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Bovine leukosis incidence in Republic of Dagestan in 2021

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SUMMARY

Results of epizootological analysis of data on bovine leucosis (BL) incidence in the Republic of Dagestan in 2021 are reported. Bovine blood was diagnostically tested for leukosis in 32 veterinary laboratories and diagnostic offices including SBI RD Republican Veterinary Laboratory. 720,489 sera were serologically tested and 7,188 (1.0%) samples were serologically positive for bovine leukaemia virus (BLV). Among the infected animals, 527 ones were subjected to haematologic testing. Persistent leukocytosis was reported in 153 (29.03%) blood samples of haematologically tested BL diseased cattle. Statistical analysis of BLV prevalence in the republic was performed for 41 Raions and 8 municipalities. High percentage of BLV infection in the animal population was reported in fourteen Raions: Kumtorkalinsky (5.8%), Gunibsky (5.3%), Tarumovsky (3.3%), Karabudakhentsky (2.9%), Akhvakhsky (2.0%), Kizlyarsky (1.8%), Charodinsky (1.7%), Kazbekovsky (1.6%), Babayurtovsky (1.5%), Tlyaratinsky (1.1%), Dakhadayevsky (1.04%), Sergokalinsky (1.02%), Novolaksky (1.0%), Shamilsky (1.0%), and in four municipalities: Makhachkala (2.0%), Izberbash (1.14%), Khasavyurt (1.1%) and Yuzhno-Sukhokumsk (1.0%). In 21 Raions and two municipalities, BLV seropositivity was below 1.0%. No BLV infected animals were detected in the Agulsky, Akhtynsky, Dokuzparinsky, Magaramkentsky, Khivsky, Suleiman-Stalsky Raions and in Derbent and Dagestanskiye Ogni municipalities. Studies of BLV prevalence in 2015–2021 demonstrated that the highest level of the animal infection was reported in 2015 (13.9%) and the lowest – in 2021 (1.0%). However, the number of animals serologically tested in 2021 exceeded the number of animals tested over the whole study period. Therefore, the Republic of Dagestan remains BL infected region.

Keywords: bovine leukosis, prevalence, epizootological analysis, incidence, Republic of Dagestan

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Конъюнктура заболеваемости лейкозом крупного рогатого скота на территории Республики Дагестан за 2021 год

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РЕЗЮМЕ

Представлены результаты эпизоотологического анализа данных по заболеваемости лейкозом крупного рогатого скота на территории Республики Дагестан в 2021 г. Диагностические исследования крови крупного рогатого скота на лейкоз были проведены в 32 ветеринарных лабораториях и диагностических кабинетах, в том числе ГБУ РД «Республиканская ветеринарная лаборатория». Серологическим методом было исследовано 720 489 проб сыворотки крови, из них 7188 (1,0%) образцов оказались серопозитивными к вирусу лейкоза крупного рогатого скота. Из числа инфицированных животных гематологическому исследованию подвергнуто 527 голов. Персистентный лейкоцитоз выявлен в 153 (29,03%) пробах крови гематологически больного лейкозом крупного рогатого скота. Проведен статистический анализ распространения вируса лейкоза крупного рогатого скота в республике в разрезе 41 района и 8 городских округов. Высокий процент инфицированности поголовья вирусом лейкоза крупного рогатого скота выявлен в 14 районах: Кумторкалинском (5,8%), Гунибском (5,3%), Тарумовском (3,3%), Карабудахкентском (2,9%), Ахвахском (2,0%), Кизлярском (1,8%), Чародинском (1,7%), Казбековском (1,6%), Бабаюртовском (1,5%), Тляратинском (1,1%), Дахадаевском (1,04%), Сергокалинском (1,02%), Новолакском (1,0%), Шамильском (1,0%); 4 городах: Махачкале (2,0%), Избербаше (1,14%), Хасавюрте (1,1%), Южно-Сухокумске (1,0%). В 21 районе и в 2 городских округах показатель серопозитивности к вирусу лейкоза крупного рогатого скота составил менее 1,0%. В Агульском, Ахтынском, Докузпаринском, Магарамкентском, Хивском, Сулейман-Стальском районах, городах Дербент и Дагестанские Огни инфицированные вирусом лейкоза крупного рогатого скота животные не выявлены. При изучении

динамики распространения вируса лейкоза крупного рогатого скота в 2015–2021 гг. установлено, что наибольший уровень инфицированности животных был в 2015 г. (13,9%), а наименьший – в 2021 г. (1,0%), но численность поголовья, подвергшегося серологическому исследованию, в 2021 г. превосходила таковую за весь анализируемый период. Таким образом, Республика Дагестан остается регионом, неблагополучным по лейкозу крупного рогатого скота.

