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Testing The Sanitary Condition Of Soil And Water In The Mountainous Regions Of Kabardino-Balkaria In Terms Of Contamination With Eggs And Larvae Of Nematodes Of The Genus *Trichocephalus* (Schrank, 1788).

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ABSTRACT

Trichocephalosis of animals and humans is a worldwide medical and veterinary problem, including in 78 regions of the Russian Federation. Nematodes of the genus *Trichocephalus* (Schrank, 1788) in the mountainous regions of the Kabardino-Balkarian Republic are dangerous to animals and humans, and also worsen the sanitary and hygienic condition of the soil and water, contaminating them with eggs and larvae. To study the sanitary and hygienic state of the soil and water in the mountainous regions of the Kabardino-Balkarian Republic with the of determination of the invasive elements of the nematodes of genus *Trichocephalus* (Schrank, 1788). The works were carried out in 2015-2018. in 10 mountain ranges at altitudes from 1000 to 2500 m above sea level by examining 100 soil and water samples to identify eggs and larvae of nematodes of the genus *Trichocephalus* (Schrank, 1788) using standard methods. In the mountain ranges Khudan, Khudan auz, Khudan Su, Er Tubu, Er Bashi, Riu Achile, Kelle, Iligy, Khasau Bat, Kranduh in 12.00-30,0% of the samples were found in eggs and larvae of *Trichocephalus ovis* (Abildgaard, 1795) and *Trichocephalus skrjabini* (Baskakov, 1924). A study of the dynamics of soil contamination by eggs and larvae of the genus *Trichocephalus* (Schrank, 1788) in the mountain zone in 2015–2018 revealed moderate soil contamination with a tendency to increase from 13.0 to 28.0% (an average of 19.8%) with an increase in the number of eggs and larvae per 100 g of soil from 7.2 ± 0.5 to 19.1 ± 1.2 ind. (on average, 12.1 ± 0.8 copies per 100 g of soil). The number of soil samples contaminated with eggs and larvae of nematodes of the genus *Trichocephalus* (Schrank, 1788) was high in areas densely populated by animals and people. On pastures of Kabardino-Balkaria, their number was 96.30%, on pastures of settlements - 88.40%. at the rivers - 72, 70%, in the territories of households - 90.60%, at the kosher - 100%, in the places of watering of the sheep - 100%, in the recreation areas of the sheep - 100%. In the spring, in an experiment on open ground in the soil of mountain pastures at altitudes of 1000–2500 m from 7.97 to 26.29% of eggs and larvae of nematodes of the genus *Trichocephalus* were viable and represented an epizootic hazard for ruminants. Nematodes eggs in soil, water, feces, hay, silage, and feed samples during winter maintained viability, respectively, at 28.0; 22.6; 37.4; 81.6; 74.2; 92.6%. The sanitary and hygienic state of 10 mountainous areas Kabardino-Balkaria can be assessed as unfavorable by contamination with eggs and nematode larvae of the genus *Trichocephalus*.

Keywords: mountain pastures; soil; water; sanitation; hygiene; eggs; larva; nematodes; genus.

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INTRODUCTION

Trichocephalosis of animals and humans is a global medical and veterinary problem in the list of parasitic zoonoses in the world. The epizootic and epidemic situation of the dangerous zoonoses disease in the regions of the Russian Federation in recent years tends to worsen infestations (Zh.A. Atabieva, M.M. Bichieva, I.V. Kolodiy et al., 2012; Zh.A. Atabieva, M.M. Sarbasheva et al., 2012) [1-5]. According to medical services for the past 20 years, the incidence of trichocephalosis has increased by a factor of 7.5 [6-10]. Trichocephalosis invasion among animals and the population throughout the territory of the Russian Federation has acquired an enzootic character with the formation of regional epizootic and epidemic rural and urban foci (F.I. Vasilevich, M.I. Kalabekov et al., 2010) [11-16]. To date, it has become apparent that a high level of extensity and intensification of different species of ungulate animals with trichocephalosis with coverage of 10-30% of adult livestock (M.M. Sarbasheva, L.K. Kazancheva, A.S. Kanokova, 2010) [17-21]. In the regions of the North Caucasus, the infection trichocephalosis of dogs is 70-100% (S.Sh. Kabardiev, K.A. Karpushchenko, 2015, N.S. Malysheva, N.A. Romanenko, 2003) [22-26]. In Russia, trichocephalosis in domestic and wild animals has become a natural - focal invasion, with multilevel protection of vital strategies in definitive and intermediate hosts through the eggs contaminated by the genus *Trichocephalus* (Schrunk, 1788) external environment (G.G. Onishchenko, 2006; M.M. Sarbasheva, Zh.M. Ardavova et al., 2012) [27, 28]. Concerning the activity of the manifestation of the epidemic process of trichocephalosis, in connection with the level of contamination with eggs and larvae of the *Trichocephalus* (Schrunk, 1788) of the mountain ecosystem of Kabardino-Balkaria, scientific studies have not been conducted, little information on the sanitary-hygienic state of the mountain objects on their contamination by the eggs and larvae of the *Trichocephalus* (Schrunk, 1788) (Shikhalieva, Dokhov, 2010; Shikhalieva, Atabieva, Kolodiy et al., 2012) [29, 30]. The goal is to conduct local-background ecological and sanitary-hygienic studies with an assessment of the contamination of mountain objects in the Kabardino-Balkaria with eggs and larvae genus *Trichocephalus*.

