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EFFECTIVENESS OF THE USE OF A PLANT IMMUNOSTIMULATOR FOR FELINE BORDETELLIOSIS

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Abstract. *In veterinary practice, veterinary specialists solve the important problem of the occurrence and development of immunodeficiency during respiratory infectious pathology in cats with the help of biologically active additives, probiotics, enzymes, immunostimulators and vitamins. Interferons are one of the most popular in use from the list of endogenous immunomodulators. But often the disadvantage of purely immunomodulatory drugs is their difficult transfer and the presence of a negative effect on the body of domestic animals. Therefore, an alternative to interferons in order to increase the immune resistance of the body and improve the well-being of cats is the search, development and use of preparations based on plant raw materials. The article presents the results of the study of the effectiveness of the herbal immunomodulator in comparison with the interferon drug "Anfluron", which was used in two complex treatment schemes for cats suffering from Bordetellosis infection. To increase the immune resistance of cats for bordetellosis, an aqueous solution of a medicinal composition based on the Rhodiola rosea root, Oplopanax root, Rozae fruits, Urtica dioica, Crataegus fruits, Hypericum perforatum fruits was used in an effective ratio of 1:1:1:0.8:0. 8:0.5. As a result of the use of the specified herbal preparation, a positive trend in the reduction of the manifestation of clinical signs in sick cats was established from the 6th day of use with a direct correlation of the decrease in the manifestation of clinical signs in sick animals treated with a classic interferon drug. As a result of the application of complex therapeutic regimens using various immunomodulatory drugs, a significant alignment of hematological indicators to the physiological norm was noted on the 10th and 14th day of treatment in animals of both study groups. The results obtained in the comparative aspect showed that the proposed herbal preparation has an immunostimulating effect, improves the general condition and can be used in the complex treatment of cats with bordetellosis.*

Key words: cats, respiratory infections, treatment, herbal preparations, herbal immunomodulators.

Introduction. The population of cats in domestic conditions as companion animals has recently increased. The number of cats is also increasing in crowded places, especially in shelters, which are constantly replenished with animals due to the loss of their owners and due to a homeless lifestyle as a result of military operations. As a result of stress due to the above circumstances, both homeless cats and domestic animals develop increased sensitivity to the action of various infectious pathogens that cause damage to various systems and organs. In domestic and foreign publications, it is noted that respiratory infections caused by

herpesviruses, caliciviruses, chlamydia, mycoplasma, and *Bordetella* are widespread among cats (Cai, 2002; Helps, 2005; Walter, 2020). *Bordetella bronchiseptica* is a pathogenic microorganism from the *Bordetella* genus belonging to the *Brucellaceae* family (Egberink, 2009; Molyneux, 2000; Register, 2012). This pathogen more often affects homeless cats, animals in kennels and shelters (Dmytryshyn, 2019; Kadlec, 2018). According to scientific data, bordetellosis is quite common among domestic animals and causes infectious pathologies of the respiratory system in 15-20% of cases among other infectious pathologies (Moore, 2022; Redelman-Sidi, 2011). It is also noted that *Bordetella* cause both monoinfection and associated course with viral respiratory pathogens (Cattelan, 2016). Respiratory virus-Bordetellosis infections in cats are accompanied by a non-specific respiratory syndrome, which is manifested by coughing. Coughing leads to the spread of an infectious pathogen and contamination of the environment (Dawson, 2000; Hlushchenko, 2024). Practical veterinarians are constantly faced with the complexity of treating mono- and associated bordetellosis. Pharmaceutical companies offer a wide selection of supporting and immunostimulating drugs (Molyneux, 2000). Currently, various biologically active additives of animal and plant origin are used, which increase the resistance and immunological status of the body, as well as anti-inflammatory potential, which contributes to the improvement of the effectiveness of the treatment of many chronic viral and bacterial infections in animals (Hlushchenko, 2024). An increase in the immune resistance of the body and an improvement in the well-being of cats occurs under the influence of preparations based on plant raw materials: groups of adaptogens, phytoncides, groups of medicinal plants that contain vitamin C (Moore, 2021). Phytopreparations based on echinacea, which is a natural remedy for increasing immunity and preventing viral diseases in cats, are considered a classic immunostimulant. The plant belongs to the class of natural adaptogens - natural remedies that have the ability to increase the body's resistance to infections. But drugs based on one component affect individual indicators of immunity and have a long course of administration from 1 to 3 months. Therefore, the issue of development and use of complex plant immunomodulators, the use of which will improve the functioning of the immune system in a natural way, is urgent.