Ключевые слова: лейкоз крупного рогатого скота, распространенность, эпизоотологический анализ, заболеваемость, Республика Дагестан

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INTRODUCTION

Bovine leukosis (enzootic bovine leukosis, EBL) is induced by bovine leukemia virus (BLV), which causes neoplastic growth of hemoblasts in blood through malignant degeneration and proliferation of immune cells, more specifically through the growth of the number of leukocytes (B- leukocytes) [1–5].

This bovine viral disease is widely spread in the USA, Canada, China, Japan and Russian Federation. West European countries (Norway, Finland, Sweden, Denmark, etc.) and New Zealand are considered BLV-free. In such countries as Italy, Portugal, Latvia, Greece, Romania, Bulgaria and Belarus, BL cases are sporadic [6–12]. According to the animal health recommendations specified in the Terrestrial Animal Health Code of the World Organization for Animal Health[1], any premises should be considered leukosis free in case 99.8% of the animals in the herd were BLV free for the last three years [13, 14].

Over the recent years, a number of programs aimed at BLV spread prevention and disease eradication on the livestock farms were approved in the Republic of Dagestan. They included "Plan for bovine leukosis prevention and control in the Republic of Dagestan in 2017–2020"[2] (approved by the order of the Republic of Dagestan government of 11 September 2017 No. 323-p), "Bovine leukosis prevention and eradication on the farms in the Republic of Dagestan" (approved by order of the Republic of Dagestan government of 28 June 2018 No. 76)[3].

Hematological and serological diagnostic tests of blood of nearly total bovine animal population are performed in the Republic for the detection of BL infected and diseased animals. Bovine leukosis, however, remains the pressing challenge in the region. One of the reasons of such situation is absence of targeted activities for the disease control in Dagestan as well as lack of full-scale preventive measures stipulated by the Veterinary Law[4].

[1] https://fsvps.gov.ru/fsvps-docs/ru/oie/oie_terrestrial_code_g_t1.pdf.
[2] https://docs.cntd.ru/document/450340001.
[3] https://docs.cntd.ru/document/550147549.
[4] Veterinary rules for implementation of preventive, diagnostic, restrictive and other measures, imposition and lifting of quarantine and other restrictions aimed at containment and eradication of bovine leukosis outbreaks: approved by Order of the Ministry of Agriculture of Russia of 24 March 2021 No. 156. Available at: https://docs.cntd.ru/document/603433105.

Therefore, the goal was to study the BLV spread in the region and to perform an epizootological analysis of the data on BL incidence in the Republic of Dagestan in 2021.

MATERIALS AND METHODS

The basic materials used for the investigation of enzootic bovine leukosis in the Republic of Dagestan included reports of the Republican, Interraion and Raion veterinary laboratories for 2021 as well as data notified by the Raion diagnostic offices. Bovine (native) blood sera delivered from different settlements and livestock farms of various types of ownership were used in the studies.

Serological and hematological tests were performed in accordance with "Methodical instructions for diagnosis of bovine leukosis" using immunodiffusion assay (AGID) and hematology analyzer. The epizootological studies were performed in compliance with "Methodical instructions for epidemiological study of bovine leukosis" [15, 16].

RESULTS AND DISCUSSION

Bovine leukosis diagnostic tests were performed in 32 Interraion, Zonal veterinary laboratories including SBI RD Republican Veterinary Laboratory as well as in the diagnostic offices located in the Raions. Biological materials (blood, sera) collected from the animals were delivered to the veterinary laboratories according to their service area. However, there are distant pastures, where the animals are mostly moved in autumn and winter. All diagnostic tests of the animals kept on the premises located in such areas are performed in the zonal veterinary laboratories [17, 18]. In 2021, officers of the veterinary laboratories of the Republic of Dagestan subjected 720,489 bovine serum samples to serological tests for BLV, and 7,188 (1%) of the samples were reported seropositive. During the same period blood collected from 527 animals was hematologically tested for persistent leukocytosis, and 153 (29.03%) blood samples from hematologically diseased cattle were identified.

