



Науковий вісник Львівського національного університету
ветеринарної медицини та біотехнологій імені С.З. Гжицького.

Серія: Ветеринарні науки

Scientific Messenger of Lviv National University
of Veterinary Medicine and Biotechnologies.

Series: Veterinary sciences

ISSN 2518-7554 print

ISSN 2518-1327 online

doi: 10.32718/nvlvet10812

<https://nvlvet.com.ua/index.php/journal>

UDC 619:616-08:619:616.99:636.2

The effect of butaselmavit and closaverm A on the immune status of cows with experimental fasciolosis sensitized by atypical mycobacteria

O. V. Kuljaba¹✉, V. V. Stybel¹, B. V. Gutyj¹, R. A. Peleno¹, V. I. Semaniuk¹, L. V. Busol², Kh. Ya. Leskiv¹, N. V. Semaniuk¹, O. B. Pryima¹, I. Ya. Mazur¹, Ya. I. Turko¹

¹Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies, Lviv, Ukraine

²State Biotechnological University, Kharkiv, Ukraine

Article info

Received 23.09.2022

Received in revised form

24.10.2022

Accepted 25.10.2022

Stepan Gzhytskyi National
University of Veterinary Medicine
and Biotechnologies Lviv,
Pekarska Str., 50, Lviv,
79010, Ukraine.
Tel.: +38-098-269-79-23
E-mail: terena4@gmail.com

State Biotechnological University,
Alchevsky Str., 44, Kharkiv, 61002,
Ukraine.

Kuljaba, O. V., Stybel, V. V., Gutyj, B. V., Peleno, R. A., Semaniuk, V. I., Busol, L. V., Leskiv, Kh. Ya., Semaniuk, N. V., Pryima, O. B., Mazur, I. Ya., & Turko, Ya. I. (2022). The effect of butaselmavit and closaverm A on the immune status of cows with experimental fasciolosis sensitized by atypical mycobacteria. Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnologies. Series: Veterinary sciences, 24(108), 82-85. doi: 10.32718/nvlvet10812

There are many reports in the literature about the critical role of the immune system in protecting the body against foreign agents. However, the role of immune status in the association of mycobacteriosis and fasciolosis has not been studied. The work aimed to investigate the effect of butaselmavit and closaverm A on the immune status of cows with experimental fasciolosis sensitized by atypical mycobacteria. For the trial, 15 cows of 4-5 years of age, black and spotted breed, were selected, from which 3 groups were formed, five animals in each. Cows of the first research group for experimental fasciolosis were injected intramuscularly with closaverm A at a dose of 0.5 ml of the drug per 10 kg of body weight. The animals of the second experimental group, for experimental fasciolosis, were intramuscularly injected with closaverm A at a dose of 0.5 ml of the drug per 10 kg of body weight and butaselmavit at a dose of 10 ml of the drug per animal. The obtained results indicate that the drugs "Klosaverm A" and "Butaselmavit" when administered intramuscularly to cows with experimental fasciolosis, sensitized by atypical mycobacteria, contribute to the activation of cellular and nonspecific links of immunity. It should be noted that a number of our research also established the stimulating effect of drugs on the humoral link of immunity, in particular, an increase in the bactericidal and lysozyme activity of blood serum of cows associated with mycobacteriosis and fasciolosis. Using "Klosaverm A" and "Butaselmavit" drugs in experimental groups of animals helped reduce the level of CIC to physiological values starting from the 21st day of the experiment. It should be noted that according to the indicators of the immune system in cows with experimental fasciolosis, sensitized by atypical mycobacteria, the combined use of closer A and butaselmavit shows a better therapeutic effect than the use of only closaverm A alone.

Key words: fasciolosis, mycobacteriosis, immune system, butaselmavit, closaverm A.

Introduction

One of the most widespread and dangerous helminthiases of large and small cattle is fasciolosis, which causes significant economic losses to animal husbandry: reduction of milk and meat productivity, deterioration of quality, and expenditure of funds for medical and preventive measures (Kulyaba et al., 2016; 2019). Despite the significant successes of foreign and domestic scientists in the study of fasciolosis, the question of the pathogenic effect of fascioles on the protective systems of the animal body is relevant (Freiuk & Stybel,

2020). The analysis of literary sources indicates that helminths are strong immunosuppressants and about the annual spread of fasciolosis on the territory of Ukraine, especially in its western, eastern and southern regions (Sobolta, & Gutyj, 2016; Kotelevich, 2017; Avramenko et al., 2019).

