

IMPROVEMENT OF THE SCHEME OF PREVENTIVE AND TREATMENT MEASURES FOR ASSOCIATED RESPIRATORY INFECTIONS IN CATS

Volodymyr Ruban

Department of Epizootology and Microbiology¹

Raisa Severyn✉

*Department of Epizootology and Microbiology¹
raisa.severin2018@gmail.com*

Alla Gontar

Department of Epizootology and Microbiology¹

Halina Haragulya

Department of Epizootology and Microbiology¹

Yaroslav Hlushchenko

Department of Epizootology and Microbiology¹

*¹State Biotechnological University
Alchevskykh str., 44, Kharkiv, Ukraine, 61002*

✉ Corresponding author

Abstract

The aim of the research was to study the etiological structure of associated infectious rhinotracheitis in cats. It has been established that infectious rhinotracheitis is registered among cats in association with infectious diseases of bacterial aetiology.

Materials and methods. The research was conducted based on a private veterinary clinic in the city of Kharkiv in 2021–2023. A total of 48 cats with signs of respiratory tract damage were examined in the clinic. Samples for laboratory diagnosis were obtained by oropharyngeal swab and transnasal lavage. To confirm the laboratory diagnosis of infectious rhinotracheitis in cats, we used the PCR method (using the Rynovir test system), as well as rapid IXA tests (FHV Ag) manufactured by ASAN PHARM (China) or ZRbio (China). To detect specific antibodies, the method of serological (retrospective) ELISA diagnostics was used using the immunoComb Feline VacciCheck device-free ELISA test system manufactured by Biogal, Israel. Bacteriological studies were carried out according to well-known methods using special nutrient media for the selection and identification of associated bacterial microflora. The sensitivity of selected dominant cultures of bacteria to antibiotics was determined by diffusion in agar using discs containing antibiotics.

Results. It was investigated that *Bordetella bronchiseptica* was determined as the dominant pathogen in the bacterial association – 52.0 %. Isolated cultures of *Bordetella bronchiseptica* were sensitive to cefamycin. The proposed science-based scheme for the treatment of infectious rhinotracheitis in association with feline bordetellosis ensures high therapeutic efficiency.

Conclusions. For the treatment of infectious respiratory diseases in cats, it is necessary to carry out individual complex etiotropic, pathogenetic and symptomatic therapy. Homoeopathic therapy relieves the symptoms of the disease, promotes faster recovery, and is an addition to the main methods of treatment. The main specific measure of disease prevention is timely vaccination (inoculation), the effectiveness of which, according to our research, ranges from 71 % to 100 %.

Keywords: cats, respiratory infections, herpes virus, prevention, treatment, vaccines, immunostimulants, antibiotics.

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1. Introduction

Infectious respiratory diseases of cats are the general name of highly contagious associated infections with an acute course, characterized by catarrhal inflammation of the mucous membranes of the upper respiratory tract, oral cavity and conjunctiva.

Viral respiratory diseases of cats are an urgent problem of infectious pathology in cats and are widespread in different countries of the world. The source of pathogens is stray animals. Stable well-being of cats concerning viral respiratory diseases is possible under the conditions of early

diagnosis of diseases, development of new and improvement of existing treatment schemes for sick animals, as well as the use of effective preventive measures. For the treatment of infectious respiratory diseases in cats, it is necessary to carry out individual complex etiologic, pathogenetic and symptomatic therapy. The main directions and goals in the treatment scheme should be supporting the body's immune system; relief of the severity of symptoms; control over food consumption; prevention of complications and associated bacterial infections. There is a tendency to use non-traditional methods for treating animals, including the use of homeopathic medicines. Homeopathic therapy weakens the symptoms of the disease, helps in faster recovery, and is an addition to the main treatment methods.

