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THE EFFECT OF RADIATION ON THE SPREAD OF HYPODERMATOSIS IN CATTLE IN THE ABAI REGION

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ABSTRACT: The article presents studies on five farm bases from different areas of the Abay region adjacent to the former Semipalatinsk test nuclear test site in order to identify the biological features of the pathogen of hypodermatosis, depending on the degree of radiation damage and differences in natural and climatic conditions. We paid special attention to the timing of the development of larval phases of hypodermatosis pathogens in cattle, the timing of their mass arrival on the backs of animals, as well as the timing of intensive flights of adult dams in various natural and climatic zones of the Abay region. Farms are located in different zones of radiation damage: from minimal radiation damage (Tarbagatai district, Kokzhira village) to the zone of emergency radiation damage (Abay district). Veterinary reports on infection of cattle with subcutaneous gadfly in the districts of the Abai region for 2022-2024 and our results indicate that animals with hypodermatosis are registered in all districts of the region. In the studied areas, the radioactive contamination of the region plays an important role in the spread of hypodermatosis. The results of the radiation examination showed that the equivalent dose rate (ED) in the zone of extreme radiation risk was 0.35 mSv/hour and in the zone of minimal radiation risk 0.08 mSv/hour. The values of the alpha particle flux density range from 0.2 to 2.2 particles/min*cm2. The measured values of the beta particle flux density in all the studied sites were <10 particles/min*cm2. Radioactive substances reduce immunity, promote the development of parasitic pathogens and negatively affect the quality and safety of slaughter products.
KEYWORDS: hypodermatosis; radioactive contamination of biocenoses; epizootological situation; biological features.
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ВЛИЯНИЕ РАДИАЦИИ НА РАСПРОСТРАНЕНИЕ ГИПОДЕРМАТОЗА КРС В АБАЙСКОЙ ОБЛАСТИ

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АННОТАЦИЯ: В статье представлены исследования с целью выявления биологических особенностей возбудителя гиподерматоза в зависимости от степени радиационного поражения и различий природно-климатических условий на пяти хозяйственных базах из каждого района Абайской области, прилегающего к бывшему Семипалатинскому испытательному ядерному полигону. Особое внимание мы уделили срокам развития ларвальных фаз возбудителей гиподерматоза крупного рогатого скота, срокам их массового прибытия на спину животных, а также срокам интенсивного полета взрослых особей в различных природно-климатических зонах Абайской области. Хозяйства расположены в различных зонах радиационного поражения: от минимального радиационного поражения (Тарбагатайский район, село Кокжыра) до зоны чрезвычайного радиационного поражения (Абайский район). Ветеринарные отчетности о заражении крупного рогатого скота подкожным оводом по районам Абайской области за 2022-2024 гг. и наши результаты свидетельствуют о том, что животные с гиподерматозом зарегистрированы во всех районах области. В исследуемых районах в распространении гиподерматоза немаловажную роль играет радиоактивное загрязненность региона. Результаты радиационного обследования показали, что уровень мощности эквивалентной дозы (МЭД) в зоне чрезвычайного радиационного риска составило 0,35 мкЗв/час, а в зоне минимального радиационного риска 0,08 мкЗв/час. Значения плотности потока альфа-частиц колеблется от 0,2 до 2,2 част/мин*см2. Измеренные значения плотности потока бета-частиц во всех исследуемых пунктах составило <10 част/мин*см2. Радиоактивные вещества снижают иммунитет, способствуют развитию возбудителей паразитов и отрицательно влияет на качество и безопасность продуктов убоя.

КЛЮЧЕВЫЕ СЛОВА: гиподерматоз; радиоактивное загрязнение биоценозов; эпизоотологическая ситуация; биологические особенности.

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INTRODUCTION

As a result of the activities of the Semipalatinsk Test site (SIP) in the period from 1949 to 1989, local areas with high concentrations of radionuclides in the environment were formed on its territory (Lukashenko et al., 2020). After the official closure of the landfill, residents living in nearby settlements began active unauthorized economic activities. As a result, to date, about more than 100 farms have been formed that are engaged in continuous and uncontrolled animal husbandry. Typical types of animal husbandry are grazing sheep, cattle breeding and horse breeding in vast steppe territories.