Reports in domestic and foreign literature also confirm that, along with bovine fasciolosis, mycobacteriosis has also become widespread. The causative agents of mycobacteriosis in animals are the so-called potentially pathogenic mycobacteria (atypical, anonymous, or unclassified), which are characterized by a

wide range of natural drug resistance (Kulyaba et al., 2017). In addition, mycobacteriosis usually develops only in the weakened organism of animals that have been adversely affected by the environment or the development of various diseases, including parasitic ones (Shevtsov, 2015). Despite a significant number of studies devoted to the study of fasciolosis in cattle, issues such as pathogenetic features of fasciolosis in cows sensitized by atypical mycobacteria, and their adequate therapy and prevention of the disease require in-depth scientific approaches.

In the literature (Martyschuk & Hutyi, 2021; Zhelavskiy et al., 2022; Chechet et al., 2022) there are many reports about the important role of the immune system in protecting the body against the effects of foreign agents. However, the role of immune status in the association of mycobacteriosis and fasciolosis has not been studied.

The aim of the study

To study the effect of butaselmavit and closaverm A on the immune status of cows with experimental fasciolosis sensitized by atypical mycobacteria

Material and methods

For the experiments, 15 cows of 4–5 years of age, black and spotted breed, were selected, from which 3 groups were formed, five animals in each. Cows of the control group (C) were experimentally infected with *Adolescaria*. Cows of the first research group (E₁) for experimental fasciolosis were injected intramuscularly with closaverm A at a dose of 0.5 ml of the drug per 10 kg of body weight. The animals of the second research group (E₂) for experimental fasciolosis were intramuscularly injected with closaverm A at a dose of 0.5 ml of the drug per 10 kg body weight and butaselmavit (Martyschuk et al., 2018; 2022) at a dose of 10 ml of the drug per animal.

When conducting the research, the rules were followed, which are mandatory for conducting tests - the selection and maintenance of analogous animals in groups. The diet of the cows was balanced in terms of nutrients and minerals.

The cellular factor of resistance was determined by the total number of T-lymphocytes (E-RUK) – by the method of spontaneous rosette formation with ram erythrocytes

according to M. Jondal et al., the total number of B-lymphocytes – according to N.F. Mendes et al. (1973). Phagocytic activity (FA), intensity (index) of phagocytosis (FI) using generally accepted methods in modification (Chumachenko V. E. et al., 1990). Among the humoral indicators of resistance, the bactericidal activity of blood serum (BABS) was studied according to the method of O. V. Smirnova, T. A. Kuzmina (1966), the lysozyme activity of blood serum (LABS) – by the photoelectrocolorimetric method (Vlizlo, 2012). Blood for analysis was taken from the jugular vein before infection and on the 7th, 14th, 21st, and 28th days of the experiment.

Experimental studies were conducted following the Law of Ukraine “On the Protection of Animals from Cruelty Treatment” dated 03/28/2006 and the rules of the European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes dated 11/13/1987.

The analysis of research results was carried out using the Statistica 6.0 software package. The probability of differences was assessed by Student's t-test. The results of average values were considered statistically significant when * – P < 0.05, ** – P < 0.001 (ANOVA).

Results and discussion

As a result of the conducted immunological studies, it was established that in the control group of cows that were exposed to experimental fasciolosis and sensitized by atypical mycobacteria, there were certain shifts in cellular indicators of immunity. The specified immune disorders were characterized by a probable decrease in the number of T- and B-lymphocytes in the blood of cows of group K (Table 1).

The use of butaselmavit and closaverm A drugs for the treatment of cows with experimental fasciolosis sensitized by atypical mycobacteria made it possible to significantly increase the cellular link of the immune system. Thus, on the 14th day, the number of T-lymphocytes in the blood of E₁ and E₂ groups increased by 2.17 and 3.94 % compared to the C group of cows. On the 21st day, the T-lymphocytes number in the blood of cows treated with closaverm A, grew up to 39.20 ± 1.40 %, and in the blood of cows treated with closaverm A and butaselmavit – to 42.53 ± 1.22 %. On the 28th day, the T-lymphocytes number in the experimental groups of animals was the highest.

