Advances in Engineering Research, volume 151

International Conference on Smart Solutions for Agriculture (Agro-SMART 2018)

Spreading of Sarcoptes Scabiei, as Psoroptes Cuniculi on Rabbits and Otodectes Cynotis on Domestic Carnivores

Maslova E.N.
Northern Trans-Ural State Agricultural University,
Tyumen, Russia,
E – mail: maslovaen@gausz.ru

***Abstract* – This article presents the results of the research of spreading Psoroptes cuniculi on rabbits and Otodectes cynotis on domestic carnivores during 2014 – 2017 in the territory of the Tyumen region. The studies were conducted by the standard methods: clinical, acarologic, haematologic. The epizootological situation with Psoroptes cuniculi of rabbits was studied according to the V.V. Makarov's recommendations et al. (2009), is relevant on 14.02.2018. For the studied period, the average values of extensiveness of rabbits Psoroptes cuniculi invasion had been 42.62, carnivores Otodectes cynotis had been 22.53. At the same time, the indicator of adult rabbits extensive invasion (EI) had been fluctuated within 39.4±1.2 – 41.8±1.5%, and of growers – 41.6±0.3 – 47.2±1.6%. The top indicators of disease incidence were registered in autumn and winter and spring periods: October - November (EI of 35.2-47.2% on rabbits, 42.5-45.2% on domestic carnivores) and in February – March (EI – 35,3 – 46.2% on rabbits and 29,.6 – 43.4% on domestic carnivores). The focality of an otodectic invasion is supported by homeless animals, whose extensiveness of invasion is within the limits of 21.5±3.1-33.4±3.2%, for domestic carnivores I is within 11.01±0.6 – 21.2±1.2%.**

Keywords — rabbits, domestic carnivores, psoroptes, otodectes, spreading.

I. INTRODUCTION

Siberia is a large producer of livestock products. Its percentage in volumes of production in the Russian Federation achieves 16-19%, and the livestock number and poultry population accounts for 15.7%. The Tyumen region refers to the developed agricultural zone of Russia with the livestock and grain orientation. Increase in production of livestock production and increase in their quality at the smallest expenses of labor and means is one of the important issues for agricultural science and practice. At the same time, one of the criteria of this task is to eliminate the negative factors interfering with full use of all productive potential qualities innated in animal bodies Their number includes animal diseases including parasitic ethiology diseases among which a widespread Sarcoptidaes [7, 14, 16]. In many invasive diseases the organism of the owner is the victim of parasites "attack". At the same time, these diseases, basically proceed as the general pathonomy of the body, causing essential deviations of the metabolic status in the owner's organism [1, 2, 5].

In the territory of the Russian Federation among sarcoptidic animal diseases the widespread invasions are Psoroptes cuniculi of cattle [6] and rabbits [4, 8, 10, 11], and Otodectes cynotis of carnivores [3, 12, 13, 15] as well.

The aim of the research is to study the distribution of Psoroptes cuniculi on rabbits and Otodectes cynotis on domestic carnivores in conditions of the Tyumen region.

