

# Monitoring of the Trematode *Metorchis Albidus* (Braun, 1893), the Causative Agent of Methorchosis, as a Threat to Habitat and Health Domestic Canines and Humans in the Southern Regions of Russia

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**Abstract.** The goal is to monitor human methorchiasis and carnivores as an epidemic and sanitary and hygienic threat to the population of the southern subject of the Russian Federation. When analyzing materials on the incidence of methorchosis in dogs of the Kabardino-Balkaria Republic, it turned out that in 12 districts the incidence rate of methorchosis in dogs varied from 5.6 to 15.9%. The gradation of the abundance index of trematode *Metorchis albidus* eggs in dog feces ranged from  $2.9 \pm 0.5$  to  $7.0 \pm 0.8$  ind. in 1 g of faeces, on average,  $4.94 \pm 0.65$  ind. per 1 g of faeces, which can provide a high level of soil contamination with eggs. In general, in the Kabardino-Balkaria, the epidemiological situation of dog methorchosis can be classified as relatively unfavorable.

## 1 Introduction

Many authors consider helminthiasis of animals and humans to be a large-scale sanitary threat to the urbanized territories of Russia, the eggs and larvae of which are contaminated soils and wastewater [1-20]. Trematode of the species *Metorchis albidus* are one of the global epidemic risks for the population of the planet and the Russian Federation [1, 2]. WHO considers that human methorchiasis is one of the massive zoonotic invasions in the world with a registration rate of up to 1.2 billion cases per year [1,2,3,4,,5,6,7,8,9,10,11,12, 13].

In the Russian Federation, methorchiasis affects up to 2-3 million people and exceeds similar indicators in European countries by 2,2 times [14,15,16,17,18,19, 20]. In this regard, the question arises of regional monitoring of the spread of methorchiasis among the population and the degree of sanitary contamination of soils of human life support infrastructure with eggs of the pathogen [1,2,3,4,,5,6,7,8,9,10-20]. The aim is to study the trematode *Metorchis albidus* as an epidemic and sanitary and hygienic threat to humans in the southern region of the Russian Federation.

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## 2 Research Methodology

Based on the analysis of materials from the reports of the structural divisions of the Rospotrebnadzor of the Russia for Kabardino-Balkaria Republic for 2021 and other medical documentation and our own research, we calculated the incidence of methorchiasis in 12 districts and sanitary contamination of soils with eggs of the species trematode *Metorchis albidus*. The main epidemiological indicators of methorchiasis in the population of Kabardino-Balkaria Republic were studied by analyzing feces for 9.0 thousand people. and 3600 soil samples for sanitary contamination with eggs trematode *Metorchis albidus*. Statistical processing of the material was carried out using the Biometrics program.

When analyzing materials on the infection of the population with methorchiasis in the Republic by coproscopy of 600 fecal samples of adults from 12 districts and cities, the incidence of methorchiasis was not detected, since 100% of the samples did not contain eggs of *Metorchis albidus*. In general, the epidemiological situation of human methorchosis in the Kabardino-Balkaria can be assessed as consistently favorable. The growth of the index of occurrence of methorchiasis among children and migrants is alarming. Indices of methorchosis occurrence in the child population and migrants increases during the year by 2.8 times. Soils in 12 districts are contaminated with eggs of *Metorchis albidus* by 14-31% (average, 21.7%), which may threaten the possible infection of the population with methorchosis.