To date, the boundaries of the landfill and individual test sites have been identified and marked on the ground with special signs warning of the presence of radioactive contamination. However, a ban on economic activity on the territory of the CIP does not guarantee that the population conducting unauthorized activities is not in danger of falling into areas of radioactive contamination. At the same time, residents of individual settlements are requesting that they be given separate parts of the M&A due to the lack of pasture land within rural districts.

It is well known that the transfer of radionuclides into livestock products can be determined by many factors, including the level and nature of contamination of pastures, the type of diet and its composition, the type, age and productivity of animals, the technology of their maintenance, etc. (Spiridonov et al., 2025, Aidarkhanov et al., 2022). The knowledge available in the world on the transfer of 137Cs and 90Sr radionuclides into livestock and poultry products is quite broad (Edomskaya et al., 2025, Krechetnikov et al., 2021, Polivkina et al., 2025). However, most of them were obtained in laboratory conditions or in territories contaminated as a result of radiation accidents (Mikhailov et al., 2025, Dyussembayeva et al. 2025), which differ from the territory of the CIP both in the nature of radioactive contamination and in natural and climatic conditions. A few studies have been devoted to the transition of transuranic radionuclides (Pu, Am) and 3H into livestock and poultry products (Edomskaya et al. 2024, Wei et al. 2025), in some cases there are no data available.

Radionuclides 137Cs, 90Sr, 239+240Pu, 241Am and 3H make the main contribution to environmental pollution at the CIP. At the same time, if high activities of radionuclides 137Cs, 90Sr, 239+240Pu and 241Am are present directly on the territory of the test sites (Experimental Field, Degelen, 4a, etc.), then increased concentrations of radionuclide 3H are found in water sources outside of them and outside the landfill (Erofeeva et al. 2026, Krivitskiy et al. 2022, Lukashenko et al., 2026). The additional relevance of the study is due to the transfer of landfill lands, which are considered to be "background" (Lukashenko et al. 2024, Kabdyrakova et al. 2025, Born-Torrijos et al. 2023), into economic circulation. Under these conditions, it is necessary to forecast the levels of radioactive contamination of livestock products obtained by M&A in order to assess the dose loads on the population consuming these products.

There is a fairly extensive literature on the effects of radioactive radiation on human and animal helminths. The use of isotopes and radiation exposure in the control of helminthiasis is described in detail in monographs published in Europe and the UK (Sabadel et al.,2022, Balachandar et al., 2026).

After the accident at the Chernobyl nuclear power plant in Belarus, studies were launched to study changes in the parasitic situation in territories contaminated with radionuclides (Nachev et al. 2025; Panov et al., 2025, Labetskaya et al., 1997). The main focus of these studies is the analysis of changes in the parasitic situation in the “exclusion and resettlement zones”, where there has been a sharp decrease in anthropogenic pressure on biocenoses. At the same time, the main attention was focused on the secondary effect of the manifestation of radioactive contamination of the area, i.e. succession processes in places with limited human activity. It has been shown that significant changes in the parasitofauna of birds and rodents occur due to changes in the abundance and species composition of hosts in these territories.

At the same time, it should be emphasized that all work on the effects of ionizing radiation on parasites was carried out on experimental material. To date, there have been practically no works devoted to the impact of radioactive contamination of the area on parasites and parasitic systems.

There were only fragmentary data on parasitic arthropods and blood parasites in radiation biocenoses (Szewczyket al., 2021, Frantsevich, 2006).

The weakening of immunity during radiation exposure leads to an increase in the number of infected animals and an increase in the intensity of invasion. In this system, the tendency to increase the invasive onset is dominant and overrides other possible directions of change in the parasitic system. Perhaps, the second type of regulation of the number of parasites is manifested here – through the mortality of hosts intensively infected with parasites.