II. MATERIAL AND METHODS OF RESEARCH

Research work had been performed during the period from 2015 to 2017 at the departments of noncontagious animal diseases and infectious and invasive animal diseases of the Northern Trans-Ural State Agricultural University as well as under production conditions of the CJSC "Agrarian and Industrial Complex Roshinsky" (The Tyumen district), private rabbit-breeding farms, 15 veterinary hospitals of the Tyumen region. To determine diagnosis of Sarcoptideae we took into account the epizootological data, clinical features and microscopic findings of animal skin scrapes. To detect itch mites we took scrapes from the new itchy focalities (no less than from 2-3 places) on the border of the infected and healthy skin. The scrapes were gathered at cloth napkins or were put into a glass test tube. Then the collected samples were labeled with detailing the name of farm, number of an animal, date of sampling. The scrapes were investigated within 1-2 full days. To study mites viability were examined with a microscope like "MBS", "MBA-2". The diagnosis on Psoroptes cuniculi was determined if we found ova, larvae, nymphs or imagos of mites. Experiments on growth intensity of the rabbits inected by Psoroptes cuniculi were conducted during September and October, 2017. At the same time, we created two groups of apparently healthy 2 months-old Californian rabbits. The first group was experimental, and the second group was control. Previously rabbits were numbered and weighed. In September we placed mites the Psoroptes cuniculi to the auricles of the experiment group of rabbits. Experiment and control animals were contained isolated, but conditions of keeping and feedings were identical. Rabbits of both groups were constantly under observation, taking into account their clinical status, paying attention to such factors as seriousness of invasion course, feed eatability, growth, weight of animals. At the development of invasion, the experimental animals were uneasy, often scratched auricles, ate feed badly. At the end of October (duration of the experience was 60 days) the experimental and

control animals were weighed. At the same time, experimental animals were divided into three groups depending on the developed stages of a Psoroptes cuniculi: light, intermediate severity and severe. We have made similar series of experiments also with adult stock of rabbits.

The received results of bacteriologic tests were statistically operated taking into account average values, their errors and reliability degree (R) on Student's with the use of the Microsoft Office Excel and Biostat program.

III. The Results of the Study and Their Discussion

The results of studying the spreading of psoroptes invasion in rabbit-breeding farms of the Tyumen region are processed and presented in the table 1.

The data of the tables 1 illustrate that Psoroptes cuniculi in rabbits is registered annually with a different degree of invasion extensiveness. Despite preventive measures and early treatment, the invasion extensiveness remains quite high in the Tyumen region. The average value of invasion extensiveness for the studied period was 42.62%

We have noted that the growth of invasion extensiveness of Psoroptes cuniculi directly depends on the age of animals. The greatest indicator of the invasion extensiveness in a percentage ratio is noted at young growth of rabbits. If the prevalence by the activator of a Psoroptes cuniculi in adult rabbits in 2015 - 2017 was 39.4±1,2 - 41.8±1.5%, then the prevalence of growers was 41.6±0.3 – 47.2±1.6%.

TABLE I. Spreading of Psoroptes cuniculi on rabbits in the territory of the Tyumen region (2015-2017 of)

Years	Adult stock		Growers	
	Examined, animals	*EI % M±m (P≤0,05)*	*Examined, animals*	*EI % M±m (P≤0,05)*
2015	3528	41.6±0.9	13259	41.6±0.3
2016	4623	39.4±1.2	12564	47.2±1.6
2017	4739	41.8±1.5	12953	44.1± 1.3

The indicators of seasonal dynamics of Psoroptes in rabbits, according to the figure 1, proves that disease degree among animals is not identical in different months. The highest rates were registered in autumn, in October - November (EI was 35.2-47.2%) and in spring, in February – March (EI was 35.3 – 46.2%). In summer the degree of animal prevalence was considerably decreased to 9.5 – 15.2% in 2015, to 8.7 – 14.5% in 2016, to 10.2 – 16.7% in 2017.

One of the spreading factors of itchy invasion is optimum conditions for a psoroptic mite, defining from which are the temperature and moisture conditions, prevailing in this or that period, as well as various ways and methods of spreading psoroptic mites, that is favorable to the existence and development of Psoroptes cuniculi invasion. Multi-year research has been established that the general temperature of rabbits body (adults and growers) remained within the limits of the standard physiological norm (37,5 - 39,0 °C) with unexpressed fluctuations, apart from the season of the year. Herewith, the temperature and relative air humidity in sheds varied considerably.