Infectious respiratory diseases of cats are caused by one or several pathogens of a viral and (or) bacterial nature [1–5]. Given that these diseases often manifest similar clinical signs (a single symptom complex), great importance is attached to the isolation and identification of the main causative agent of the disease in order to develop appropriate measures of therapy and prevention. The main reservoir of infection is sick cats or convalescent animals, in which there is long-term virus-carrying or bacterial-carrying [6–10]. Leading doctors of city veterinary clinics note that in recent years cases of infectious rhinotracheitis in cats have increased in association with infectious diseases of bacterial aetiology, such as *Escherichia coli*, *Shigella* spp., *Pasteurella haemolytica*, *Pasteurella multocida*, *Staphylococcus aureus*, *Staphylococcus hyicus*, *Streptococcus* spp., *Klebsiella* spp., *Proteus* spp., *Pseudomonas aeruginosa*, *Campylobacter* spp., *Mycoplasma* spp., *Haemophilus* spp [11–14]. There are many reports that the highest percentage is *Bordetella bronchiseptica*. In this regard, there is a need to develop new effective treatment regimens for the associated course of infectious rhinotracheitis. Diagnosis of the disease is complex and is carried out comprehensively on the basis of epizootological data, clinical signs and results of laboratory studies [15–17]. The lack of unified and accessible methods of laboratory diagnosis of associated rhinotracheitis in cats in Ukraine leads to its complicated course and difficulties in the timely treatment of sick animals. Treatment and prevention of infectious respiratory diseases in cats are individual and specific for each disease, but due to the fact that respiratory diseases in cats often have a course in the form of various associations, the system of medicinal and preventive measures should be comprehensive, taking into account the possible complications caused by such associations pathogens [18, 19]. The use of non-traditional methods of treating animals has become a very interesting direction in developing veterinary practice. The use of medicinal herbs, acupuncture, and homeopathy is practised [20, 21]. Suppose the goal of traditional medicine is the diagnosis of a disease. In that case, its etiologic treatment or prevention, then non-traditional treatment includes such factors as feeding a pet and its emotional and physical state. That is, the general condition is considered, which can help in choosing additional therapeutic methods and the best among them.

Therefore, the main directions and goals in the treatment scheme for cats from infectious respiratory diseases should be the support of the body's strength; relief of the severity of symptoms; control over food consumption; prevention of layering of additional bacterial infection on an organism weakened by the virus.

The aim of the research was to study the etiological structure of associated infectious rhinotracheitis in cats, treatment and prevention of the disease.

2. Materials and methods

The research was conducted on the basis of a private veterinary clinic in the city of Kharkiv in 2021–2023. In order to establish the spread of infectious rhinotracheitis in the domestic cat population in the city of Kharkiv, comprehensive diagnostics were implemented using anamnestic data, analysis of the symptoms of the disease, and the results of clinical tests of blood samples were studied. The lack of prophylactic immunization in sick animals was of great importance for the occurrence of respiratory infections. To confirm the laboratory diagnosis of infectious rhinotracheitis in cats, we used the PCR method (using the Rynovir test system), as well as rapid IXA tests (FHV Ag) manufactured by ASAN PHARM (China) or ZRbio (China). The tests provided 95 % accuracy and specificity. To detect specific antibodies, the serological (retrospective) ELISA diagnostics method was used using the immunoComb Feline VacciCheck device-free ELISA test system manufactured

by Biogal, Israel. Bacteriological studies were carried out according to well-known methods using special nutrient media to select associated bacterial microflora with their subsequent identification. Samples for laboratory diagnosis were obtained by oropharyngeal swab and transnasal lavage. The sensitivity of selected dominant bacteria cultures to antibiotics was determined by diffusion in agar using discs containing antibiotics.

A total of 48 cats with signs of respiratory tract damage were examined in the clinic. Therapeutic tactics in treating acutely infectious rhinotracheitis in cats were aimed at the scientifically based use of drugs that ensured the fastest possible recovery of sick animals.

The study protocol was approved by the Faculty of Veterinary Medicine Committee (No. 4; date 2020.11.12) at the State Biotechnological University, Kharkiv, Ukraine.

3. Results

A total of 65 cats with clinical signs of infectious respiratory diseases were examined. According to the research results conducted by the PCR method, FeHV-1 DNA was identified in the material from 48 sick cats (73.8 %). FeHV-1 DNA was not detected in 17 animals (26.2 %). No diagnostic titers of antibodies to FeHV-1 were detected in the blood sera of 48 sick animals at the beginning of the disease. In the blood sera of 29 animals (60.4 %) at the stage of recovery, a diagnostic increase in titers of antibodies to FeHV-1 was established. However, this indicates that the cats fell ill with infectious rhinotracheitis. Bacteriological examination of bronchial mucus (purulent secretions from the nasal cavities) of sick animals revealed symbiotic microflora of the respiratory tract in various combinations from all the studied samples.