It has been established that environmental changes can affect the number of insect pests. Studying the effects of various environmental factors, including the effects of increased radiation, provides an opportunity to better understand the nature of changes in the effects of parasites on animals and humans. Information about the prevalence and impact of hypodermatosis in Kazakhstan is currently very incomplete. There is one study from Western Kazakhstan, where almost 100% of all cattle (until 1998) were reported to contain hypodermic larvae (Bauer et al., 2023). According to S. Bauer, M. Koibagarova, L. Leader, V. Hajibalayeva, during the 2015-2016 winter season, blood serum samples were taken from 891 cattle from 30 dairy farms in eight regions (Aktobe, Kostanay, North Kazakhstan, Akmola, Pavlodar, Karaganda, East Kazakhstan, Almaty). The samples were examined using a commercially available Elisa kit (fasciolosis test for antibodies in bovine blood serum; idexx website, Montpellier, France) According to the manufacturer's instructions. A total of 74% of all cattle were seropositive to subcutaneous tissue antibodies, and seropositive animals were found in 29 out of 30 farms. The average seroprevalence ranged from 54-66% (Aktobe, Almaty, Northern Kazakhstan) to 89-97% (Pavlodar, Karaganda, Eastern Kazakhstan). These results show that hypodermatosis is widespread throughout Kazakhstan (Bauer et al., 2023). Our work is devoted to the study of the direct effect of chronic ionizing radiation on parasitic systems using the example of hypodermatosis in natural biocenoses. In our opinion, both of these areas of work complement each other and, in the future, will allow us to fully describe the changes taking place in the epizootological situation of hypodermatosis in territories contaminated with radionuclides and predict its further development.

METHODS OF THE RESEARCH

The work was carried out in the period from 2022-2024 in the laboratory of the Department of Veterinary Sanitation and in the regional testing Laboratory of Engineering (IRLIP) «Scientific Center for Radioecological Research» of the Shakarim University and farms adjacent to the Nuclear Power in Abai (Sarzhal village, Karaul village), Beskaragai (Birlik village), Tarbagatai (Kokzhyra village), Urdzhar (Makanchi village) districts, as well as in Semey (Prirechnoye).

Sampling was carried out according to the Methodological guidelines "Environmental monitoring" (Determination of the content., 2007), GOST 17.4.3.01-83 Nature protection. Soils. General requirements for sampling (GOST 17.4.3.01-83), GOST 27262-87, ST RK GOST R 51592-2003 Water. General requirements for sampling (ST RK GOST R 51592-2003), ART RK 1545-2006 Radiation control. Sampling of surface and wastewater. General requirements (ART RK 1545-2006). Gamma spectral and radiochemical analyses were performed on a gamma spectrometer with an electrocooled coaxial germanium detector from Alpha Analyst, Canberra (USA) (Methodology for determining., 2010,). To establish the epizootic situation of hypodermatosis, we used our own observations and veterinary reports on the infestation of cattle with larvae of subcutaneous gadfly in the districts of the East Kazakhstan region for 2022-2024. We also studied the location of larvae in various areas of the skin and the dynamics of larval pupation by conventional methods. The graphs and data visualization were performed using Microsoft Excel 2019 software (Microsoft Corp., USA).

RESULTS

On the basis of five farms from different regions of the East Kazakhstan region, we conducted research to study the biological characteristics of the causative agent of hypodermatosis, depending on the degree of radiation risk and differences in natural and climatic conditions.

The results of the radiation examination are presented in Figures 1,2,3.

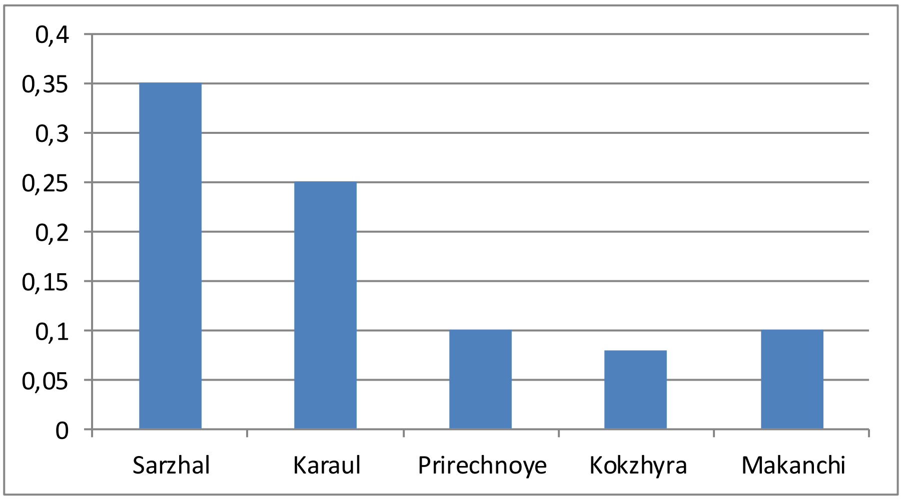

Figure 1. MED values of the daytime surface of the studied points

As can be seen from the histogram, the equivalent dose rate (ED) level in the area of extreme radiation risk (Sarzhal village) was 0.35 mSv/hour. In the zone of maximum radiation risk (Karaul village) 0.25 μSv/hour, in the zone of increased radiation risk (Prirechnoye village) 0.10 μSv/hour. In the zone of minimum radiation risk, the village of Kokzhyra is 0.10 μSv/hour and the village of Makanchi is 0.08 μSv/hour.