## 3 Results and Discussions

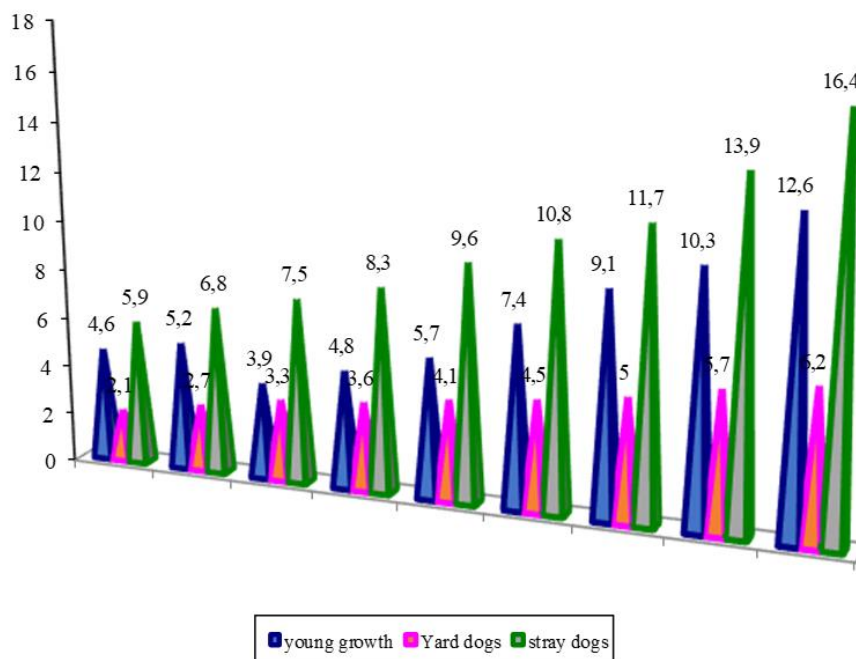
When analyzing materials on the incidence of methorchiasis in dogs of the Kabardino-Balkaria Republic, it turned out that in 12 districts the incidence rate of methorchosis in dogs varied from 5.6 to 15.9% (Table 1). The gradation of the abundance index of trematode *Metorchis albidus* eggs in dog feces ranged from  $2.9 \pm 0.5$  to  $7.0 \pm 0.8$  ind. in 1 g of faeces, on average,  $4.94 \pm 0.65$  ind. per 1 g of faeces, which can provide a high level of soil contamination with eggs (Table 1). In general, in the Kabardino-Balkaria Republic, the epidemiological situation of dog methorchosis can be classified as relatively unfavorable (Fig. 1).

**Table 1.** Results of the analysis of data on the incidence of dogs with methorchosis in the regions of Kabardino-Balkaria (%)

Districts	Researched, man	Infested, man	Occurrence index, %	Abundance indices of eggs <i>Metorchis albidus</i> in 1 g of dogs feces
Prokhladnensky	750	50	6,67	$2,9 \pm 0,5$
Maysky	750	42	5,60	$3,5 \pm 0,6$
Tersky	750	89	11,87	$4,6 \pm 0,8$
Zolsky	750	64	8,53	$3,2 \pm 0,5$
Baksansky	750	105	14,00	$4,3 \pm 0,6$
Urvansky	750	119	15,87	$5,2 \pm 0,7$
Leskensky	750	80	10,67	$5,8 \pm 0,9$
Chereksky	750	66	8,80	$6,1 \pm 0,7$
Chegemsky	750	93	12,40	$4,8 \pm 0,5$
Elbrussky	750	104	13,87	$7,0 \pm 0,8$
Nalchik	750	75	10,00	$6,6 \pm 0,7$
Chegem	750	83	11,07	$6,0 \pm 0,5$

Total:	9000	970	10,78	4,94±0,65
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In the Kabardino-Balkarian Republic, the incidence of dog methorchiasis is low due to planned anti-epizootic work (Fig. 1). At the same time, it can be attributed to risk regions, since the number of young animals, adult yard and stray dogs with methorchiasis does not tend to decrease, but an increase in invasion is observed during the year (Fig. 1). An alarming increase in the incidence of stray dogs. Methorchiasis morbidity rates in stray dog populations have increased by 2.8 times over the year, which can cause environmental pollution by invasive trematode elements (Fig. 1).



**Fig. 1.** Indicators of monthly infection of young animals, adult yard and stray dogs with methorchiasis in the Kabardino-Balkarian Republic in%, for 2021

When analyzing materials on the infection of the population with methorchiasis in the Kabardino-Balkarian Republic by coproscopy of 600 fecal samples of adults from 12 districts and cities, the incidence of methorchiasis was not detected, since 100% of the samples did not contain eggs of *Metorchis albidus* (Braun, 1893) (Table 2). In general, the epidemiological situation of human methorchiasis in the Kabardino-Balkarian Republic can be assessed as consistently favorable (Table 2).