Table 1 demonstrates the results of serological and hematological tests of bovine sera and whole blood samples for EBL. Therefore, the highest amount of serological tests was performed in the laboratories located in the lowland area of Dagestan, where the major part of the animal

Table 1
BL epizootological monitoring in the Republic of Dagestan, 2021

No.	Veterinary laboratory	Serological tests			Hematological tests of AGID-positive animals		
		Number of animals	AGID-positive	%	Number of blood samples	Diseased animals detected	%
1	Republican	47,538	2,377	5.0	103	22	21.4
2	Agulskaya	4,444	–	–	–	–	–
3	Akushinskaya	24,974	–	–	–	–	–
4	Babayurt	44,456	789	1.8	312	90	28.8
5	Botlikh	51,768	–	–	–	–	
6	Buynaksk	28,242	81	0.3	–	–	–
7	Gumbetovsky	–	–	–	–	–	–
8	Gunib	16,236	48	0.3	–	–	–
9	Dakhadayevskaya	16,565	–	–	–	–	–
10	Derbent	18,075	25	0.14	–	–	–
11	Dokuzparinskaya	22,193	–	–	–	–	–
12	Izberbash	15,608	134	0.9	–	–	–
13	Kasumkent	21,764	–	–	2	–	–
14	Kizilyurt	38,339	188	0.5	–	–	–
15	Kizlyarsk	41,244	680	1.6	–	–	–
16	Kochubeyskaya	42,574	973	2.3	90	32	35.6
17	Kulinskaya	11,847	4	0.03	–	–	–
18	Kurakh	8,257	–	–	–	–	–
19	Lakskaya	17,866	4	0.02	–	–	–
20	Levashy	19,775	48	0.2	–	–	–
21	Maydanovskaya	24,124	–	–	–	–	–
22	Nogayskaya	16,051	11	0.07	–	–	–
23	Rutulskaya	6,402	–	–	–	–	–
24	Tabasarany	12,208	29	0.2	–	–	–
25	Tarumovskaya	26,313	803	3.1	–	–	–
26	Tlyaratinskaya	3,631	–	–	–	–	–
27	Khasavyurt	89,979	969	1.08	20	9	45.0
28	Khivskaya	6,437	–	–	–	–	–
29	Khunzakh	4,217	–	–	–	–	–
30	Tsuntinskaya	10,253	–	–	–	–	–
31	Charodinskaya	12,640	25	0.2	–	–	–
32	Shamilskaya	16,469	–	–	–	–	–
	Total	**720,489**	**7,188**	**1.0**	**527**	**153**	**29.03**

population is accumulated: in Khasavyurt Zonal Veterinary Laboratory – 89,979 bovine serum samples; in the Republican Veterinary Laboratory – 47,538 bovine serum samples; in Babayurt Veterinary Laboratory – 44,456 bovine serum samples; in Kochubeyskaya Veterinary Laboratory – 42,574 bovine serum samples, in Kizlyarsk Veterinary Laboratory – 41,244 bovine serum samples; in Kizilyurt Veterinary Laboratory – 38,339 bovine serum samples; in Tarumovskaya Veterinary Laboratory – 26,313 bovine serum samples, in Izberbash Veterinary Laboratory – 15,608 bovine serum samples. BLV seropositivity rate amounted to 1.08% (969 animals); 5.0% (2,377 animals); 1.8% (789 animals); 2.3% (973 animals); 1.6% (680 animals); 0.5% (188 animals); 3.1% (803 animals); 0.9% (134 animals), respectively. Analysis of the data submitted by the nine veterinary laboratories demonstrated that the level of the BLV infected animals was below 0.5%: in Derbent – 0.14% (25 animals), in Buynaksk – 0.3% (81 animals), in Gunib – 0.3% (48 animals), in Levashy – 0.2% (48 animals), in Tabasarany – 0.2% (29 animals), in Charodinskaya – 0.2% (25 animals), in Nogaysk – 0.07% (11 animals), in Kulinsk – 0.03% (4 animals), in Laksk – 0.02% (4 animals). In other 14 veterinary laboratories and diagnostic offices, located mostly in the mountainous regions, no bovine leukosis was diagnosed. No animal sera were tested for specific precipitating antibodies against BLV in Gumbetovsky Diagnostic Office.

The resulted data demonstrate that there is large-scale serological testing for BLV antibodies performed in the Republic, but hematological tests of blood sera are random, and the complete picture of EBL prevalence cannot be, therefore, made. Nevertheless, those little if any hematological analysis data obtained in 2021 and earlier indicate that the incidence level is high and hematologically diseased animals are not removed from the herd [19].