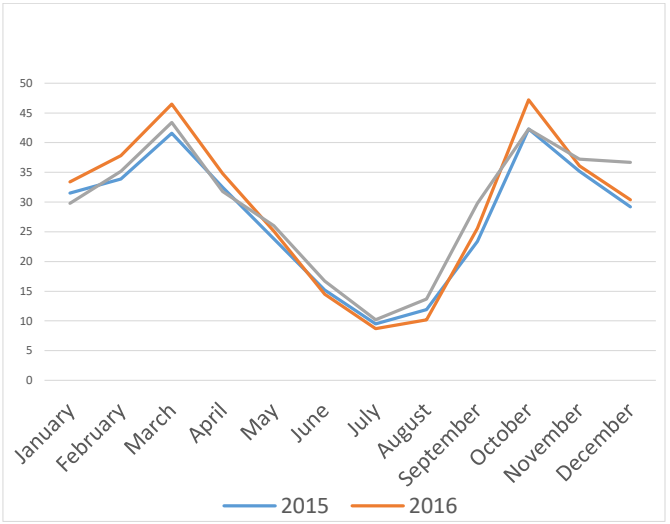

Fig. 1. Seasonal dynamics of a Psoroptes cuniculi in rabbits

Thus, within June-August the air temperature in sheds remained within 18-20 °C, and relative humidity of air was 69-72%, we supposed that it was the cause of minimum incidence of rabbit Psoroptes cuniculi. In October-March the air temperature decreases in sheds to 9-11 °C, and the relative air humidity increases up to 81-94%, that is creating optimum microclimatic conditions for sarcoptideae mites existence, as evidenced by the maximum quantity of involved animals in this invasive process (EI was 37.1-44.7%).

The results of the research have shown that the threshold periods of life preservation of sarcoptideae mites are from 36 to 64 full days upon condition of mites being in the darkened place with relative humidity of 80-84% and with the air temperature within 0-11ºC. Imago mites die within one minute at the air temperatures above 60ºC, and they live no more than eight minutes when the temperature is below 19ºC. When air temperature is below 0ºC and above 5ºC the activity and survival of mites is considerably reduced. Decrease in relative air humidity n rooms negatively influences the survival of Psoroptes cuniculi. When mites are in the conditions with the identical air temperature, but different humidity, they die 3-5 times quicker at humidity less than 60 - 65%, than at air humidity of 85-90%.

We suppose that, the level of lightning conditions in the rabbit-breeding rooms is one of the factors oppressing or opposite intensifying the activity of sarcoptideae mites. The results of the conducted research have revealed that in the darkened rooms with insufficient illumination coefficients the viability duration and of mites and their survival remains longer (1,5-2 times), than with sufficient lighting (coefficient of natural illumination - not less than 0,8%; light coefficient – not less than 1:15). The experience shows that, as a rule, rabbit-breeding sheds are darkened.

Depending on a clinical course of disease, the most common form at young animals is light (43.2%) as well as intermediate severity (39.2%). 45.6% of adult animals have light form,

37.9%. have intermediate severity. Also the growers are more subjected to the transition of an invasion to a severe form, at the same time "head leaning" developed only in 1.9% of cases.

The light form of Psoroptes had the following visible clinical features: rabbits shake their heads, there are scratches and crusts, firstly at the basis of acoustic meatus, then they reach 1/3 auricle. In the scrapes taken from the pathologic focalities about 20 imagos of P.cuniculi mites are registered in one scrape.

The intermediate severity form is characterized by crusts which cover from 1/2 to 2/3 an auricle surfaces, the last is significantly condensed. From 20 to 60 mites imagos of P. cuniculi are registered in the scrapes taken from the pathological focalities.

The heads of the animals nonsurviving from a severe form of a Psoroptes cuniculi,were examined 73.4% of adult animals and 53.1% of growers had unilateral eardrum perforation, 25.4% and 46.9% respectively had bilateral. Further we have examined the vestibular system (middle and inner ear). In places of examination we have found itchy mites. Their greatest number (74 – 80%) was revealed in the bony labyrinth of the inner ear. 7 adult rabbits (1.2%) did not have eardrum perforation. However, there was a great number of mites in external partt ofthe auricle, 70-72% had been noted. Psoroptic crusts and allopecias from an auricle have extended to the surface of the neck and shoulders, that is not peculiar to a psoroptic invasion. We have disignated these clinical signs to an atypical form of Psoroptes cuniculi.