The purpose of the work. The aim of the work was to study the effectiveness of the herbal immunostimulator in the complex therapy of bordetellosis in cats.

Materials and methods. The material for the research was cats suffering from bordetellosis, which were kept in three private shelters for animals in the city of Dnipro 30 animals aged 3-8 months were involved in the experiment. With weight of 1.5-2.5 kg, which were assigned randomization numbers and placed in separate boxes. Complex diagnostics were used to establish the diagnosis for bordetellosis, which included the clinical and epizootological method and the laboratory method. In order to confirm the laboratory diagnosis for bordetellosis, a bacteriological method of pathogen isolation was introduced. Oropharyngeal swabs and intranasal washes were examined. To isolate *B. bronchiseptica*, carbon-blood agar was used, where the inhibitor cephalixin was added to suppress the growth of accompanying microflora of the respiratory tract. Two groups of 15 sick animals each were formed. In the therapeutic basic scheme of treatment of cats with signs of acute respiratory disorders, the antibacterial preparation "Doxivet" («Borshchahivskiy CFF», LLC, Ukraine), metabolism stimulator "Vitazal" PJSC "VNP Ukrzoovetprompostach", Ukraine), drops for the nose «ZOOset» (SkyVet, LLC, Ukraine), antioxidant "Trifuzol Neo" (Ukraine) were used. Veterinary preparations were used for sick cats treatment in both groups. The animals of group No. 1 were included in the therapeutic scheme of the investigated aqueous solution of the medicinal collection, which contained in its composition of the *Rhodiola rosea* root, *Oplopanax* root, *Rosae* fruits, *Urtica dioica*, *Crataegus* fruits, *Hypericum perforatum* fruits in an effective ratio of 1:1:1: 0.8:0.8:0.5. The drug was given orally in a dose of 2.0 cm³ for 10 days twice a day. The immunostimulant "Anfluron" (PJSC "VNP Ukrzoovetprompostach", Ukraine) was

included in the therapeutic scheme of the animals of group No. 2, which was administered intramuscularly in a dose of 1cm³ for 5 days once a day.

Research results. Research began with a clinical examination of sick cats after confirming the diagnosis for bordetellosis. We determined the main symptoms of respiratory tract damage, analyzed the dynamics of their manifestation, starting from the first day, and further analyzed their duration on the third, sixth, tenth and fourteenth day. The obtained results are shown in Table 1.

Table 1

The dynamics of the manifestation of clinical signs in experimental groups of cats with bordetellosis (n=15)

Observation periods	The clinical signs and groups									
	Body temperature		Signs of oppression		Conjunctivitis		Rhinitis		Cough	
	1	2	1	2	1	2	1	2	1	2
1st day	39,8	39,9	13	12	10	11	9	10	12	13
3rd day	39,5	39,4	13	12	10	11	8	9	11	12
6 days	39,1	39,0	12	9	7	8	3	4	8	9
10 days	38,6	38,4	3	4	2	1	1	1	5	3
15 days	38,3	38,2	0	0	0	0	0	0	1	1