On the next stage, epizootological data on bovine leukosis in Raions and towns of the Republic in 2021 were analyzed. Dagestan consists of 41 Raions and 10 municipalities. Bovine sera were serologically tested for leukosis nearly in each administrative unit (Table 2). Total of 720,489 blood samples were tested and 7,188 (1.0%) of them turned seropositive. High percentage of BLV infected animals was reported in 14 Raions and 4 municipalities. The highest number of the seropositive animals is housed on the lowland farms and on remote pasture premises located in the foothill and mountainous regions. BLV infection in these Raions and municipalities ranged from 1.0 to 5.8%: in Kumtorkalinsky Raion – 5.8%, in Gunibsky Raion – 5.3%, in Tarumovsky Raion – 3.3%, in Karabudakhkentsky Raion – 2.9%, in Akhvakhsky Raion – 2.0%, in Kizlyarsky Raion – 1.8%, in Charodinsky Raion – 1.7%, in Kazbekovsky Raion – 1.6%, in Babayurtovsky Raion – 1.5%, in Tlyaratinsky Raion – 1.1%, in Dakhadayevsky Raion – 1.04%, in Sergokalinsky Raion – 1.02%, in Novolaksky and Shamilsky Raions – 1.0% in each, as well as in municipalities of Makhachkala – 2.0%, Izberbash – 1.14%, Khasavyurt – 1.1% and Yuzhno-Sukhokumsk – 1.0%. In 21 Raions and 2 municipalities BLV seropositivity level was below 1.0%. In other 6 Raions (Agulsky, Akhtynsky, Dokuzparinsky, Magaramkentsky, Khivsky, Suleiman-Stalsky) and two municipalities (Derbent, Dagestanskiye Ogni) no BLV infected animals were detected.

Table 2
BL diagnostic tests in the Raions and municipalities of the Republic of Dagestan, 2021 (according to SBI RD Republican Veterinary Laboratory)

No.	Raions and municipalities	Serological tests		
		Number of animals	AGID-positive	Infected animals detected, %
1	Agulsky	4,552	–	–
2	Akushinsky	45,590	180	0.4
3	Akhvakhsky	14,887	299	2.0
4	Akhtynsky	10,391	–	–
5	Babayurtovsky	11,372	174	1.5
6	Botlikhsky	32,405	130	0.4
7	Buynaksky	28,213	81	0.3
8	Gergebilsky	24,863	193	0.8
9	Gumbetovsky	11,356	35	0.31
10	Gunibsky	24,432	1,300	5.3
11	Dakhadayevsky	13,605	141	1.04
12	Derbentsky	14,754	22	0.15
13	Dokuzparinsky	9,077	–	–
14	Kazbekovsky	14,897	243	1.6
15	Kaytagsky	5,477	2	0.04
16	Kizilyurtovsky	14,397	45	0.3
17	Kumtorkalinsky	5,256	305	5.8
18	Kayakentsky	7,840	56	0.7
19	Karabudakhkentsky	9,228	263	2.9
20	Kizlyarsky	25,874	467	1.8
21	Kulinsky	22,206	111	0.5
22	Kurakhsky	9,090	2	0.02
23	Laksky	22,863	170	0.7
24	Levashinsky	21,965	77	0.4
25	Magaramkentsky	15,192	–	–
26	Novolaksky	10,674	106	1.0
27	Nogaysky	15,139	10	0.07
28	Rutulsky	9,201	36	0.4
29	Suleiman-Stalsky	9,297	–	–
30	Sergokalinsky	6,353	65	1.02
31	Tabasaransky	12,453	29	0.2
32	Tarumovsky	30,225	983	3.3
33	Tlyaratinsky	13,536	151	1.1
34	Untsukulsky	13,493	93	0.7
35	Khasavyurtovsky	59,650	305	0.5
36	Khivsky	7,196	–	–
37	Khunzakhsky	12,880	54	0.4
38	Tsumadinsky	16,568	88	0.5
39	Tsuntinsky, Bezhtinsky District*	6,528 3,215	11 –	0.2 –
40	Charodinsky	20,298	349	1.7
41	Shamilsky	23,306	224	1.0
42	Kizlyar m.	7,086	20	0.3
43	Makhachkala m.	14,785	290	2.0
44	Kaspiysk m.	706	4	0.6
45	Izberbash m.	702	8	1.14
46	Yuzhno-Sukhokumsk m.	3,895	39	1.0
47	Derbent m.	560	–	–
48	Dagestanskiye Ogni m.	456	–	–
49	Khasavyurt m.	2,505	27	1.1
	Total	**720,489**	**7,188**	**1.0**

*Bezhtinsky District – administrative region within Tsuntinsky Raion.

It was established that the level of BLV infection of the animals in the Republic did not decrease in 2021 (1.0%) as compared to 2020 (1.02%), and the number of the animals diagnostically tested for bovine leukosis increased [20].