Table 1

The effect of butaselmavit and closaverm A on indicators of cellular immunity of cows with experimental fasciolosis, sensitized by atypical mycobacteria (M ± m; n = 5)

Indicator	Groups animals	Before infection	Term of research (days)			
			7	14	21	28
T-lymphocytes, %	C	44.20 ± 1.25	40.14 ± 1.20	38.43 ± 1.22	36.75 ± 1.24	39.52 ± 1.26
	E ₁	44.25 ± 1.20	41.53 ± 1.30	40.60 ± 1.35	39.20 ± 1.40	40.15 ± 1.30
	E ₂	44.29 ± 1.17	42.11 ± 1.35	42.37 ± 1.21*	42.53 ± 1.22*	44.26 ± 1.28*
В-лімфоцити, %	C	18.07 ± 0.60	16.52 ± 0.50	15.41 ± 0.55	14.15 ± 0.55	14.75 ± 0.50
	E ₁	18.05 ± 0.55	17.14 ± 0.65	16.85 ± 0.60	16.12 ± 0.55*	16.43 ± 0.60*
	E ₂	18.08 ± 0.52	17.78 ± 0.60	17.61 ± 0.65*	17.56 ± 0.62**	18.08 ± 0.60**

We also studied the effect of drugs on the B-lymphocytes number in the blood of cows with experimental fasciolosis sensitized by atypical mycobacteria. The stimulatory effect of closaverm A and butaselvevit on the cellular immunity of cows, namely on the number of B-lymphocytes, was established. Since this indicator in E₁ and E₂ groups gradually increased throughout the trial, it was the highest on the 21st and 28th days. It should be noted that the use of butaselvevit

contributed to a faster increase in the B-lymphocytes number in the E₂ than the use of only closaverm A.

Therefore, the obtained results indicate that the drugs “Klosaverm A” and “Butaselvevit” when administered intramuscularly to cows with experimental fasciolosis, sensitized by atypical mycobacteria, contribute to the activation of T- and B-cell links of immunity.

Table 2 presents the influence of butaselvevit and closaverm A on indicators of non-specific immunity of cows in association with mycobacteriosis and fasciolosis.

Table 2

The influence of butaselvevit and closaverm A on indicators of non-specific immunity of cows with experimental fasciolosis, sensitized by atypical mycobacteria (M ± m; n = 5)

Indicator	Groups animals	Before infection	Term of research (days)			
			7	14	21	28
Phagocytic activity, %	C	54.3 ± 1.72	51.3 ± 1.95	50.4 ± 1.60	49.2 ± 1.65	49.9 ± 1.80
	E ₁	54.5 ± 1.81	52.1 ± 2.00	52.5 ± 1.90	53.1 ± 1.75	53.5 ± 1.75
	E ₂	54.4 ± 1.63	52.8 ± 1.75	53.4 ± 1.88	54.2 ± 1.68*	54.5 ± 1.75
Phagocytic index, units	C	9.61 ± 0.30	8.66 ± 0.23	8.35 ± 0.26	7.85 ± 0.25	8.06 ± 0.20
	E ₁	9.60 ± 0.30	9.30 ± 0.35	9.15 ± 0.30*	8.95 ± 0.30*	9.45 ± 0.25**
	E ₂	9.62 ± 0.22	9.44 ± 0.28*	9.37 ± 0.25*	9.58 ± 0.32**	9.66 ± 0.21**

As the research results showed, intramuscular administration of closaverm A and butaselvevit to cows increases the non-specific immunity of cows with experimental fasciolosis sensitized by atypical mycobacteria. Thus, on the 14th day, the phagocytic activity of neutrophil granulocytes in group E₁ increased by 2.1 %, and in the blood of cows of group E₂ – by 3.0 % compared to the C group. On the 21st day, the phagocytic activity of neutrophil granulocytes in the blood of group E₁ was 53.1 ± 1.75 %, and in group E₂ – 54.2 ± 1.68 %,

while in the C group this indicator was 49.2 ± 1.65 %. On the 28th day, the highest phagocytic activity was established in group E₂, which was administered the drugs “Klosaverma A” and “Butaselvevit” in combination, compared to the C group, it increased by 4.6 %.

The growth of phagocytic index was also established in animals of research E₁ and E₂ groups. Compared with the C group of cows, this indicator on the 21st day increased by 14 and 22 %, respectively.