During the clinical study, on the first day, an increase in body temperature was noted in sick animals of both groups, which was maintained over the next three days. A significant decrease in body temperature in animals of both studied groups was noted already on the sixth day of treatment. Also, sick cats of both studied groups showed signs of depression, conjunctivitis, rhinitis, and cough due to bordetellosis. The analysis of the dynamics of clinical signs showed a direct correlation of the number of sick cats with leading respiratory symptoms at the beginning of the disease and during the treatment period in both experimental groups, that is, the dynamics of recovery was manifested in the same way in sick cats of group No. 2, which received "Anfluron" as an immunostimulator, and in sick cats group No. 1, which was given a herbal preparation. As shown in Table 1, these clinical signs began to decrease after the sixth day of treatment. After 14 days of treatment, the same number of sick cats remained in both studied groups, in which signs of coughing still persisted due to their severe condition. Therefore, observations of the dynamics of clinical signs in cats suffering from bordetellosis showed that the developed phytopreparation in the form of an aqueous solution of a collection of medicinal plants showed the same positive effect on the body of sick animals as the classical immunostimulator "Anfluron".

Due to the pathogenic effect of *Bordetella*, there were violations of the physiological state of sick cats, which is necessarily confirmed by a change in the morphological indicators of the blood. Therefore, the next stage of our research was the study of changes in hematological parameters of blood in sick cats compared to healthy animals. Hematological studies were performed on the first day, and later on the 6th and 12th day of treatment (Table 2).

The data presented in Table 2 show that at the beginning of the disease, a decrease in the level of hemoglobin and a decrease in hematocrit indicators were found in sick cats, which is associated with a violation of oxygen exchange due to the pathogenic effect of *Bordetella* in the organs of the respiratory tract, as a result of which signs of anemia developed.

A significant increase in the number of leukocytes and eosinophils was established, which indicated intoxication caused by an infectious agent, as a significant increase in monocytes was noted. Suppression of the immune response was indicated by a decrease in the number of lymphocytes and an increase in rod-nuclear and neutrophils. As a result of the application

of a complex therapeutic scheme with the use of various immunomodulatory drugs, we noted a reliable leveling of hematological indicators to the physiological norm on the 12th day of treatment in animals of both studied groups.

Table 2

Dynamics of morphological indicators of blood in experimental groups of cats suffering from bordetellosis (n=15)

Indicators	Clinically healthy animals	Indicators of sick animals, the 1 st day	Indicators of sick animals on the 6th day		Indicators of sick animals on the 12th day	
			1 st gr.	2 nd gr.	1 st gr.	2 nd gr.
Erythrocytes, $\times 10^{12}/l$	4,6-10,0	$7,95 \pm 1,3$	$8,2 \pm 0,6$	$8,5 \pm 0,7$	$8,9 \pm 1,01$	$8,65 \pm 1,32$
Hemoglobin, g/l	80-160	$75,2 \pm 15,5$	$76,8 \pm 12,5$	$76,5 \pm 11,6$	$85,5 \pm 13,8$	$86,8 \pm 14,2$
Hematocrit, %	24,0-45,0	$22,68 \pm 2,6$	$22,8 \pm 3,8$	$23,28 \pm 2,8$	$26,8 \pm 3,6$	$25,5 \pm 4,2$
Leukocytes, $\times 10^9/l$	5,5-18,0	$20,56 \pm 1,16$	$19,55 \pm 0,9$	$19,45 \pm 0,8$	$17,65 \pm 1,1$	$17,85 \pm 0,9$
Banded neutrophils, %	0-4,0	$4,85 \pm 0,73$	$3,65 \pm 0,93$	$3,45 \pm 0,85$	$3,25 \pm 0,65$	$3,13 \pm 0,43$
Segment neutrophils, %	35,0-75,0	$48,25 \pm 2,65$	$49,35 \pm 2,4$	$48,20 \pm 2,6$	$48,71 \pm 2,8$	$48,55 \pm 2,7$
Eosinophils, %	1-8	$10,45 \pm 1,35$	$9,35 \pm 1,2$	$9,15 \pm 1,5$	$7,68 \pm 1,2$	$7,78 \pm 1,1$
Basophils, %	0-1	0	0	0	0	0
Monocytes, %	1-5	$6,78 \pm 0,74$	$4,38 \pm 0,6$	$4,65 \pm 0,8$	$3,85 \pm 0,7$	$3,95 \pm 0,6$
Lymphocytes, %	20,0-55,0	$59,7 \pm 2,15$	$57,4 \pm 2,1$	$56,2 \pm 2,4$	$53,0 \pm 3,2$	$52,85 \pm 2,1$