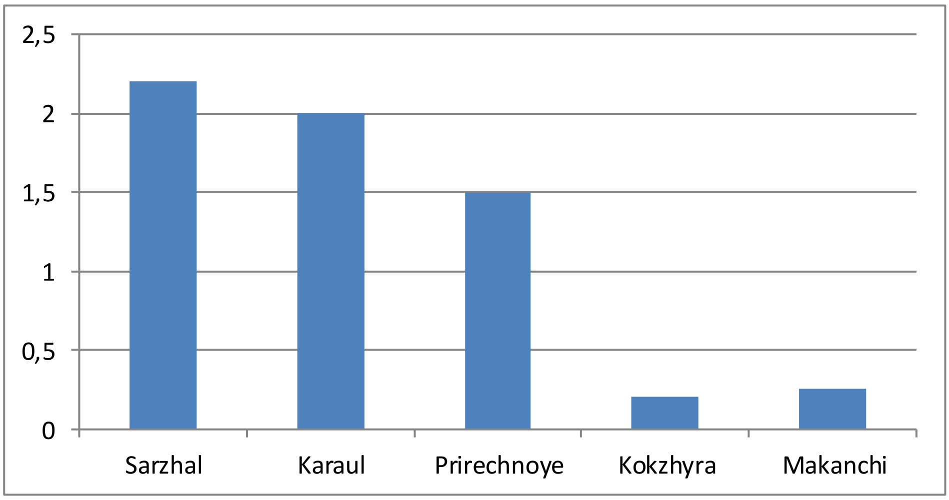

Figure 2. Values of the alpha particle flux density on the surface of the studied points

The values of the alpha particle flux density range from 0.2 to 2.2 particles/min*cm2. In the area of extreme radiation risk in Sarzhal village, the alpha particle flux density is 2.2 particles/min*cm2. In the maximum radiation risk zone in Karaul village, the alpha particle flux density is 2.0 particles/min*cm2l. In the zone of increased radiation risk in the village of Prirechnoye, 1.5 particles/min *cm2. In the zone of minimum radiation risk in S.Kokzhyra 0.2 parts/min*cm2 and Makanchi village 0.25 parts/min*cm2.

The measured values of the beta particle flux density in all the studied sites were <10 particles/min*cm2. In the area of extreme radiation risk in Sarzhal village, the beta particle flux density is 9.4 particles/min*cm2. In the maximum radiation risk zone in Karaul village, 8.2 particles/min*cm2. In the zone of increased radiation risk in the village of Prirechnoye 5,6 particles/min * cm2. In the zone of minimum radiation risk in S.Kokzhyra 5.2 parts/min*cm2 and Makanchi village 4.2 parts/min*cm2.