During the inspection the indicators of the clinical status of rabbits of control group and the first experimental groups (with light form of Psoroptes cuniculi) remained within the norm: the pulse rate was within 126.0 – 140.8, 135.8 – 148.8 bpm; the quantity of respiratory movements was 56.7 – 57.0, 55.1 – 57.0 per one minute; body temperature was 38/6 – 38.8, 38.4 – 38.8 ºC. Indicators of the clinical status of adult rabbits with intermediate severity form of psoroptes remained within norm as well. Averagely, the pulse rate was within 130.6 ± 2.4 bpm; the quantity of respiratory movements was 59.2 ± 1.3 per one minute; body temperature was 39.1 ± 0.3 °C. We have noticed that rabbits with a severe form of invasion had derangements of all indicators of their clinical status: the pulse rate was 166.2 ± 1.4 bpm; the quantity of respiratory movements was 114.6 ± 1.2 per one minute; body temperature was 40.4 ± 0.5 oC. Young rabbits had derangements of all indicators of their clinical status already at the development of invasion before the intermediate form. If the abnormalities were not serious at the intermediate form of Psoroptes cuniculi then at a severe form they were more considerable: pulse rate was 165.8 ± 2.1 and 168.9 ± 2.1 bpm; the quantity of respiratory movements was 79.1 ± 0.2 and 117.6 ± 2.6 per one minute; body temperature was 39.7 ± 0.6 and 41.1 ± 0.3 ºC.

The intensity of rabbit growth is the main property of changing weight of an animal with age. Such indicators as growth and development allow to estimate a condition of animals more correctly. The weight indicator at the 90-days age is very important as at this time the second preliminary estimation of the growers, selected for breeding when completing replacement stock, is made. Therefore, in further research we used rabbits at the age of 2.5 - 3 months.

We had established that rabbits of control group have reached the body weight of 1994.4±1.52 g at an average daily gain of 16.23±0.03 g. Rabbits of experiment group had lower additional weights, in comparison with control animals.

Furthermore, the deeper psoroptic process was developed, the less the rabbits put on additional weight. So, rabbits with a light form of Psoroptes cuniculi had average daily weight gain of 15.57±0.09 g: with intermediate severity had 13.64±0.03 g; rabbits having severe form gained 11.51±0.05 g that was 4.07%, 15.96% and 29.09% less, than healthy animals had. It should be noted that during the experience there was a death of one rabbit with severe form of Psoroptes cuniculi.

A similar series of experiments were conducted with an adult livestock of rabbits as well. Body weight of rabbits with a light form of Psoroptes cuniculi in comparison with production weight decreases by 6.95%, rabbits with a light and severe form of psoroptes by 12.69% and 27.71% respectively. Therewith, we have registered the death of one doe-rabbit having a severe form of Psoroptes cuniculi.

The received results convincingly show that Psoroptes cuniculi in rabbits promotes considerable loss of body weight of animals.

TABLE II. DYNAMICS OF RABBITS WEIGHT GAIN DEPENDING ON THE FORM OF PSOROPTES CUNICULI

Animal group (form of Psoroptes)	**Average body weight of 1 animal. t. *M±m (P≤0.03)***		**Average daily gain. g M±m (P≤0.03)**
	defined	***empiric***	
Experimental (light)	718.36±4.87	1652.6±2.75	15.57±0.09
Experimental (intermediate)	713.31±5.47	1531.7±1.11	13.64±0.03
Experimental (severe)	720.67±4.0	1411.5±1.76	11.51±0.05
Control	720.80±3.26	1994.4±1.52	16.23±0.03

The results of studying on spreading otodectic invasion in the South of the Tyumen region presented in the table 3 have shown that there is an excess incidence of otoacariasis. Thus, in 2017 the average invasion extensiveness was within 24.2±0.36., that is reliably above the indicators of 2015, where EI was 19.6±1.36. The main invasion focalities are supported by homeless animals, the invasion extensiveness is in limits 21.5±3.1-33.4±3.2%. The invasion extensiveness of domestic animals is much lower and is 11.01±0.6 – 21.2±1.2%.