Table 3

The influence of butaselvevit and closaverm A on indicators of the humoral link of immunity in cows with experimental fasciolosis, sensitized by atypical mycobacteria (M ± m; n = 5)

Indicator	Groups animals	Before infection	Term of research (days)			
			7	14	21	28
Bactericidal activity, %	C	62.2 ± 0.55	58.3 ± 0.55	56.6 ± 0.50	55.1 ± 0.52	56.8 ± 0.60
	E ₁	62.4 ± 0.60	59.8 ± 0.65	59.1 ± 0.70*	59.7 ± 0.55***	60.1 ± 0.65**
	E ₂	62.2 ± 0.65	60.4 ± 0.50*	61.4 ± 0.56***	62.2 ± 0.45***	62.7 ± 0.62***
Lysozyme activity, %	C	23.5 ± 0.45	21.1 ± 0.50	20.6 ± 0.50	19.5 ± 0.50	20.5 ± 0.51
	E ₁	23.2 ± 0.55	21.7 ± 0.60	21.2 ± 0.65	21.6 ± 0.50*	22.1 ± 0.65*
	E ₂	23.3 ± 0.52	22.0 ± 0.66	22.8 ± 0.50*	23.0 ± 0.58**	23.7 ± 0.62**
CIC, mol/l	C	64.74 ± 4.0	70.67 ± 3.5	73.21 ± 4.0	78.51 ± 4.0	76.45 ± 3.5
	E ₁	64.70 ± 4.2	69.10 ± 3.5	70.15 ± 4.1	70.56 ± 4.2	69.42 ± 3.6
	E ₂	64.72 ± 3.7	67.86 ± 4.0	68.12 ± 3.6	67.67 ± 3.5*	65.55 ± 3.9*

The obtained research results indicate that after the application of butaselvevit and closaverm A to cows in appropriate doses, a non-specific link of the immune system is activated. After intramuscular injections of drugs, for 28 days, indicators of non-specific immunity remained at a high level, which ensures the high phagocytic activity of leukocytes.

After researching the values of humoral immunity indicators in cows treated with closaverm A and butaselvevit, high bactericidal and lysozyme activity of blood serum was established (Table 3). The lysozyme activity of the blood serum of cows of group E₂ on the

14th and 21st days increased by 2.2 and 3.5 %, respectively. The bactericidal activity of blood serum for the specified periods was up by 4.8 and 7.1 %, respectively.

During the study of circulating immune complexes in cows of the C group, their level was found to be elevated, where on the 21st day of the test, the level of CIC reached 78.51 ± 4.0 mol/l. A high level of CIC in the blood serum of cows with experimental fasciolosis, sensitized by atypical mycobacteria, indicates suppression of the body's immunoreactive system due to the attachment of specific

antibodies to the metabolic products of the causative agents of the disease.

The use of clozaverm A and butaselmavit in experimental animals contributed to the reduction of the CIC level to physiological values starting from the 21st day of the experiment. On the 28th day, the CIC level in the blood of experimental groups of animals decreased by 9 and 14.3 %.

In experiments studying the effect of closaverm A and butaselmavit to prevent the negative effects of fasciols and mycobacteria, it was established that they exhibit different immunostimulating properties. It should be noted that according to the indicators of the immune system in cows with experimental fasciolosis, sensitized by atypical mycobacteria, the combined use of closaverm A and butaselmavit shows a better therapeutic effect than the use of only closaverm A alone.

Conclusions

The course of fasciolosis in cows sensitized by atypical mycobacteria in the experimental groups contributed to the suppression of humoral, cellular, and non-specific immunity. The use of closaverm A and butaselmavit contributed to the increase of immune protection of the body of cows in association with mycobacteriosis and fasciolosis.

Conflict of interest

The authors declare that there is no conflict of interest.