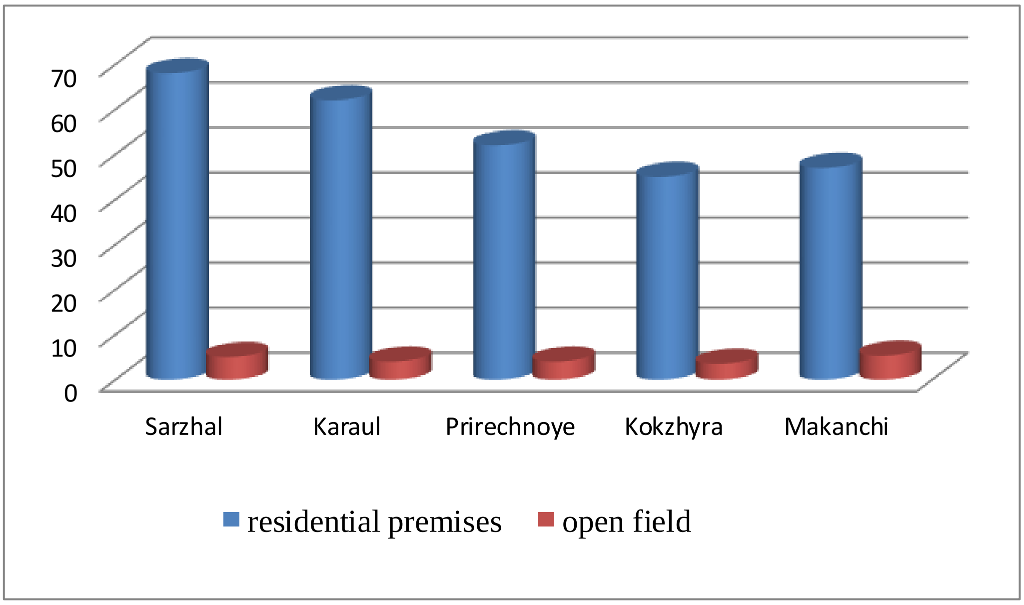

Figure 3. Measurement results of radon and thoron EROA (Bq/m3)

The equivalent equilibrium volumetric activity (EROA) of thoron at all points of the study was <5 Bq/m3. The radon EROA ranges from 42 to 68 Bq/m3. According to the research results, it was found that the volume activity of radon and thoron in the atmospheric air did not exceed the values of the permissible average annual volume activity for the population, established by hygienic standards, and amounting to 200 Bq/m3. A comparative indicator of the extent of invasion in recent years of cattle under the age of 2 years and older than 2 years, affected by hypodermatosis in various areas of the East Kazakhstan region, has been made. In 2022, this figure was 44.68%, in 2023– 43.28%, in 2024 – 34.95%. The specific prevalence of hypodermatosis among cattle over 2 years of age in these areas is as follows: in 2022 – 23.28%, in 2023 – 22.12%, in 2024-12.49%. The results of veterinary reporting on the infestation of cattle with subcutaneous gadfly larvae in the districts of the East Kazakhstan region for 2022-2024 indicate that animals with hypodermatosis are registered in almost all districts of the region. As a result of the study, five farms in Eastern Kazakhstan were identified, which are located in different climatic conditions and four radiation risk zones of the former Semipalatinsk nuclear test site. Attention was paid to the timing of the development of larval phases of bovine hypodermatosis pathogens, the timing of their mass approach to the animal's back, the timing of pupation and the timing of intensive summer of adult gadflies were taken into account. Farms are located in different radiation risk zones.

Table 1. Comparative indicators of the prevalence of hypodermatosis in cattle under 2 years of age between 2022-2024 in different districts of the Abai region

Years	Studied livestock	Farms					Average, %
		Urzhar District, peasant farming" Birlik"	Tarbagatay District, cooperative "Kokzhira"	Semey City, LLP" Agrofirma Prirechnoye "	Beskaragay district, peasant farming "Balke"	Abai District, peasant farming "Nariman"	
1	2	3	4	5	6	7	8
2022	All studied cattle	20	37	10	20	33	
	Sick	7	23	5	8	12	
	EI, %	35	62.1	50.0	40.0	36.3	44.68
	II, ex.	15.4	24	18.7	20.4	23.2	20.34
1	2	3	4	5	6	7	8
	All studied cattle	30	30	30	30	30	
	Sick	7	11	5	17	25	

2023	EI, %	23.3	36.6	16.6	56.6	83.3	43.28
	II, ex.	27	30	15	40	70	36.4
2024	All studied cattle	30	30	30	30	30	
	Sick	5	8	-	11	18	
	EI, %	16.6	26.6	-	36.6	60	34.95
	II, ex.	7	12	-	13	16	12

Notice: EI - extensity of infection; II – the intensity of infection.

As shown in Table 1, in 2022, a total of 120 cattle under the age of 2 years were examined for hypodermatosis, including 55 cattle with hypodermatosis, i.e. the average figure was 44.68%. The highest rate of cattle with hypodermatosis is in Tarbagatai district, the prevalence of infestation is 62.1%, and the lowest rate is in Urzhar district, IE – 35%.

In 2023, 30 heads of cattle were taken from each district and examined for hypodermatosis, a total of 150 cattle were examined, of which 84 cattle were diagnosed with hypodermatosis, the total IE was 56%. The highest incidence of hypodermatosis is in Abay district, and the lowest rate is in Semey City, "Agrofirma "Prirechnoye" LLP.