As noted in scientific publications, the problem of the occurrence and development of immunodeficiency in animals is solved by using biologically active additives, probiotics, enzymes, immunostimulators, immunomodulators, and vitamins (Hlushchenko, 2024). The use of nucleic acid derivatives, as well as a number of biogenic drugs, whose ability to increase the non-specific resistance of the body is the basis for their widespread use in the complex therapy of infectious diseases, is not excluded (Moore, 2021).

The results of our research showed the same therapeutic effect with the use of the classic interferon-based immunostimulator "Anfluron" and phytosorb, which contains in its composition the roots of *Rhodiola rosea*, *Zamanicha talla*, the fruits of rose hips, hawthorn, nettle grass and St. John's wort in an effective ratio of 1:1 :1:0.8:0.8:0.5. The use of immunomodulators in both therapeutic schemes had an anti-inflammatory, antimicrobial, bacteriostatic effect, had a positive effect on the dynamics of the recovery of sick cats and increased the immune resistance of the body of sick animals.

Conclusion. Thus, the method of increasing the immune resistance of cats during Bordetella infection by using a herbal preparation based on an aqueous solution of a medicinal composition based on the *Rhodiola rosea* root, *Oplopanax* root, *Rozae* fruits, *Urtica dioica*, *Crataegus* fruits, *Hypericum perforatum* fruits was used in an effective ratio, is in no way inferior to the action of a classical immunostimulator, is economically beneficial and can be used in the complex therapy of respiratory infections.

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ЕФЕКТИВНІСТЬ ВИКОРИСТАННЯ РОСЛИННОГО ІМУНОСТИМУЛЯТОРА ЗА БОРДЕТЕЛІОЗУ КОТІВ

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Резюме. У ветеринарній практиці важливу проблему виникнення і розвитку імунодефіциту за респіраторної інфекційної патології у котів ветеринарні фахівці вирішують за допомогою використання біологічно активних добавок, пробіотиків, ферментів, імуностимуляторів та вітамінів. Одними із найбільш популярних у застосуванні з переліку ендогенних імуномодуляторів є інтерферони. Але нерідко недоліком чисто імуномодулюючих препаратів є їх важке перенесення та наявність негативного впливу на організм домашніх тварин. Тому альтернативою для інтерферонів з метою підвищення імунорезистентності організму та покращання самопочуття котів є пошук, розробка та застосування препаратів на основі рослинної сировини. У статті наведені результати вивчення ефективності рослинного імуномодулятора у порівнянні з препаратом інтерферону «Анфлурон», які використовували у двох комплексних схемах лікування котів, хворих на бордетеліозну інфекцію. Для підвищення імунорезистентності котів за бордетеліозу застосовували водний розчин лікарського збору на основі коріння родіоли рожевої, коріння заманихи високої, плодів шипшини коричневої, трави кропиви дводомної, плодів глоду, трави звіробою продірявленого у ефективному співвідношенні 1:1:1:0,8:0,8:0,5. У результаті застосування зазначеного фітопрепарату було встановлено позитивну динаміку зменшення прояву клінічних ознак у хворих котів з 6-го дня застосування з прямою кореляцією зменшення прояву клінічних ознак у хворих тварин, яким застосовували класичний інтерферонний препарат. У результаті застосування комплексних терапевтичних схем з використанням різних імуномодулюючих препаратів відзначалося достовірне вирівнювання гематологічних показників до фізіологічної норми на 12-тий день лікування у тварин обох досліджуваних груп. Отримані у порівняльному аспекті результати показали, що запропонований фітопрепарат чинить імуностимулюючу дію, покращує загальний стан і може використовуватися у комплексному лікуванні котів за бордетеліозу.

Ключові слова: коти, респіраторні інфекції, лікування, фітопрепарати, рослинні імуномодулятори.

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