MATERIALS AND METHODS

The work was carried out on the basis of the laboratory of parasitology of the Federal State Biological University "Pre-Caspian Zone Scientific Research Veterinary Institute" in 2015-2018. For this purpose, from the places of resting and resting of animals in the mountain tracts of Khudan ally, Khudan auz, Khudan su, Er tjubi, Er Bashi, Riu achile, Kelle, Ylygy, Hassu - bat, Kranduh, 100 samples of soil were taken for examination for detection of eggs and larvae genus *Trichocephalus* (Schrunk, 1788). In the biotopes of the mountain zone, taking into account the vertical belts of the Kabardino-Balkaria Republic, we set up experiments to determine the timing of the development of eggs and larvae genus *Trichocephalus* (Schrunk, 1788) at altitudes of 1000, 1500, 2000, 2500 m above sea level. The experiments were performed using fresh eggs and larvae genus *Trichocephalus* (Schrunk, 1788) washed from the uterus. Samples of eggs in the amount of 10-15 thousand were placed on the experimental plot monthly from March to November. For this eggs and larvae genus *Trichocephalus* (Schrunk, 1788), was placed in glass jars, which were then placed on a biological platform. Samples of soil, water, faeces, hay, silage, mixed fodder with eggs and larvae genus *Trichocephalus* (Schrunk, 1788) were taken daily to determine the viability of invasive elements. In each case, 100 specimens were examined under a microscope eggs and larvae from soil, water, fesses, hay, silage, concentrated feed samples. The viability of eggs and larvae genus *Trichocephalus* (Schrunk, 1788) winter season was studied in a mountainous zone. In the samples of soil, water, fesses, hay, silage, mixed fodder in late November; fresh eggs and larvae genus *Trichocephalus* (Schrunk, 1788) were introduced and left during the winter until March of the following year in the external environment. After the winter period, eggs and larvae genus *Trichocephalus* (Schrunk, 1788) were investigated by methods of helminthoscopy and the MUK "Methods of Sanitary and Parasitological Studies" [1-30]. The data was subjected to statistical processing according to the computer program "Biometry".

RESULTS

Sanitary-helminthological ecological examinations of soil samples made it possible to identify unfavorable mountainous territories in epizootic and epidemiologically dangerous conditions with regard to the occurrence of doses of invasions eggs and larvae genus *Trichocephalus* (Schrunk, 1788) (Table 1).

According to the results of studies of soil samples in places of rest and recreation of animals in the mountain tracts Kabardino-Balkaria Republic (Khudan ally, Khudan auuz, Khudan su, Er tjubi, Er Bashi, Riu acile, Kelle, Ylygy, Khasau bat, Kranduh), respectively at 12.00; 18.00; 16.00; 15.00; 6.00; 30,0; 28.00; 16.00; 19.00; 14.00% of the samples found eggs and larvae genus *Trichocephalus* (Schränk, 1788) in an amount per 100 g of sample, respectively, 14.1 ± 1.9 ; 8.7 ± 0.7 ; 3.5 ± 0.4 ; 11.3 ± 2.0 ; 7.0 ± 0.6 ; 17.4 ± 1.8 ; 8.3 ± 0.9 ; 10.1 ± 1.3 ; 13.0 ± 1.1 ; 9.4 ± 1.0 ekz. (Tabl. 1). In soil samples in places of resting and resting of animals in Kabardino-Balkaria Republic mountainous 10 tracts per 100 g of sample, on average, were found $10,46 \pm 1,17$ ekzemplyar eggs and larvae genus *Trichocephalus*.