In 2024, 30 heads of cattle were taken from each district, a total of 150 heads of cattle were studied, of which 46 cattle were affected by hypodermatosis, i.e., IE – 38.3%. This year, the highest indicator is in Abay district, and the lowest indicator is in Urzhar district. "Semey LLP ""Agrofirma ""Prirechnoye " is 100% free from hypodermatosis of cattle." In this farm, mainly breeding animals, then veterinary and sanitary and hygienic measures are carried out in a timely and high-quality manner. In addition, the livestock of this farm does not mix with other rural animals, and the pasture lands are separate. In the regions of the East Kazakhstan region, the timing of the development of the larval stage of the causative agent of hypodermatosis varies. Based on previous studies and comparing studies of 3 years, it turned out that the approach of larvae to the back of cattle will occur in February-April, the fall of larvae will occur in April-May, and the widespread flight of gadflies will occur in May-September.

Table 2. Location of larvae in the affected skin areas

Host body area	Larvae quantity	Percentage of the total	Range in infected animals
Head-neck	7	4.8	1-3
Back	60	40.8	1-40
Belly	3	2.04	1-6
The back part	40	27.2	1-30
Forelimbs	12	8.16	1-5
Hind limbs	25	17.0	1-10

As the radiation exposure increases, the parasitic load on the host populations increases. But in the system, cestodes are rodents (the definitive host) this increase is limited by the radio sensitivity of the intermediate host. As soon as the power of the radiation factor exceeds the radiation resistance of intermediate hosts, a decrease in the infection of animals with cestodes is observed. Consequently, in this parasitic system, the “weak link” can be both a definitive host and an intermediate one, depending on the level of radioactive contamination of the biocenosis. In parasitic systems, where the parasite is a more radio-sensitive organism than the host, we have observed a decrease in animal infection with these parasites. In the coccidia-rodent parasitic system, where the “weak link” is the parasite, there is a significant decrease in the infection of rodents with coccidia, and this process positively correlates with an increase in radiation contamination of the biocenosis.

DISCUSSION

Changes in parasitic systems as a result of radioactive contamination of biocenoses lead to a change in the parasitic situation of the territory and a change in the potential of foci of parasitic diseases (Eslamiradet al.,2024). In parasitic systems, where the "weak link" is the host (more radio-sensitive), an increase in invasion occurs, which is expressed in an increase in the intensity and extensiveness of the invasion. This happens in the following systems: rodents–nematodes (geohelminths), cestodes–soil invertebrates–rodents. The direction of our work is the radioactive contamination of biocenoses on parasitic systems and, as a result, the change in the parasitic environment in these territories. Belarusian researchers focused on the factors influencing the parasitic environment and caused "primarily by the cessation of anthropogenic pressure on the biocenosis" (Panov et al., 2025). The consequence of the removal of anthropogenic pressure is the activation of successional processes in the contaminated area, which affects the number and species diversity of the animal population. This leads to the disappearance of pre-existing foci of various human and animal diseases or the emergence of new ones (ibid.). The study of this phenomenon is absolutely fair and necessary. And anthropogenic impact or its removal really affects the wildlife of these territories and, accordingly, the parasitofauna. However, the removal of anthropogenic pressure on the biocenosis can occur under the influence of other causes (not only radioactive contamination). Radioactive contamination of biocenoses and removal of anthropogenic pressure on them are two different phenomena, and they can act on parasitofauna in different ways. Therefore, when Belarusian parasitologists write about changes in the parasitic situation in radionuclide-contaminated territories as a result of the removal of anthropogenic pressure, it is not clear which of these factors influenced these changes.

CONCLUSION

Hypodermatosis infection in radiation biocenoses does not change, and it practically does not depend on the degree of radioactive contamination. With an increase or decrease in the infection rate of the hosts of the analyzed groups of parasites, there is an almost uniform decrease or increase in the number of each type of parasite. But it should be noted that this process is influenced by the different radio sensitivity of the hosts and the parasites themselves. Thus, the radiation biocenoses of the studied areas of the Abai region are characterized by an increase in infection with bovine hypodermatosis (up to a certain level of radioactive contamination). Infection with bovine hypodermatosis is decreasing, the greater the decrease, the more the biocenosis is contaminated with radionuclides. The intensity and extent of the invasion of these parasites will not change, but it is possible that radiation in the soil affects the larvae through the skin during pupation, which requires further research.

AUTHOR CONTRIBUTIONS

Conceptualization and theory: SD, NI, LK and KA; research design: NI; data collection: NI and USh; analysis and interpretation: SD and AT; writing draft preparation: SD, NI and TB; supervision: SD, AT and LK; correction of article: LK and NI; proofread and final approval of article: SD, AT, LK and KA. All authors have read and agreed to the published version of the manuscript.

