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New Approaches to the Treatment of Canine Pneumonia

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ABSTRACT

The main goal of this study is to develop an effective method for the treatment of pneumonia in dogs. Clinical and hematological studies of the dogs sick with pneumonia as well as bacteriological examination of sputum were carried out to determine the bacterial composition and the sensitivity to antibiotics. Our recommended approach on the use of Moxifort, Gamavit, and ACC has manifested a high therapeutic effect.

Introduction

Canine pneumonia is common in the dogs of all breeds and ages. Pneumonia morbidity ranges between 45-50 % and pneumonia mortality - 34-36 % in the animals. Pneumonia is accompanied by exhaustion, severe fever, cough, rales in the lungs, sclerosis spots, severe decrease of the airway surface of lungs, expanding hypoxia, rapid-onset suffocation, severe cardiovascular and respiratory failure, intoxication signs, drop in the life activities and working capacities of the animals which sometimes lead to death (Belov, 1990, Ketiladze, et al., 1986, Lebedev, et al., 2022, Matveev, 1997, Fedyuk and Aleksandrov, 2001).

Air contamination with pathogenic viruses and bacteria as well as the bacterial and viral diseases in lungs contribute to the development of canine pneumonia. Besides, the failures in animal care and management rules, such as keeping them in wet and cold premises, exposing an animal to the draught and sharp fluctuations of air temperature, bathing with cold water or making long walks in the cold weather, contribute significantly to the contraction of canine pneumonia. Besides, deficiency of biologically active substances, vitamins and microelements in the diet contributes to the development of pneumonia (Lipnitsky, 1996, Marchuk and Berbentsova, 1989, Yeleseyev, 1989, Nimand and Suter, 1998, Plyashchenko and Sidorov, 1979).

Many scientific works are already dedicated to the treatment and prevention of canine pneumonia, but the problem still raises interest in terms of developing faster and more effective ways of pneumonia treatment.

Materials and methods

The main goal of research is to develop an effective way of treating the canine pneumonia with the use of strong and wide-spectrum antibiotics, mucolytic and immune-stimulating agents. The studies were carried out in winter of 2020-2021 at the Chair of Therapy, Diagnostics and Pharmacology of the Armenian National Agrarian University. The experiments involved 10 dogs aging from 2 to 4 years old, divided into two experimental groups with 5 dogs per group.

The first group was treated in the traditionally practiced way. Each animal was injected intramuscularly with Ceftriaxone antibiotics in a dose of 0.12 ml per each kilogram, once a day, as well as Broncholytin as broncholytic agent was given to them in a dose of 2 teaspoons, thrice a day.

The second group of animals was treated with a combination of drugs recommended by us: Moxifort was administered intramuscularly in a dose of 0.1 ml per each kg, once a day, and Acetylcysteine, 1 tablet once a day, and also Gamavit – intramuscularly, 0.5 ml per each weighing kg, twice a day. The treatment lasted 8 days.

All animals were subject to daily clinical examination (general state, body temperature, pulse and respiratory rate) and checkup of hematological indicators (red and white cell counts, hemoglobin contents, erythrocyte sedimentation rate). The blood cell count was performed by use of a hemocytometer, the hemoglobin content was measured with a SALI hemoglobinometer, and the sedimentation rate was evaluated using Panchenkov's micromethod.

To determine the species composition and quantity of pathogenic bacteria in the inflammatory bronchial fluid of sick dogs, we took samples and performed a seeding on nutrient media. Sampling was carried out with the use of sterile cotton tip, which we inserted into the animal's nostril by making rotating movements. Then we placed the tips into the sterile test tubes containing 1 ml of saline. In advance, we prepared another 4 sterile test tubes containing 1 ml of meat-infusion broth. Using a sterile syringe, we filled 1 ml of saline saturated with fungal fluid from nasal cavity into the first test tube, getting 1:10 rate of dilution. Then we transferred 1 ml of liquid from the first tube to the second test tube, getting 1:100 dilution rate. In the same way, we got 1:1000 and 1:10 000 dilution rates. From the last dilution of 1:10 000 we made a seeding in the volume of 0.2 ml on the surface of meat-infusion broth, which we spread on the surface of the broth with a sterile swab. Then, we placed the nutrient media into a thermostat at 37 ^{0}C temperature. After 24 hours, we put the Petri dish with the meat-infusion broth on a black paper, turned it upside down and performed the study and count of the emerged gouts.