Simultaneously with the research of spreading disease we have studied seasonal dynamics of Otodectes cynotis from 2015 to 2017.

According to the results of the research, presented in the figure 2, the disease in carnivores starts developing in early autumn. In September the invasion extensiveness is 24.9-33.4%. The peak of invasion falls on November when spreading of Otodectes cynotis reaches 42.5-45.2%. During the period from December to February included, EI declines and becomes

22.8-28.4%. The second peak of the incidence of Otodectes cynotis is noted in March (EI is 29.6 – 43.4%). In summer cases of animals affecting by mites are rather low, EI is at the level of 3.9 – 8.7%.

TABLE III. SPREADING OF OTODECTES CYNOTIS OF ANIMALS IN THE TYUMEN REGION (2015-2017)

Inhabited area	**Prevalence of Otodectes cynotis. EI. % M±m (P≤0.05)**		
	Domestic	*Homeless*	*Average indicator*
2015			
Tyumen district	11.1±0.8	33.05±3.1	38.6±1.94
Tyumen city	10.7±0.4	10.2±1.6	10.5±0.23
Total	11.0±0.6	22.1±3.1	19.6±1.36
2016			
Tyumen district	31.1±2.1	41.6±3.7	37.3±1.12
Tyumen city	10.1±0.6	16.2±1.3	13.9±0.36
Total	21.2±1.2	25.7±3.2	23.8±1.11
2017			
Tyumen district	22.3±1.9	38.1±3.3	29.1±1.04
Tyumen city	12.6±1.2	33.1±2.4	20.2±1.09
Total	17.6±1.3	36.3±2.1	24.2±0.36

Fig. 2. Seasonal dynamics of Otodectes cynotis on cats and dogs

At clinical inspection of animals it was established that the most widespread degrees of an Otodectes cynotis are intermediate (47.3 – 50.3%) and light forms (33.8 – 44.1%). At the same time, growers with the severe form of Otodectes cynotis are met more often than adults and they are 8.9% and 5.6% respectively.

Weak degree of disease was characterized by the hyperaemia on the interface of external ear, otodectic focalities, formation of otodectic crusts which can be spread to 1/4 of auricles. about 15 mites imagos of O. cynotis were observed by a microscopic research. Intense itching appears, animals shake their heads.

The average extent of disease was characterized by the otodectic focalities in the form of scabs and crusts of moderate thickness covering 1/4 – 1/2 of auricles, severe hyperaemia of external acoustical meatus, rise of local body temperature. There were found from 15 to 80 imagos of mites-dermestids in scrapes.

Strong infected degree was displayed by the otodectic focalities in the form of scald heads and crusts covering more than 1/2 surfaces of inflammation of an auricle, an external ear, acoustic meatus, drum membrane, occuring purulent exudate with an unpleasant smell. Among other symptoms there is a severy palpatory tenderness in the base of the ear channel and auricles, animals hardly open a mouth, hardly chew firm food, there is a deterioration in hearing, 13,3% of dogs and 2,5% of cats were registered with incoordination of muscle movements. Scrape contained more than 80 imagos of mites-dermestids.