ETHICAL ASPECTS

All procedures complied with the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (1986, ETS No. 123) and the national Law of the Republic of Kazakhstan «On Responsible Treatment of Animals» (No. 97-VII LRK, 2021), as well as relevant institutional guidelines.

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ТҮЙІН

Мақалада Абай облысының бұрынғы Семей сынақ ядролық полигонына іргелес орналасқан әр аудандарынан бес шаруашылық базасында радиациялық зақымдану дәрежесіне және табиғи-климаттық жағдайлардың айырмашылықтарына байланысты гиподерматоз қоздырғышының биологиялық ерекшеліктерін анықтау мақсатында, зерттеулер жүргіздік. Ірі қара малдың гиподерматоз қоздырғыштарының ларвальды фазаларының даму мерзіміне, олардың жануарлардың арқасына жаппай келу мерзіміне, сонымен қатар Абай облысының әртүрлі табиғи-климаттық аймақтарында ересек бөгелектердің қарқынды ұшу мерзімдеріне аса мән бердік. Шаруашылықтар радиациялық зақымданудың әртүрлі аймақтарында орналасқан: ең аз минимальді радиациялық зақымданудан (Тарбағатай ауданы, Көкжыра ауылы) төтенше радиациялық зақымдану аймағына (Абай ауданы) дейін. Абай облысының аудандары бойынша 2022-2024 жылдарға арналған ірі қара малдың тері астындағы садақпен зақымдануы туралы ветеринариялық есептер және біздің нәтижелеріміз гиподерматозбен ауыратын жануарлардың облыстың барлық аудандарында тіркелгенін көрсетеді. Зерттелетін аудандарда гиподерматоздың таралуында аймақтың радиоактивті ластануы маңызды рөл атқарады. Радиациялық зерттеу нәтижелері төтенше радиациялық тәуекел аймағындағы эквиваленттті доза (МЭД) қуатының деңгейі 0,35 мкЗв/сағ ал ең төменгі радиациялық тәуекел аймағында 0,08 мкЗв/сағ құрағанын көрсетті. Альфа бөлшектерінің ағын тығыздығының мәндері 0,2-ден 2,2 бөлікке дейін / мин * см2. Барлық зерттелетін нүктелердегі бетта бөлшектерінің ағын тығыздығының өлшенген мәндері < 10 бөлік/мин*см2 болды. Радиоактивті заттар иммунитетті төмендетеді, паразит қоздырғыштарының дамуына ықпал етеді және сою өнімдерінің сапасы мен қауіпсіздігіне теріс әсер етеді.

РЕЗЮМЕ

В статье представлены исследования с целью выявления биологических особенностей возбудителя гиподерматоза в зависимости от степени радиационного поражения и различий природно-климатических условий на пяти хозяйственных базах из каждого района Абайской области, прилегающего к бывшему Семипалатинскому испытательному ядерному полигону. Особое внимание мы уделили срокам развития ларвальных фаз возбудителей гиподерматоза крупного рогатого скота, срокам их массового прибытия на спину животных, а также срокам интенсивного полета взрослых особей в различных природно-климатических зонах Абайской области. Хозяйства расположены в различных зонах радиационного поражения: от минимального радиационного поражения (Тарбагатайский район, село Кокжыра) до зоны чрезвычайного радиационного поражения (Абайский район). Ветеринарные отчетности о заражении крупного рогатого скота подкожным оводом по районам Абайской области за 2022-2024 гг. и наши результаты свидетельствуют о том, что животные с гиподерматозом зарегистрированы во всех районах области. В исследуемых районах в распространении гиподерматоза немаловажную роль играет радиоактивное загрязненность региона. Результаты радиационного обследования показали, что уровень мощности эквивалентной дозы (МЭД) в зоне чрезвычайного радиационного риска составило 0,35 мкЗв/час, а в зоне минимального радиационного риска 0,08 мкЗв/час. Значения плотности потока альфа-частиц колеблется от 0,2 до 2,2 част/мин*см2. Измеренные значения плотности потока бета-частиц во всех исследуемых пунктах составило <10 част/мин*см2. Радиоактивные вещества снижают иммунитет, способствуют развитию возбудителей паразитов и отрицательно влияет на качество и безопасность продуктов убоя.

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