We detected white, as well as transparent, round smooth-edged bulged mucous dewdrop-like gouts. Purple diplo- and streptococci were detected in the Gram-stained microbiological smears made from I type of the gouts, while in the smears made from II type of gouts we detected red bipolar coccidial germ. In order to determine the sensitivity of germs to the antibiotics, we placed the paper discs saturated with antibiotics (Gentamicin, Amoxiclav, Cyprinol, Moxifort, Benzylpenicillin, Bicillin-3) on the surface of sterile meat-infusion broth on the different sides of Petri dish; then we made a seeding in the diluted sample by spreading it on the surface of broth with the use of a sterile spatula and placed the nutrient media into the thermostat for 24 hours at 37 ^{0}C temperature. We calculated the rate of sensitivity by measuring the sizes of suspension area (in cm) in the microbial fouling around the discs; the larger suspension area is, the more sensitive the respective germs to the tested antibiotic agents are. From the agents tested by us, Amoxiclav gave rise to 0.7 cm of microbial fouling suspension area and Moxifort – to 1.8 cm. In case of other antibiotics, the suspension area was too insignificant.

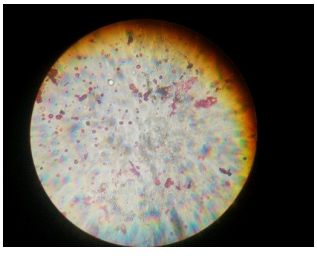

Figure 1. *Staphylococcus.*

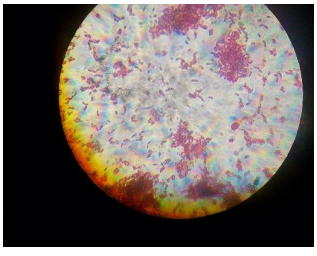

Figure 2. *Pasteurella.*

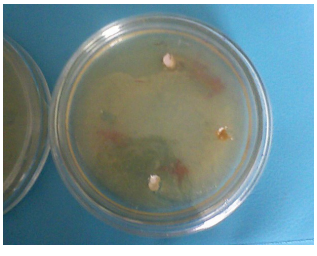

Figure 3. *Fouling Suspension Area on the Meat-Infusion Broth.*

Figure 4. *Germ Culture.*

Within the framework of the studies, detection of animals sick with pneumonia and disease diagnostics were performed in the clinics where the further management and clinical-laboratory examination of sick animals were organized as well.

Animals with pneumonia were brought to the clinics at different stages of the progress and development of disease. Based on the animal health conditions and the results of examination, the most optimal treatment schedule was developed.

Results and discussions

As the Table 1 shows, before the treatment all experimental animals had a decreased red blood-cell count making 2.5x1012 l on average, an increased white blood-cell count making 22x109 l on average, decreased hemoglobin making 60 g/l on average, and increased ESR making 45 mm/h on average. In the animals of the first test group that were treated with the traditionally practiced Amoxiclav and Broncholytin medicines, the recovery of hematological parameters took place very slowly, and the positive changes in blood pattern were insignificant in the first days of treatment. Recovery of these parameters came up in the last days of treatment, about on day 7 or 8, while in the second group of animals treated through our proposed approach with the use of Moxifort, ACC, Lasolvan and Gamavit the recovery of hematological parameters started from the very first days of treatment, about on day 2 to 4, and already on the 7th day of treatment these parameters were fully recovered, which proves the high therapeutic efficacy of the our proposed approach.

The following manifestations were recorded in all animals sick with pneumonia: body temperature rise, accelerated pulse and respiration, signs of the suffocation caused by hypoxia and decrease in the airway surface of lungs, severe cardiovascular and respiratory failure, and intoxication signs.

Table 2 presents the results of clinical checkups in sick animals, and it proves that in the animals of 1st test group that were treated under the traditional approach the clinical parameters (body temperature, pulse, respiration) recovered slowly (on the day 7 or 8 of the treatment), unlike the animals of 2nd test group that were treated with our proposed approach, whose clinical parameters started to normalize from day 2 to 4 of the treatment and completely recovered on the 7th day of treatment. The same is for the clinical course of disease: amelioration of signs in the 1st group of animals was slower and they recovered on day 7 or 8 of the treatment, while the improvement of general conditions in the 2nd group of animals began on the day 2 to 4 of the treatment and already on 7th day of treatment the animals were in almost good health.