**Table 2.** Results of the analysis of data on the incidence of people with methorchosis in the regions of Kabardino-Balkaria (%)

Districts	Researched , man	Infested, man	Occurrence index, %	Abundance indices of eggs <i>Metorchis albidus</i> in 1 g of human feces
Prokhladnensky	50	0	0	0
Maysky	50	0	0	0
Tersky	50	0	0	0
Zolsky	50	0	0	0

Baksansky	50	0	0	0
Urvansky	50	0	0	0
Leskensky	50	0	0	0
Chereksky	50	0	0	0
Chegemsky	50	0	0	0
Elbrussky	50	0	0	0
Nalchik	50	0	0	0
Chegem	50	0	0	0
Total:	600	0	0	0

The soils of 12 districts and cities of the Kabardino-Balkarian Republic were also analyzed for contamination with the eggs of the causative agent of trematodes (*Metorchis albidus*), the results of which are presented in Table. 3. As can be seen, the soils of 12 districts and cities are infected by 14.00-30.67% (average 21.72%) with eggs of the trematode *Metorchis albidus*, which can be a factor in the infection of humans and dogs with methorchiasis.

**Table 3.** Results of monitoring the sanitary contamination of soils in settlements of the Kabardino-Balkaria Republic with eggs of the causative agent of methorchiasis(trematode *Metorchis albidus*) (in absolute numbers and in %)

Districts	Soil samples studied	Number of soil samples with <i>Metorchis albidus</i> eggs, %		<i>Metorchis albidus</i> eggs were found in 1 g of soil
Prokhladnensky	300	48	16,00	4,60±0,13
Maysky	300	60	20,00	4,85±0,17
Tersky	300	72	24,00	5,44±0,19
Zolsky	300	54	18,00	3,52±0,13
Baksansky	300	78	26,00	5,96±0,22
Urvansky	300	92	30,67	6,39±0,27
Leskensky	300	64	21,34	4,80±0,16
Chereksky	300	76	25,34	5,48±0,14
Chegemsky	300	54	18,00	4,36±0,14
Elbrussky	300	72	24,00	5,64±0,18
Nalchik	300	42	14,00	3,83±0,16
Chegem	300	70	23,34	5,51±0,20
Total:	3600	782	21,72	5, 03±0,17

## 4 Conclusions

When analyzing materials on the incidence of methorchosis in dogs of the Kabardino-Balkaria Republic, it turned out that in 12 districts the incidence rate of methorchosis in dogs varied from 5.6 to 15.9%. The gradation of the abundance index of trematode *Metorchis albidus* (Braun, 1893) eggs in dog feces ranged from 2.9±0.5 to 7.0±0.8 ind. in 1 g of faeces, on average, 4.94 ±0.65 ind. per 1 g of faeces, which can provide a high level of soil contamination with eggs. In general, in the Kabardino-Balkaria, the epidemiological situation of dog methorchosis can be classified as relatively unfavorable. When analyzing materials on the infection of the population with methorchiasis in the Republic by coproscopy of 600 fecal samples of adults from 12 districts and cities, the incidence of methorchiasis was not detected, since 100% of the samples did not contain eggs of

*Metorchis albidus*. In general, the epidemiological situation of human metorchosis in the Kabardino-Balkaria can be assessed as consistently favorable. The growth of the index of occurrence of metorchiasis among children and migrants is alarming. Indices of metorchosis occurrence in the child population and migrants increases during the year by 2.8 times. Soils in 12 districts are contaminated with eggs of *Metorchis albidus* by 14-31% (average, 21.7%), which may threaten the possible infection of the population with metorchosis. A new information and methodological toolkit for organizing remote teaching staff for children with special educational needs was recommended to general educational institutions of the Kabardino-Balkarian Republic. A significant question for us was addressed to teachers and specialists of general education schools: "Was this online platform for psychological and pedagogical support of children with SEN useful to you?". 100% of teachers and specialists answered: "Yes". After analyzing another question, we found that all the pages of the information and methodological tools were used by teachers in their work with children with AKI in full.

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