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Epizootic State on Leucosis of Cattle, The Perspective Directions of its Prevention and Measures of Fight in Kazakhstan and Kostanay Region

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The characteristic of leucosis of cattle is provided in work, the epizootic situation on leucosis in Kazakhstan and rural districts of Kostanay region is covered, results of comparative diagnostic value of reaction of immunodiffusion (RID) and the immunofermental analysis (IFA) are shown, options of preventive and improving actions are proved. Options about possibility of infection of the person of VL cattle and its consequence are discussed. The question that RID-positive animals, lifelong carriers of an oncovirus at all stages of an illness and are obvious sources etiologic agent of leucosis is considered. The "Veterinary Rules about Urgent Measures of Prevention and Improvement of Cattle from Leucosis in Breeding Farms and Agricultural Formations of All Forms of Ownership" project is developed. It is established that full delivery of RID-positive animals without overexposure, in process of their identification, is the most expedient, economically justified and most perspective method.

Key words: Leucosis of cattle, Epizootic situation, Oncovirus of leucosis, Prevention, Eradication.

Leucosis of cattle (hemoblastosis) – chronic, retrovirus and, as a rule, the fatal illness of the tumoral nature which is shown an asymptomatic current, violation of maturing of blood cells, achroacytosis, malignancies in bodies haematogenic and lymph system and also in other bodies and fabrics of an organism.

The disease is widespread on all continents and worldwide, represents one of complex problems of veterinary medicine of Kazakhstan and subjects of Kostanay region, strongly occupies one of leading positions in structure of infectious pathology[1,2,3,4,5,6].

The huge loss to animal husbandry economy from leucosis consists not only of the losses connected with death and premature rejection of highly productive cows, decrease in efficiency and quality of dairy and meat products, costs of carrying out the against leucosis actions, the birth inside uterine of the infected young growth and young growth with immune deficiency, and also a ban on sale of breeding cattle from unsuccessful farms. Especially the question connected with possibility of infection of the person with a virus of leucosis of cattle and consequences of this infection is particularly acute. It is established that this virus easily affects sheep at whom the lymph sarcoma develops much quicker, and also horses, goats, pigs, rabbits and mice are susceptible, isn't dependent on breed and age. The virus is capable to break in vitro interspecific barriers including person, and to accumulate metabolites (metabolism products) possessing oncogenic properties in an organism of sick animals.

It is known that the infected cows are producers of virus particles, and in their milk and meat tumor cells are found as infected, and. The infected foodstuff can't be completely cleared of leucosis virus by pasteurization or temperature processing. At the same time by epidemiological researches it is shown that consumption of crude

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milk from the infected VL of cows, doesn't lead to increase in incidence of hemoblastosis at the person. However in this plan completely to exclude danger of a virus of leucosis of cattle to the person it is impossible.

Besides, four related VL of cattle of a virus of the person are revealed: A T-lymphocytic virus of the person (HTLV-1,2,3,4) belonging to the same sort Oncovirus of S type of Retroviridae family, as VL of cattle[7]. The virus of the first type infected about 20 million people around the world. The oral way of its transfer that points to potential possibility of such transfer of VL of cattle to the person is described at the person. The number of researches in blood of the person of an antibody (RSK, RID, IFA and an immunobloting) to the VL of cattle structural proteins is established. At research of 257 healthy people contacting to sick cows in 74% of cases presence of specific antibodies to VL of cattle is registered. Existence in an organism of the antibodies reacting with anti-genes to VL of cattle indicates presence at people of a virus or its fragments due to consumption of meat, milk and dairy products from the infected animals. In the subsequent researches executed with use of the immunoenzymometric analysis (IFA) and the polymerase chain reaction (PCR) it is established that from 454 people of 12,5% (57) answered in the affirmative in IFA which were tested further by means of PCR and only 12,3% (7 of 57) were identified as carriers of virus DNA.

It specifies that integration of VL of cattle into a genome of blood cells of the person is possible, and the percent of such event from the epidemiological point of view is rather high. And though danger of development of leucosis in the person as a result of an infection of VL of cattle is estimated as improbable, it is impossible to be confident in lack of consequences of infection with a virus. Especially negative consequences can be at a recombination of VL of cattle and HTLV and receiving a recombinant virus. The probability of such event is rather high as similarity of genomes of VL of cattle and HTLV is made within 58%, and implementation of a recombination requires one condition – presence at a cell of both pro-viruses. Emergence of a recombinant virus under natural conditions can be reflected in an epidemiological situation since the virus, quite possibly, will be able to affect with identical efficiency both cattle, and the person[8] extremely negatively.