A. Studying the external acoustic meatus and drum membrane

Practically all acoustic meatus was occupied by psoroptic scabies. There was localization of about 85-90% of O. cynotis mites. Herewith, 3 dogs (60%) and 4 cats (80%) had drum membrane perforation: 2 dogs had unilateral (40,0%) and 1 cat had a bilateral (20%) perforation. Edges of the drum membrane in all cases were cicatricial that indicates the chronic course of invasion. Mainly we registered full-rim perforation (80% of dogs and 100% of cats), 1 dog (20%) had marginal perforation. In the first case the membrane tissue was around a tympanic ring, in the second case reaches a bone.

B. Studying a vestibular system.

To study the vestibular system, we have separated frontal bones and took a petrous bone together with an auricle by means of rib scissors. After eviscerating a petrous bone we detached an auricle from it by scissors, and prosected the bone itself. Disconnected parts of a petrous bone were placed into a Petri dish to examine with a microscope of MBA-1 or MBA-2. At the same time, it was noticed suppurative contents with inclusion of O. cynotis mites, mainly in a bony labyrinth of an inner ear. There was a localization of 10-15% of intradermal mites.

Thereby, it has been found mites of O. cynotis in middle and an inner ear of dogs and cats. At the same time, the studied animals have not had clinical symptoms of a leaning head, but in all cases Otodectes cynotis was followed by inflammation of ear and eardrum tissues.

During the research work we have noticed that 9.7% of dogs and 6.8% of cats with intermediate severity and severe forms of an Otodectes cynotis have a complication of otitises by bacterial microflora (figure 3).

Bacteriological researches of auricles microflora have shown that dominating bacteria were: Staph. aureus – 75.3%, E.coli – 11.2%, Streptococcus – 7.3%, Pseudomonadaceae, in particular, Pseudomonas Aureginosa – 3.5%, nonpathogenic staphylococcus – 1.5%, Klebsiella pneumoniae – 1.2%.

The obtained data should be considered at an Otodectes cynotis on dogs and cats with severy and intermediate severity of invasion.

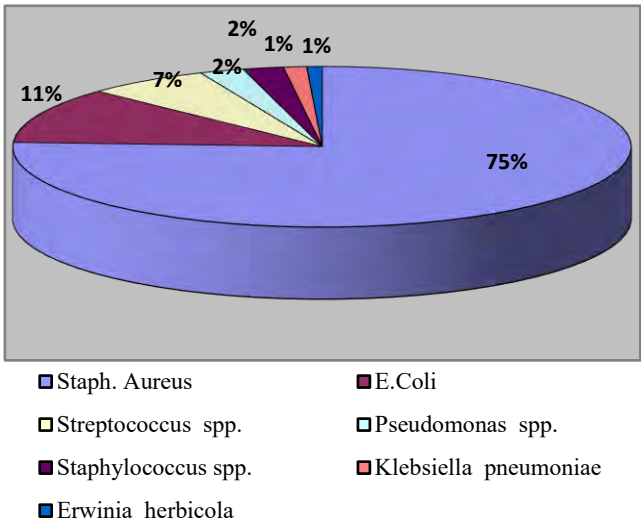

Fig. 3. Results of bacteriological testing the scrapes from auricles of dogs with Otodectes cynotis.

The basic indicators of clinical status of dogs and cats with light degree of Otodectes cynotis were stayed within physiological norm. The pulse rate of experiment dogs and cats was 110.2±2.4 – 111.2±0.4 bpm and 110.0±0.6 – 113.2±1.2 bpm; the quantity of respiratory movements – 18.2±2.2 – 21.2±1.3 per one minute and 21.4±2.1 – 24.3±1.4 per one minute; body temperature – 38.4±0.6 – 38.4±0.6 °C and 38.3±0.2 – 38.4±0.6 °C.

There have been observed that animals with an intermediate severity of invasion have light body temperature increase – up to 39.0 – 39.2 °C at dogs and up to 39.2 – 39.3 °C at cats. The pulse rate was within 119.3 – 120.2 (118.4 – 119.4) bpm; the quantity of respiratory movements was 28.2 – 29.9 (27.9 – 28.3) per 1 minute.