Bovine leukosis epizootic data for 2015–2021 were reviewed for the examination of BLV spread dynamics.

The Figure demonstrates that the highest amount of the serological tests for bovine leukosis was performed in 2021, and the number of the infected animals was the lowest in this period. In 2015, only 7,310 bovine blood samples were tested and the seropositivity amounted to 13.9% (1,016 animals). High percentage of the infected animals was associated with the random testing for leukosis and lack of any program for the disease prevention and control in the Republic of Dagestan. Large-scale diagnostic testing for bovine leukosis was started in the region in 2018 and it was performed according to the "Plan of measures for bovine leukosis prevention and control to be implemented in the Republic of Dagestan in 2017–2020", but no disease control and preventive measures were implemented. As soon as the Plan was approved, the number of animals subjected to diagnostic tests increased dramatically: 223,293 animals in 2018; 625,970 animals in 2019; 524,930 in 2020; and 720,489 animals in 2021. The percentage of the BLV infected animals decreased from 4.03% (2018) to 1.0% (2021).

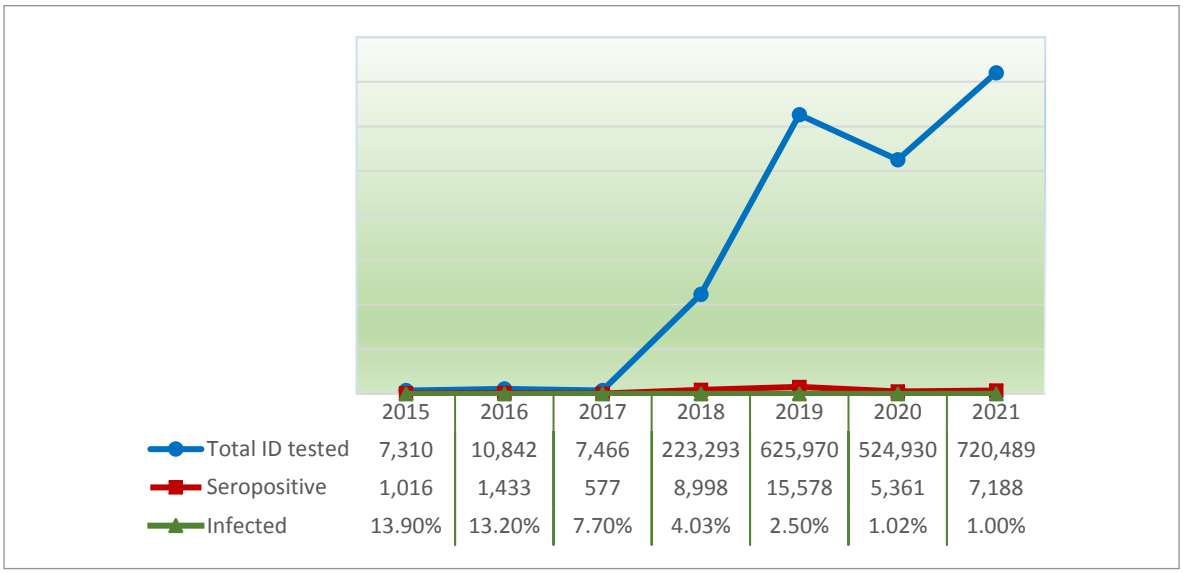

Fig. BL spread dynamics in the Republic of Dagestan, 2015–2021

Therefore, it can be concluded that the percentage of the BLV-infected animals and level of the leukosis incidence remain still high. This situation can be explained by the fact that systemic activities on the on-farm prevention and control of the disease have been started just recently and are carried out not in full extent.

CONCLUSION

In 2021, diagnostic tests for bovine leukosis were performed in all veterinary laboratories in the Republic of Dagestan, excluding Gumbetovsky diagnostic office.

720,489 bovine serum samples were subjected to serological tests, out of which 7,188 (1.0%) were seropositive. High levels of animal infection were identified in 14 Raions and 4 municipalities. In 2 municipalities and 21 Raions BLV seropositivity level was below 1.0%. No BLV infected animals were detected in Agulsky, Akhtynsky, Dokuzparinsky, Magaramkentsky, Khivsky, Suleiman-Stalsky Raions and in Derbent and Dagestanskiye Ogni municipalities. Over the period from 2015 to 2021 the lowest percentage of BLV infected animals was reported in 2021 – 1.0% of tested animals.

Proceeding from the above the conclusion can be made that bovine leukosis is diagnosed almost in all veterinary laboratories of the Republic, the incidence level is high and targeted control and preventive measures are incomplete.

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