Infection occurs at penetration into an organism of the lymphocytes containing a virus of leucosis of cattle through the blood, milk, biological liquids containing lymphoid cages of animals, subjects in which there are VL of cattle, and also sperm of the infected manufacturing bulls. It is quite probable that blood-sucking pincers and insects can transmit a virus[9]. The activator is transferred inside uterine, but more often calves catch mother's milk after the birth. Cows transmit leucosis virus during calving; licking a calf. Ways of infection are airborne, alimentary, iatrogenic (reinfection when carrying out veterinary and preventive actions)[10], pre-natal (from 5 to 20% of number which were born)[11]. Except hereditary predisposition there is also an age selectivity of a disease (4-8 – summer animals are ill more often than other age). It is more predisposed to get sick cattle red and black and motley breeds.

After infection in an organism specific antibodies against VL of cattle are formed, animals remain infected for life that leads to weakening of immune system of an organism, the raised susceptibility to infectious and noncontagious diseases, increase in infertility, decrease in an exit of calves, abortions. The born calves have diseases of respiratory organs, disorders of digestion. Infectious process at a leucosis is characterized by the following stages: incubatory (preleukemic) – from the moment of infection before synthesis of antibodies; asymptomatic (initial) – from emergence of antibodies before detection of hematologic changes; the hematologic – which indicator is persistent achroacytosis and stages of tumoral growth of malignant tumors in fabrics of the haematogenic, lymphoid and other bodies. The incubatory period at leucosis is from two months to two years at experimental infection and from two to six years at the natural. The preleukemic (asymptomatic) stage can be determined only by s serological and virological researches[1,6,8].

MATERIALS AND METHODS

During work collecting statistical data and the epizootic analysis of the veterinary reporting, methods of lifetime diagnostics of cattle of the patient with leucosis, pilot studies and the comparative analysis was carried out.

DISCUSSION

Main factors of distribution of leucosis are: acquisition of cattle from unsuccessful farms, untimely diagnosis of an illness, incomplete coverage of all gender and age groups of cattle from six-month age, etc. In general on regions of the Republic of Kazakhstan for 2007-2014 coverage by serological researches of cattle on leucosis fluctuates from 2,3 to 43,7%, and in general on the republic for this period it exceeded 18,0% a little. At the same time the contamination percent in the last two years equaled about 2,5% (fluctuations from 0,23 to 6,64). Agricultural formations of North Kazakhstan (6,64%), West Kazakhstan (5,57%), Pavlodar (5,04%), Akmolinsk (4,32%), Zhambylsk (3,63%), Kostanay (3,57%), East Kazakhstan (2,12%) regions in which the contamination percent by 1,1 – 3,39 times exceeds a similar indicator on the republic appeared the most unsuccessful on leucosis of cattle.

In the subjects of Kostanay region for 2007-2014 on leucosis more than 1,3 million heads are subjected to serological researches, about 67,0 thousand reacting that makes 4,87% with fluctuations from 3,42 (2011) to 9,01 (2008) are allocated (figure 1,table 1). From the volume of the conducted researches it isn't possible to establish authentically quantity of the pro-studied cattle on gender and age groups, and also initially and repeatedly. The analysis of indicators of the table also showed that from 66,7 thousand heads of an immunodiffution (RID) animals reacting on reaction, only 6,67% from them investigate on hematology. This figure is only about 4,5 thousand heads which are discarded undoubtedly and hand over on the compelled slaughter. Other 93,33% of a livestock from among reacting on cattle RID, and it is over 62,0 thousand heads, remain aren't tested on hematology and with a high probability constantly are among conditionally healthy livestock of cattle. In the last two years (2013 - 2014) the number investigated decreased by leucosis of cattle by 26,5-29,6 times in comparison with 2011.

The number of reacting for the last five years on RID was over 29,2 thousand, and quantity of cattle checked on hematology – 763 heads or only 2,1%. If we consider results of researches[12,13] that calves are born from RID-positive cows which in 10 - 15% of cases the virus of leucosis breaks a placental barrier of mother, infecting a fruit inside uterine, we obviously leave a huge number of sources of the causative agent of leucosis which are placed everywhere in subjects of all forms of ownership - breeding, in commodity agricultural formations, and in private farmsteads. Young growth from RID-positive and reacting on hematology frequently if not everywhere, is used for reproduction.