With the development of invasion we have observed the change in the clinical status of animals. We have registered the increase in pulse rate to 130.2±1.9 – 131.3±1.9 bpm at dogs and 127,5±1,9–131,2±0,4 bpm at cats; the quantities of respiratory movements (per one minute) to 38,4±1,8 – 39.2±2.3 at dogs and to 37.2±1.3 – 38.0±1.8 at cats; body temperatures to 38.2±0.1 – 38.5±0.2 °C at dogs and 38.4±0.3 – 38.5±0.2 °C at cats. All indicators were above physiological constants, that indicates the pathogenic influence of mites-dermestids on animals.

According to the research results we has established that puppies of the control group have reached the body weight of 11701.7±1.12 g at an average daily weight gain of 53.24±0,43 g. Dogs of experiment groups had lower weight gain, in comparison with control animals. At the same time, the deeper Psoroptes cuniculi process was developed, the less weight gains were. Thus, dogs with weak degree of Otodectes cynotis had the average daily weight gains of 45.65±0.32 g (-14.3%), with intermediate severity – 42.66±0.26 g (-19.9%); with severe – 40.15±0.29 g (-24.7%).

Body weight indicators of an adult dogs' control group are also higher, than in experimental ones. Body weight of dogs with weak degree of Otodectes cynotis in comparison with production weight goes down by 5.7% (793.0±0.31 g), with intermediate severity of Otodectes cynotis – by 8.5% (1482.2±0.23 g), with severe degree of Otodectes cynotis - by 10.6% (1743.6±0.30 g).

The average daily weight gains in the group of the infected kittens were 8.43±0.03 g at animals with weak degree of an invasion, 8.01±0.02 g – with intermediate severity, 7.26±0.05 – with severe degree, and in control group 9.03±0.02. Thus, kittens of experiment group have put on weight by 6.7%, 11.3% and 19.7% less, than kittens of control group. During experience, we have recorded the death of 1 kitten with a severe degree of Otodectes cynotis .

Adult cats of the first experiment group (to weak degree of invasion) had reduced weight by 9.7%, in the second experiment group (with intermediate severity) – by 14.6%, in the third experiment group (with severe degree of invasion) – by 22.6%. We have observed the body weight gain by 6.8% in the control group of animals. There was a death of one cat with severe degree of Otodectes cynotis .

IV. Conclusion

Based on the analysis of research results we can draw the following conclusions:

- In Tyumen region the prevalence of the Psoroptes cuniculi on rabbits is 42.62%; the prevalence of Otodectes cynotis on carnivores is 22.53%.
- At Psoroptes cuniculi on rabbits the prevalence of adult animals is 24.15 – 30.42%, growers – 27.89 – 34.16%. At Otodectes cynotis on dogs and cats the prevalence is 23.9-27.3% and 32.1 – 39.8% respectively.
- Among rabbits the mild form (43.2 – 45.6%) and the intermediate form (37.9 – 39.2%). of Psoroptes cuniculi are the most widespread.
- At Otodectes cynotis of carnivores the mild form (33.8 – 44.1%) and intermediate form are widespread (47.3 – 50.3%).
- Psoroptes cuniculi on rabbits and Otodectes cynotis on cats and dogs promote the considerable losses of animals body weight.

Spreading of sarcoptic invasion happens because of the developed optimum conditions for psoroptic mites. We have defined, along with the decrease in resistance of an organism, the temperature and moisture conditions prevailing in one or another period as well as various ways and ways of spreading of a psoroptic mite, that is the existence of causes favoring to the development of a psoroptic invasion. The main focalities of an otodectes invasion are supported by the homeless animals.

Reference

[1] O.N. Goncharenko, E.P. Krasnolobova, N.A. Cheremenina, K.A. Sidorova, S.A. Veremeeva," Case-method in the structure of training the veterinary physician", Astra Salvensis, 2018, vol. 6, pp. 647-655.