Table 1. Sanitary and hygienic condition of the soil of mountain objects of Kabardino-Balkaria Republic for their contamination with eggs and larvae genus *Trichocephalus* (Schränk, 1788)

Investigated objects - natural boundary	Investigated soil samples	Amount contaminated soil samples	% contaminated samples soil	Number of eggs and larvae genus <i>Trichocephalus</i> in 100 g samples soil, ekzemplyar
Hudan Ally	100	12	12,00	$14,1 \pm 1,9$
Hudan Auuz	100	18	18,00	$8,7 \pm 0,7$
Hudan su	100	16	16,00	$3,5 \pm 0,4$
Er Tjubi	100	15	15,00	$11,3 \pm 2,0$
Er Bashi	100	6	6,00	$7,0 \pm 0,6$
Rio Acile	100	30	30,00	$17,4 \pm 1,8$
Kelle	100	28	28,00	$8,3 \pm 0,9$
Ylygy	100	16	16,00	$10,1 \pm 1,3$
Khasau baht	100	19	19,00	$13,0 \pm 1,1$
Kranduh	100	14	14,00	$9,4 \pm 1,0$
Total:	1000	174	-	-
Average:	-	-	17,40	$10,46 \pm 1,17$

A study of the dynamics of soil contamination by eggs and larvae of the genus *Trichocephalus* (Schränk, 1788) in the mountain zone in 2015–2018 revealed moderate soil contamination with a tendency to increase from 13.0 to 28.0% (an average 19.8%) with an increase in the number of eggs per 100 g of soil from 7.2 to 19.1 ekz. (average, 12.1 ekz. per 100 g of soil) (Table 2).

Table 2. Number soil samples with eggs and larvae genus *Trichocephalus* (Schränk, 1788) (according to coproonocopy)

Year	Investigated soil samples, ekzemplyar	Discovered soil samples with eggs and larvae genus <i>Trichocephalus</i> , ekz.	EI, %	Amount eggs and larvae genus <i>Trichocephalus</i> (Schränk, 1788) in 100 g samples soil, ekzemplyar
2015	100	13	13,0	$7,2 \pm 0,5$
2016	100	17	17,0	$9,2 \pm 0,7$
2017	100	21	21,0	$12,8 \pm 0,9$
2018	100	28	28,0	$19,1 \pm 1,2$
Total:	400	79	-	-
Average:	100	-	19,8	$12,1 \pm 0,8$

The number of soil samples contaminated with eggs and larvae of nematodes of the genus *Trichocephalus* (Schränk, 1788) was high in areas densely populated by animals and people. On pastures of Kabardino-Balkaria, their number was 96.30%, on pastures of settlements - 88.40%. at the rivers - 72, 70%, in the territories of households - 90.60%, at the kosher - 100%, in the places of watering of the sheep - 100%, in the recreation areas of the sheep - 100% (table 3).

Table 3. Contamination mountain objects of Kabardino-Balkaria Republic eggs and larvae genus *Trichocephalus* (Schrank, 1788) (according to ooscopy of soil)

Objects	Number of objects, units	Investigated samples soil, units	Samples soil with eggs and larvae genus <i>Trichocephalus</i> (Schrank, 1788)	% contaminated samples	Power contaminated objects
Priselskie pastures	26	293	282	96,30	+++
Pasture pastures	10	310	274	88,40	+++
Shores of mountain rivers	14	300	218	72,70	+++
Rural home ownership	58	320	290	90,60	+++
Territory of cocharum	34	300	300	100,0	+++
Places of watering	23	300	300	100,0	+++

Conditional designations: + - weak power pollution;
 ++ - medium power pollution;
 +++ - strong degree of s contamination.

In the experiments on the open ground in the soil of the pasture pastures of the Kabardino-Balkaria Republic, at the altitudes of 1000, 1500, 2000, 2500 m above sea level, respectively, 26.29; 19.83; 12.53 and 7.97% of the eggs and larvae genus *Trichocephalus* (Schrank, 1788) (Table 4). During the winter period, the number of non-viable eggs of the eggs and larvae genus *Trichocephalus*, including those in the samples of soil, water, faeces, hay, silage and mixed fodder, was not sufficient was, respectively, 72.0; 77.4; 62.6; 18.4; 25.8 and 7.4% (Table 5).

