Cattle leukemia in the territory of the Irkutsk region

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Abstract. The article presents an analysis of the results of diagnostic studies on cattle leukemia in the Irkutsk region for 2004-2017. It has been established that infection with the cattle leukemia virus was 3.7 ± 0.4%; the number of hematological sick animals was 4.2 ± 0.2%. During the analyzed period, the percentage of infected livestock decreased (p <0.01) in both public and individual sectors. The number of hematological animals ranged from 2.3 to 6.1% (with peaks in 2007 and 2015) and was characterized by a slight decrease (by 0.9%).

1. Introduction
Leukemia is an important social and veterinary-biological problem, which is pretty widespread throughout the world [1, 2]. Importation of pedigree cattle in the 40s-60s of the 20th century caused leukemia in the Russian Federation. The level of infection with the cattle leukemia virus (LV cattle) varies considerably in different territories of Russia. Leukemia poses a potential hazard to the gene pool of breeding dairy cattle. The great economic damage caused to animal husbandry by leukemia is related to the culling of animals compromised in relation to the infection, utilization of carcasses, producing young animals for meat, as well as the costs of carrying out recreational activities [3]. This forces many countries to adopt national programs to combat this disease.

2. Materials and Methods
Assessment of the situation of cattle leukemia in the Irkutsk region for the period 2004-2017 was carried out using the reporting forms of the Irkutsk Interregional Veterinary Laboratory (IVL), comprised according to the results of diagnosing leukemia (immunodiffusion reaction in an agar gel (RID) on the basis of the IVL and eight stations for combating animal diseases. Also, assessing the situation on cattle leukemia in the Irkutsk region was carried out according to the results of enzyme-linked immunosorbent assay (ELISA), polymerase chain reaction (PCR), and hematological studies.

During 200402017, cattle from the public and private sectors of the Irkutsk Region, bulls-producers from the State Breeding Association and farms, animals for breeding and procurement, as well as young animals (n = 3481731) were investigated by the serological reaction of the RID. 24206 serum samples for detection of post-infectious antibodies were examined by ELISA; 100 samples of pathological material and 311 blood samples from cattle were examined by PCR. The volume of hematological studies was 173,315, including 15,213 in “leukoformulas.” Statistical data processing
was carried out in accordance with standard methods [4]. Differences between the compared parameters were considered statistically significant at $p \leq 0.05$. We determined long-term dynamics using the straight-line equation and the regression coefficient $b$. Significance of these dynamics was determined using the Pearson coefficient $r$.

3. Results

According to serological studies (RID) for the period 2004-2017, an analysis of the epizootic situation of cattle leukemia virus (LV) was $3.7 \pm 0.4\%$. Infection of cattle in the public sector (agricultural enterprises) exceeded ($p < 0.01$) the same indicator in the sector of individual animal owners. Among young animals, infection with the cattle LV at the age of 1 to 2 years was higher ($3.4 \pm 0.5\%$). The average long-term infection rate of bulls-producers was $1.1 \pm 0.1\%$ (Figure 1).

![Figure 1. Animals infected with the cattle leukemia virus according to the RID results in the Irkutsk region in 2004-2017 (average long-term indicators), \%.](image)

In the long-term perspective, we can note the following: (1) a significant reduction in the infection of cattle in the public ($r=-0.806$) and individual ($r=-0.864$) sectors (Figure 2a), (2) young animals of two age groups ($r=-0.556$ and $r=-0.872$ respectively) (Figure 2b), as well as animals for breeding and procurement ($r=-0.581$) identified (Figure 2c).

In 2004-2005, the highest infection rate of both public and private animals was observed (at the level of 12% and 2%, respectively). In 2017, the lowest infection rate of cattle in the public sector was found (5.4%). Since 2012, the infection of cattle in the private sector did not exceed 0.3-0.4%.

During the analyzed period, the infection of young animals aged from 6 months to 1 year decreased in more than 2 times; and it was in 5 times at the age of 1 to 2 years. The highest percentage of young animals reacting to RIDs (aged from 6 months to 1 year) was recorded in 2004, 2009, and 2013 (over 3%); from 1 year to 2 years – in 2004 (more than 7%), 2005-2007 (at the level of 5%).
Figure 2 a, b, c. Long-term dynamics of infection with the cattle leukemia virus in the Irkutsk region.

Infection rates among the bulls-producers ranged from 1.1% to 2.4% in 2004-2009. In subsequent years, there was a decrease (at the same time, the bulls-producers being infected with the leukemia virus were not detected in 2012-2013 and 2015-2016), but an increase in this indicator was noted again in 2017.
In 2005, the highest percentage of animals responding to RID for breeding and procurement was identified (11.7%), which was associated with high infection of cattle in Usolsky (27.4%) and Cheremkhovsky (34.4%) districts, mainly because a number of breeding farms in these areas sells animals. In the following years, the cattle infection rate for breeding sales and purchases decreased. Moreover, no infected animals were detected in 2017.

Post-infectious antibodies to the leukemia virus were detected in the serum from cattle by the method of enzyme-linked immunosorbent assay (ELISA) in 42.0% of cases. In the study of samples of the pathological material of cattle by the method of polymerase chain reaction (PCR), all results were negative; in the study of blood samples, positive results amounted to 3.5%, including in 9 cases (3.2%) in 2010 and in 2 cases (7.6%) in 2015.

When analyzing hematological studies, it was established that the number of hematological diseased animals was 4.2±0.2%; suspicious for leukemia – 1.4±0.1%; a total number of sick and suspicious heads for the disease – 5.6±1.2%.

During the observation period, the number of hematological patients varied (p> 0.05) from 2.3 to 6.1% (with peaks in 2007 and 2015) and was characterized by a slight decrease by 0.9% in 2017 (if compared with 2004) (Figure 3).

The number of animals suspicious of the disease varied (p> 0.05) from 0.9% to 2.2% (the highest levels were in 2009 and 2014) and was characterized by a slight increase by 0.6%.

4. Discussion

Thus, assessing the epizootic situation of cattle leukemia in the Irkutsk region for 2004-2017 showed the following results, which we also would like to discuss. According to the RID results, infection with the cattle leukemia virus was 3.7±0.4% 2.1±0.2% for young animals from 6 months to 1 year old; 3.4±0.5% at the age of 1 to 2 years; 1.1±0.1% for bulls-producers; 2.4±0.7% among the animals for breeding and procurement. In long-term, a significant reduction in the infection of animals in the public and private sectors is observed (in 2.3 and 5.2 times, respectively), including in more than 2 times for young animals aged from 6 months to 1 year, in 5 times for those aged from 1 to 2 years. Also, there is a decrease in the RID percentage among the animals for breeding and procurement. Post-infectious antibodies to leukemia virus by ELISA were detected in 42.0% of cases. In the study of blood samples by the method of polymerase chain reaction, positive results amounted to 3.5%. According to the results of hematological studies, a number of hematological sick animals was 4.2±0.2%, a number of 1.4±0.1% among those being suspicious for leukemia. During the observation period, a number of hematological sick animals experienced a slight decrease (0.9% in 2017 if compared to 2004), and a number of suspicious patients had a slight increase (0.6%).

5. Conclusion

Considering the different levels of infection in different territories of the Russian Federation, our research insights on the epizootic situation of cattle leukemia, its dynamics in the perennial aspect at
the regional level, it is highly necessary to identify patterns and characteristics of the spread of this disease, as well as to develop more effective anti-leukemia measures.

References

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