The diagnosis on leucosis is made in a complex, on the basis of epizootological, clinic-hematologic, serological, virological, pathologicoanatomical and histological researches of all animals more senior than half a year.

The main method of diagnosis of leucosis in the existing programs for prevention and fight against leucosis of cattle, both in foreign countries,

Table 1. Information serological researches on leucosis across Kostanay region for 2007 - 2014.

Years	Investigated on leucosis (one thousand heads)	Allocated positive for leucosis (RID) (one thousand heads)	The percent of contamination	Investigated on hematology (heads)
2007	250,91	8,91	3,55	855
2008	166,86	15,05	9,01	2390
2009	203,23	13,46	6,62	444
2010	292,39	12,94	4,43	276
2011	325,31	11,11	3,42	254
2012	106,29	3,8	3,57	217
2013	10,99	0,49	4,46	11
2014	12,23	0,94	7,69	5
Total	1368,21	66,7	4,87	4452
On average for every year	171,03	8,34	4,88	556,5

and in the CIS countries including in Kazakhstan, for many years there is a RID which is characterized by simplicity of application, high sensitivity, specificity and profitability at mass researches[13,14,15].

The IFA method also differs in high sensitivity at diagnosis of leucosis. In Kazakhstan it is used as an alternative method due to the lack of reliable domestic test system and high cost of its acquisition. In this regard, we conducted commission comparative researches on the diagnostic value of RID and IFA which practically showed equivalent results and proved that it is possible to carry out mass diagnosis of leucosis by both methods. Identification of RID-positive animals has to become a signal for carrying out the mass researches differentiated the against leucosis actions of[16,17,18].

Indispensable condition of emergence and distribution of leucosis is existence of a source of the activator. Having caught once, animals remain infected for life. It is well-known that obvious sources of a virus of leucosis is RID-positive animals, lifelong carriers of an oncovirus at all stages of manifestation of an illness and constitute real danger to healthy animals. Already in an initial (asymptomatic) stage of an illness characteristic shifts as a part of blood are shown: the quantity of leukocytes and especially lymphocytes increases, appear unripe and the pathological low-differentiated forms of cages. In this stage the virus shows the pathogenic action by settling in white blood cells, destroys an organism of animals. It is impossible to destroy a virus in blood cells, including in lymphocytes. It is necessary to destroy lymphocytes to kill a virus of leucosis, and it will lead to sharp weakening of the protective mechanism of an organism - to an immunodeficiency. For this reason still, unfortunately, effective remedies and rational methods of treatment of leucosis aren't developed.

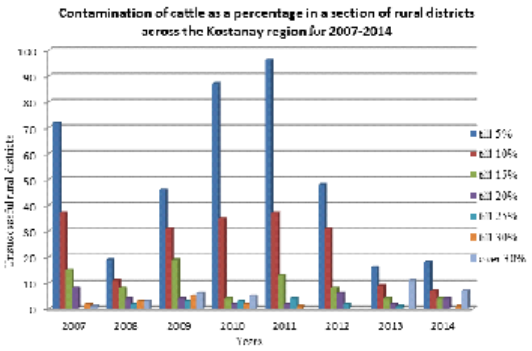

Fig. 1. Contamination of cattle as a percentage in a section of the rural Districts of Kostanay regions for 2007 - 2014

Clinical forms of leucosis are shown in the hematologic (developed) stage where besides the progressing hematologic shifts, the general state worsens – yields of milk decrease, progress exhaustion, there comes violation of warm activity, lymph nodes increase.

At a tumoral (terminal) stage the illness quickly progresses, is shown by growth of malignant tumors in fabrics of the haematogenic and lymphoid systems, easing and exhaustion of the haematogenic bodies, blockade of immune system and death of animals.

It follows from the provided characteristic of stages and pathogenesis that the leucosis from the moment of infection constantly progresses throughout an illness. The RID method possesses high sensitivity and specificity at identification of patients with leucosis of animals.

However practically in all or many directive documents and scientific researches on leucosis consider that RID-positive animals are infected, but aren't considered as patients as the disease isn't shown yet, and are only virus carriers. And only at positive results of hematologic researches of RID-positive animals recognize as patients, and they are subject to slaughter. Such interpretation bring confusion when carrying out improving actions and don't give the grounds for a conclusion them from herd, as sources of the causative agent of leucosis. There are also other definitions: the animals who are positively reacting on RID and it is positive on hematology – are conditionally sick, demanding repeated research on RID and hematology in two months and in case of receiving positive result the second time, recognize animals as patients and they are subject to slaughter. They allow double research on hematology with the purpose to make sure that an animal sick with leucosis at positive RID.