[2] M.H. Dzhafarov, S.A. Shemyakova, M.N. Mirzayev, N.V. Esaulova, F.I. Vasilevich, "Medical parasitology and parasitic diseases", 2017, No. 3, pp. 25-28.

[3] V.N. Domatsky, "Means of therapy and prevention of parazitoz of dogs and cats. Achievements of modern science", 2016, vol. 9. No. 11, pp. 93-96.

[4] T.S. Katayeva, O.I. Manukalo, "Psoroptoz of rabbits. Veterinary science of Kuban", 2006, No. 4, pp. 27-28.

[5] E.B. Kerbabayev E.B., M.V. Rozovenko, F.I. Vasilevich et al,. "Arakhnoentomoza of farm animal",. Coursebook, Moscow: MGAVMB, 2000, p. 138.

[6] V.A. Kurtekov, "The incidence of cattle in the Tyumen region caused by ektoparazita and helminths.Science and education: development vectors. Current trends of development of boarding schools and correctional educational institutions of Russia", Materials of the International scientific and practical conference and All-Russian pedagogical readings, 2016, pp. 10-13.

[7] O.A. Loginova, L.M. Belova, "The sheep's blood serum chemistries before application of antihelmintic of Eprimek, Ritril and "Aversekt-2", Questions of standard and legal regulation in veterinary science, 2017, No. 4, pp. 148-150.

[8] E.N. Maslova, "Result of monitoring of sarkoptoidoz of animals (an ear form) in the Tyumen region", Bulletin of the State agricultural university of the Northern Trans-Ural region, 2015, pp. 87-93.

[9] V.V. Makarov. A.V. Svyatkovsky, V.A. Kuzmin, O.I. Sukharev. "Epizootologichesky method of a research", St. Petersburg: publishing house "Fallow deer", 2009, p. 224.

[10] V.E. Pasechnik, "Psoroptoz of rabbits (clinic and diagnostics)", Theory and practice of fight against parasitic diseases, 2011, No. 12,. pp. 376-377.

[11] C.A. Sidorova, E.N. Maslova, N.A. Cheremenina, V.N. Domatsky, L.A. Glazunova, "State of the body of rabbits suffering from psoroptosis receiving SEL-PLEX. Biology and Medicine", 2014, vol. 6., No. 3, pp. BM-043-14.

[12] O.A. Stolbova, Yu.V. Glazunov, L.N. Skosyrskikh, "Ticks-parasites of dogs in northern Trans-Urals", Indo American Journal of Pharmaceutical Sciences, 2018, vol. 5, No. 3,, pp. 1675-1682.

[13] O.A. Stolbova, L.A. Glazunova, A.A. Nikonov, YU.V. Glazunov, Ye.A. Ponomareva, G.A. Yarmots," Effektivnost' profilakticheskikh priyemov pri mastitakh u korov v Severnom Zaural'ye", Mezhdunarodnyy nauchno-issledovatel'skiy zhurnal, 2017, No. 3-3 (57), pp. 27-30.

[14] V.I. Fisinin, I.G. Ushachyov, A.F. Aleynikov et al, "Concept of development of agrarian and industrial complex of the Northern Trans-Ural region of Russian Academy of Agrarian Sciences", Department of agrarian and industrial complex of administration, Novosibirsk, 2002, p. 64.

[15] E.M. Chudnova, A.A. Vorontsova, "Treatment of an otodektoz at cats. Online scientific magazine", 2017, No. 4-1 (19), pp. 112-113.

[16] M.A. Chasovshchikova, O.M. Sheveleva, M.A. Svjazhenina, N.I. Tatarkina, A.B. Satkeeva, A.A. Bakharev, E.A. Ponomareva. Koshch aev A.G., Journal of Pharmaceutical Sciences and Research, 2017, vol. 9, No. 7, pp. 1038-1044.