroenteritis is established. In this regard, the WHO Expert Committee on Food Safety included the above-mentioned bacteria in the official list of infectious agents of foodborne diseases in 1982 [1]

CONCLUSIONS

As a result of bacteriological investigations of organs from healthy and compulsorily killed animals and birds, 1367 cultures were isolated and identified from food and environmental objects, 44.4% of them were attributed to Salmonella, 24.2% to Escherichia, 18.9% % - staphylococci and 12.5% - to other microorganisms.

An analysis of extensive domestic and foreign literature and the results of our research have shown that in recent years there has been an increase in the specific gravity of salmonella, Escherichia and staphylococci that cause disease in various animals, including humans.

Summary. For most zoonotic infections, contamination of raw materials with intestinal contents is of primary importance in the process of its production cutting and processing. At the same time, the level of secondary contamination of the finished product is directly related to the intensity of infection and the degree of bacterial carry of birds and animals.

In general, it seems expedient to carry out research aimed at studying the full range of anthropogenic and technological influences affecting the formation of an ecological niche of intestinal food pathogens. In this case, the identification of priority factors that cause the emergence of new zoonotic pathogens and an assessment of their role in the occurrence of foodborne diseases is of primary importance for predicting the degree of risk and the epidemiological significance of such infections.

Table 1. Variants of crops isolated from farm animals and birds

The type of animals	Examined animals	Type of isolated cultures							Total allocated
		Salmonella	Escherichia	Listeria	Yersinia	Campylobacter	Staphylococcus	Clostridium	
Cattle	550	82	48	16	1	1	36	4	188
Small cattle	450	44	18	15	2	1	19	6	105
Pigs	200	35	19	13	5	12	18	3	105
Horses	150	11	5	-	-	-	3	-	19
Domestic birds	200	57	39	18	4	19	24	5	166
Total examined animals	1500	229	129	62	12	33	100	18	583

Table 2. Variants of crops isolated from food and environmental objects

The type of object	Examined samples	Types of isolated cultures						Total allocated
		Salmonellas	Escherichia	Listeria	Yersinia	Campylobacter	Staphylococcs	
Meat and meat products	200	110	39	6	1	3	24	183
Dairy	200	89	51	4	-	2	86	232
Meat of birds	200	114	74	24	1	-	13	226
Egg (contents and washings)	200	35	18	1	1	-	16	71
Meat of fish	200	5	-	-	1	-	1	7
Feed	100	8	6	2	1	-	-	17
Washing of milking machines	50	9	8	-	-	-	9	26
Washings of the hands of workers	50	8	6	-	-	-	8	22
Total examined samples	1200	378	202	25	5	5	157	784

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