Table 1. Hematological data of the animals affected with Pneumonia*

Parameter	Reference range	Before treatment	Group 1				Group 2			
			Day 2	Day 4	Day 6	Day 8	Day 2	Day 4	Day 6	Day 8
Erythrocytes, 1012 l	5.5-8.5	2.5±4.32	3.0±4.34	3.8±3.28	4.0±3.14	5.2±2.93	4.5±4.18	5.3±3.18	5.9±2.54	7.8±1.97
Leucocytes, 109 l	6-17	22±2.43	21±1.64	20±1.11	19±1.04	18±1.16	18±1.58	17±1.42	10±1.36	8±0.83
ESR, mm/h	2-8	45±.0.28	38±0.14	30±0.14	25±0.12	19±0.11	38±0.26	25±0.24	15±0.18	10±0.17
Hemoglobin, g/l	120-180	60±0.45	68±0.48	90±0.34	100±0.32	119±0.54	95±0.52	110±0.43	120±0.36	130±0.21

Table 2. Clinical data of the animals affected with Pneumonia*

Parameter	Reference range	Before treatment	Group 1				Group 2			
			Day 2	Day 4	Day 6	Day 8	Day 2	Day 4	Day 6	Day 8
T, °C	38.5-39	41.0±4.71	40.9±3.51	40.5±3.91	39.9±3.01	39.6±2.12	39.9±4.21	39.6±3.94	39.0±2.92	38.8±2.21
P, BPM	90-110	140±4.13	130±3.62	125±2.31	119±1.14	100±0.36	110±3.81	100±2.51	100±2.01	90±1.32
R, bpm	16-18	45±3.78	40±2.71	35±1.56	29±1.34	25±3.56	35±3.24	28±2.36	20±2.28	17±2.15

*Composed by the authors.

Based on the above mentioned, it can be concluded that an effective approach to treatment of canine pneumonia is the joint use of (1) Moxifort, our selected fluoroquinolone medicine, which possesses strong antimicrobial characteristics affecting a wide range of pathogenic microorganisms, (2) Acetylcysteine (ACC) which has strong antispasmodic and expectorant effect enabling a quick clearance from inflammatory exudate and restoration of ventilation in the respiratory tract, and (3) Gamavit, immune-stimulating agent specific with its high efficacy, which enables to increase body's immunity and defense in a proper rate.

Conclusion

During the studies, we have treated the bacterial pneumonia in dogs mainly caused by the pathogenic bacteria: Staphylococci, Streptococci, Diplococci, Pasteurella, Klebsiella and other pathogenic microorganisms. In all the cases which we observed, poor care conditions contributed to the disease, specifically a long stay of animals outdoor in cold weather and keeping animals in cold and damp shelters, which contributed to the decrease in immunity, development of bacterial infection in the lungs, and contraction of pneumonia. In all of the observed cases, pneumonia was specific with a complex nature and the large parts of lungs affected by pathologic processes. Disease was followed by a rise of body temperature, debilitating fever, dehydration, intense cardiovascular and respiratory failure, arrhythmia, tachycardia, and increasing suffocation. Disease caused deviation in both the clinical and the hematological indicators. Inflammation and intoxication resulted in hypochromic anemia, significant decrease of erythrocyte count and hemoglobin contents, increase of ENA, and leukocytosis induced by the mobilization of body defense. In order to make precise diagnosis of the disease, we carried out a comprehensive examination of sick animals, including the clinical, hematological, microbiological, and radiological checkups. To address the disease, we proposed a new treatment of pneumonia using the antibiotics, mucolytic drugs and immunostimulants. We chose Moxifort as an antibiotic medicine, which is classified to the fluoroquinolone agents and which has a broad-range effect and strong antimicrobial characteristics, Lasolvan, and Acetylcysteine as the mucolytic agents, which have antitussive, antiseptic and bronchodilatory actions, Gamavit as an immune-stimulating agent intended for the veterinary use only, which is an adaptogen with strong immune-boosting action. We compared the effectiveness of our proposed treatment for canine pneumonia with the effectiveness of traditional treatment. The successful selection and combination of the medicines affects all elements of disease and enables reduction in duration of pneumonia treatment and quicker recovery of sick animals as compared to treatment of animals with the drugs used in traditional practice.

In order to treat the canine pneumonia effectively, a complete examination of sick animals (clinical, laboratory, instrumental) is required. As a precaution, the infectious and invasive diseases causing pneumonia shall be prevented in time, the animal feeding shall be improved, the rations shall be balanced in the terms of all necessary nutrients to reinforce the immunity in animals, the animal care and welfare shall be improved to provide the animal management in the clean, well-ventilated, dry and heated (in wintertime) conditions. It is necessary to avoid hypothermia in animals, keeping them in damp and cold shelters, and taking them outdoor for long walks in cold weather.

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