In our opinion, RID-positive animals can't be considered healthy, and production received from them – qualitative. Not to identification or their continuous overexposure including when carrying out offered twice in two months of

confirmations on hematology, will serve as the reason of continuous and daily infection of healthy animals, to increase in number of sick animals that, certainly, will lead to a long and wide circulation of leucosis.

In this direction we taking into account experience of fight against leucosis of cattle in the CIS countries, the Republic of Kazakhstan and Kostanay region developed the "Veterinary Rules about Urgent Measures of Prevention and Improvement of Cattle from leucosis in Breeding Farms and Agricultural Formations of All Forms of Ownership" project. By results the serological researches, we define options and methods of prevention, and also improvement of concrete unsuccessful point. At establishment of the positive diagnosis on leucosis, introduce restrictions and develop a long-term plan of improving actions. Improvement of a number of cattle is carried out differentially depending on extent of defeat and the status of agricultural formation. Methods of improvement are reduced to systematic researches, isolation and slaughter of sick animals[6,17,19,20].

RESULTS

At identification to 10% (25 agricultural formations in 2014) reacting on RID of a number of cattle their immediate delivery on slaughter is economically expedient. The subsequent serological researches of all gender and age groups of cattle are more senior than 6 months with an interval of 2-3 months to double negative results on RID. At implementation of these requirements and carrying out final actions, subjects appear safe.

At incidence of cattle to 30% (11 agricultural formations in 2014), they are divided on RID-negative and RID-positive. The last are supported separately and permanently, investigated only by their hematologic method two times a year - in the spring and in the fall. Milk from cows of this group at 80 °C is pasteurized and is used to a feeding livestock. The animals reacting on hematology are subject to immediate delivery on slaughter. Allow for this category of farms operation of RID-positive animals not more long than two years. The young growth received from them is transferred to fattening.

Investigate systematically RID-negative animals on RID with an interval of 2-3 months to double in a row negative results. From RID-negative cows and heifers will organize the isolated cultivation of a repair livestock. Control of their wellbeing is carried out serological researches in 6 months age, and then every 6 month. Replacement of RID-positive cows only RID-negative heifers and girls-calves is made better at the same time.

Investigate all adult animals only by a hematologic method every 6 month in agricultural formations where incidence of herd exceeds 30% (9 agricultural formations in 2014). Reacting on hematology animals is handed immediately over on slaughter. Milk is boiled and fed to a feeding livestock. Find possibilities of replacement of the compromised livestock with healthy animals, including construction of farms of the isolated cultivation of a repair livestock on the share beginnings with other interested heads of agricultural formations is possible.

At identification of animals with leucosis (RID-positive) in individual farms, are subjected to slaughter. Milk and dairy products from such farmsteads is forbidden to realize on free sale.

Full delivery of RID-positive animals without overexposure, in process of their allocation, is the most expedient, economically justified and perspective method. Economic efficiency for 1 tenge of expenses equaled on average 3,37 tenge (fluctuations from 2,74 to 4,18), and at delivery of the animals reacting on hematology - 1,53 tenge or is 2,2 times less. In structure of economic damage losses from the compelled slaughter, reduction of efficiency and decline in quality of production, and also losses from loss of yield were from 84 to 86%[18].

CONCLUSIONS

Thus, for clarification of a real epizootic situation on leucosis of cattle as in the Republic of Kazakhstan, and subjects of Kostanay region, it is necessary to increase at least by 3-4 times volumes of serological researches. Plan targets for the serological researches on gender and age groups - the young growth is made more senior than 6 months, a uterine livestock, calves -girls of lay age, bulls – producers [16].

Fight against leucosis is conducted many years. The relation to leucosis of cattle as to a chronic infectious disease has to be uniform at all

levels of veterinary science, in the territory of all Kazakhstan. However continuous and universal distribution of this disease testifies to an inefficiency of the existing methods of fight and demands development of scientific methods and approaches to a problem, and also practical decisions.

Recognize that RID-positive animals are lifelong carriers of an oncovirus, i.e. an obvious source of the causative agent of leucosis at all stages of development of an illness. Hold preventive and improving against leucosis events in a complex and differentially, depending on weight and the level of distribution of an illness.

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