References

- Avramenko, N. V., Kozii, N. V., Shahanenko, R. V., & Shahanenko, V. S. (2019). Kompleksne likuvannia velykoi rohatoi khudoby za fastsiolozu. *Naukovyi visnyk veterynarnoi medytsyny*, 2, 46–52. URL: http://nbuv.gov.ua/UJRN/nvnm_2019_2_8 (in Ukrainian).
- Chechet, O. M., Kovalenko, V. L., Vishchur, O. I., Haidai, O. S., Liniichuk, N. V., Gutyj, B. V., & Krushelnyska, O. V. (2022). The activity of T- and B-cell links of specific protection of chicken-broilers under the influence of synbiotic preparation “Biomagn” and “Diolide” disinfectant. *Ukrainian Journal of Veterinary and Agricultural Sciences*, 5(1), 46–52. DOI: 10.32718/ujvas5-1.08.
- Freiuk, D., & Stybel, V. (2020). The intensity of the processes of lipid peroxidation in the blood of cows in experimental fasciolosis. *Scientific Messenger of LNU of Veterinary Medicine and Biotechnologies. Series: Veterinary Sciences*, 22(100), 151–155. DOI: 10.32718/nvlvet10025.
- Kotelevich, V. (2017). Veterinary and sanitary assessment of food quality and safety in Zhytomyr region. *Scientific Messenger of LNU of Veterinary Medicine and Biotechnologies. Series: Veterinary Sciences*, 19(78), 58–61. DOI: 10.15421/nvlvet7812.
- Kulyaba, O. V., Stybel, V. V., & Gutyj, B. V. (2016). The influence of clozaverm A and catozal on antioxidant status of cows organism for the experimental fasciolosis, sensitized atypical mycobacteria. *Scientific Messenger LNUVMBT named after S. Z. Gzhytskyj*, 18, 2(66), 96–99. DOI: 10.15421/nvlvet6621.
- Kulyaba, O., Stybel, V., & Gutyj, B. (2017). The influence of closaverm a and catozal on indicators of protein synthesizing functions of cows liver by experimental fasciolosis, sensitized by atypical mycobacteria. *Sci-entific Messenger LNUVMBT named after S. Z. Gzhytskyj*, 19(73), 122–125. DOI: 10.15421/nvlvet7325.
- Kulyaba, O., Stybel, V., Gutyj, B., Turko, I., Peleno, R., Turko, Ya., Golovach, P., Vishchur, V., Prijma, O., Mazur, I., Dutka, V., Todoruk, V., Golub, O., Dmytriv, O., & Oseredchuk, R. (2019). Effect of experimental fascioliasis on the protein synthesis function of cow liver. *Ukrainian Journal of Ecology*, 9(4), 612–615. URL: <https://www.ujecology.com/articles/effect-of-experimental-fascioliasis-on-the-protein-synthesis-function-of-cow-liver.pdf>.
- Martyshuk, T. V., & Hutyi, B. V. (2021). Imunofiziolo-hichniy stan ta antyoksydantnyi potentsial orhanizmu porosiat za umov oksydatsiinoho stresu ta dii koryhui-uchykh chynnykiv: monohrafiia. Lviv: SPOLOM (in Ukrainian).
- Martyshuk, T. V., Gutyj, B. V., & Vishchur, O. I. (2018). Indicators of functional and antioxidant liver status of rats under oxidative stress conditions and on the action of the liposomal drug “Butaselmavit”. *Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnologies*, 20(89), 100–107. DOI: 10.32718/nvlvet8919.
- Martyshuk, T., Gutyj, B., Vyshchur, O., Paterega, I., Kushnir, V., Bigdan, O., et al. (2022). Study of Acute and Chronic Toxicity of “Butaselmavit” on Laboratory Animals. *Arch Pharm Pract.*, 13(3), 70–75. DOI: 10.51847/XHwVCyfBZ3.
- Shevtsiv, M. V. (2015). Features immunological reactivity animals with tuberculosis and mycobacteriosis. *Scientific Messenger of LNU of Veterinary Medicine and Biotechnologies. Series: Veterinary Sciences*, 17(1), 220–225. URL: <https://nvlvet.com.ua/index.php/journal/article/view/250>.
- Sobolta, A., & Gutyj, B. V. (2016). Clozafen influence and rafenzole on genomes stability of cattle at fasciolosis invasion. *Scientific Messenger of LNU of Veterinary Medicine and Biotechnologies. Series: Veterinary Sciences*, 18(1), 163–167. URL: <https://nvlvet.com.ua/index.php/journal/article/view/65>.
- Stybel, V., Gutyj, B., Gufriy, D., Slivinska, L., Frejuk, D., Kuljaba, O., Martyshuk, T., Guta, Z., & Leno, M. (2021). The effect of butaselmavit and clozaverm A on the antioxidant status of cows in experimental fasciolosis. *Scientific Messenger of LNU of Veterinary Medicine and Biotechnologies. Series: Veterinary Sciences*, 23(104), 131–135. DOI: 10.32718/nvlvet10421.
- Zhelavskiy, M. M., Kernychnyi, S. P., Dmytriv, O. Y., & Betlinska, T. V. (2022). Cellular aging and immunity. *Ukrainian Journal of Veterinary and Agricultural Sciences*, 5(1), 8–16. DOI: 10.32718/ujvas5-1.02.