Table 4. Indicators overwintering eggs and larvae genus *Trichocephalus* (Schrank, 1788) in soil on pasture pastures Kabardino-Balkaria Republic (according to ooscopy of samples soil)

Height above the level sea, m	Number of eggs and larvae genus <i>Trichocephalus</i> in soil in autumn when bookmarking experience, ekz.	Number of eggs and larvae genus <i>Trichocephalus</i> in soil in the spring, ekzemplyar	Number of non-viable eggs and larvae genus <i>Trichocephalus</i> in soil in the spring, ekzemplyar	% viable eggs and larvae genus <i>Trichocephalus</i> in soil in the spring
1000	500±10	483±25,92	127±11,33	26,29
1500	500±10	469±23,71	93±8,64	19,83
2000	500±10	447±21,48	56±4,50	12,53
2500	500±10	414±18,66	33±2,75	7,97

Table 5. Indicators of overwintering of eggs and larvae genus *Trichocephalus* (Schrank, 1788) in the mountain zone in samples of soil, water, faeces, hay, silage and mixed fodder

Objects of research	Number of samples, ekz.	Investigated eggs and larvae genus <i>Trichocephalus</i> , total, ekz.	Number of non-viable eggs and larvae genus <i>Trichocephalus</i> in soil in the spring		% viable eggs and larvae genus <i>Trichocephalus</i> in soil in the spring	
			ekz.	%	ekz.	%
Soil	30	500	140	28,0	360	72,0
Water	30	500	113	22,6	387	77,4
Feces	30	500	187	37,4	313	62,6
Hay	30	500	408	81,6	92	18,4
Silage	30	500	371	74,2	129	25,8
Mixed fodder	30	500	463	92,6	37	7,4

DISCUSSION

The data indicate a high level of contamination of the soil in the sites of resting and resting animals in the mountain tracts of Khudan ally, Khudan Auz, Khudan su, Er tjubi, Er Bashi, Riu achile, Kelle, Ylygy, Khasau baht, Kranduh by eggs of the eggs and larvae genus *Trichocephalus* (Schrunk, 1788). In the soil of pasture pastures of the Kabardino-Balkaria Republic, at the altitudes of 1000, 1500, 2000, 2500 m above sea level, respectively, 26.29; 19.83; 12.53 and 7.97% eggs and larvae, which agrees with the data Vasilevich, Bittirov et al.

CONCLUSION

When studying the contamination of mountain objects in the Kabardino-Balkaria Republic by eggs and larvae genus *Trichocephalus* (Schrunk, 1788) found that the dynamics of soil contamination with eggs is characterized by an increase in the level of soil contamination from 63.0 to 88.0% (on average, 80.5%) with an increase in the number of eggs per 100 g of soil from 7.6 ± 0.4 to 19.3 ± 1.1 specimens. (on the average, 12.3 ± 0.7 specimens per 100 g of soil). The number of soil samples with eggs and larvae genus *Trichocephalus* (Schrunk, 1788) the pristel pastures was 96.30%, in the pasture pastures - 88.40%, in the banks of mountain rivers - 72.70%, in the soil of rural households - 90.60%, in the areas of kosher - 100%, in places watering - 100%, in places of rest of sheep and goats - 100%. Cestoda eggs, which were in the soil, water, fesses, hay, corn silage and mixed fodder during the winter, remained viable in the amount, respectively, 28.0; 22.6; 37.4; 81.6; 74.2; 92.6%. In experiments on an open site in the soil of pasture pastures of Kabardino-Balkaria at altitudes of 1000, 1500, 2000, 2500 m. y. the seas overwintered, respectively, 26.29; 19.83; 12.53 and 7.97% eggs and larvae genus *Trichocephalus* (Schrunk, 1788). The sanitary and hygienic state of 10 mountainous areas can be assessed as unfavorable by contamination with eggs and larvae of the genus *Trichocephalus*.

Authors' Contributions

This study was developed and monitored by AMB. Collaborators SAB, KhKhSh, IKhSh, SShM collected soil and water samples from mountain sites in the region and conducted research on the contamination with eggs and *Trichocephalus* larvae (Schrunk, 1788). AMB analyzed and interpreted data. All authors participated in the preparation of the material, read and approved the final manuscript.

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