Several groups of bacteria were isolated from sick cats. Bacterial cultures were identified by morphological and tincture properties. *Bordetella bronchiseptica* was isolated from 25 cats (52.0 %), *Pasteurella* spp. was isolated from 12 cats (25.0 %), *Staphylococcus* spp. was isolated from 6 cats (12.5 %), *Streptococcus* spp. were isolated from 3 cats (6.3 %), and *Haemophilus felis* were isolated from 2 cats (4.2 %). *Bordetella bronchiseptica* and *Pasteurella* spp. were isolated from 5 cats (10.4 %).

Respiratory disorders in sick cats during an associated course of infectious rhinotracheitis were accompanied by severe development of conjunctivitis, rhinitis, bronchitis, and tracheitis. The disease was characterized by the formation of sputum and mucus in the respiratory tract, as a result of which the inflammatory process was complicated by the development of pneumonia. The respiratory syndrome was complicated by a dry, painful cough, shortness of breath, and an increase in body temperature. In this regard, an urgent need is to develop new effective treatment regimens for the associated course of infectious rhinotracheitis. It was considered necessary in the process of treating sick animals to recommend to cat owners to provide them with optimal conditions of keeping and complete food of a soft consistency in the form of fish and meat broths, raw eggs, warm milk, porridge, pureed vegetables, boiled chicken or minced fish. In the course of treatment, daily cleaning of the nose and eyes from inflammatory exudate with tampons moistened with antiseptic solutions: iodinol, solution of furacilin, potassium permanganate, boric acid or decoctions of medicinal plants such as calendula, beggarticks, chamomile, St. John's wort was introduced. One of the main means of the therapeutic scheme was the use of immunomodulators such as interferon, fosprinil or immunofan. To combat bacterial infection in the case of eye damage, we recommended using antibacterial ointment and drops. In order to introduce effective treatment of associated infectious rhinotracheitis, the sensitivity of the bacterium *Bordetella bronchiseptica* to antibiotics was determined since the indicated pathogen was dominant in the bacterial association against the background of herpesvirus infection in cats (**Table 1**).

As shown by the research results shown in Table 1, the greatest delay in the growth of the *Bordetella bronchiseptica* culture was observed under the action of the antibiotics cefamycin, ampicillin, and amoxicillin (zone of growth delay on MPA – 22–28 mm). A slightly weaker bactericidal effect was observed when ceftriaxone and cefazolin were used (zone of growth retardation – 17 mm), and tylosin and amoxicillin were ineffective (zone of growth retardation – 12–14 mm). The results of the conducted research coincide with scientific data that *Bordetella* is resistant to antibiotics of the penicillin series. Therefore, the zone of growth retardation on MPA was the smallest in addition

to antibacterial agents, and internal sulfonamide drugs: biseptol, groseptol, sulfadimesin, and nor-sulfasol. Encouraging results in terms of speeding up the recovery of sick cats were obtained as a result of the inclusion in therapeutic schemes of means for stimulating intracellular exchange processes and for increasing non-specific resistance of homoeopathic drugs such as «Engistol» in the form of joint injections with the drug «Mucosa compositum». «Coenzyme compositum» (Table 2).

Table 1
Sensitivity of *Bordetella bronchiseptica* culture to antimicrobial drugs

| No. | The name of the active substance | Sensitivity (zone of no bacterial growth in mm) |
|-----|----------------------------------|---|
| 1 | Cefamycin | 28 |
| 2 | Ampicillin | 24 |
| 3 | Amoclanid | 22 |
| 4 | Ceftriaxone | 17 |
| 5 | Cefazolin | 17 |
| 6 | Tylosin | 14 |
| 7 | Amoxicillin | 12 |

Table 2
Effectiveness of the treatment scheme for associated infectious rhinotracheitis of cats in the conditions of a private veterinary clinic

| Group of sick animals | Drug names | The disappearance of clinical signs in sick animals | | | | | | | | | |
|---|--|---|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|--|
| | | 6 th day | 7 th day | 8 th day | 9 th day | 10 th day | 11 th day | 12 th day | 13 th day | 14 th day | |
| A control group of sick animals (<i>n</i> = 8) | Cefamycin+Grosseptol+Orasept+Hepavikel | – | – | – | – | – | 1 | 3 | 3 | 1 | |
| An experimental group of sick animals (<i>n</i> = 8) | Cefamycin+Grosseptol+Orasept+Hepavikel Engistol+Mucosa compositum+Immunofan | – | – | 6 | 7 | 8 | | | | | |

The complex of measures for the elimination of infectious rhinotracheitis in association with bordetellosis was developed taking into account the results of bacteriological studies; it included etiotropic therapy, the use of immunomodulating and vitamin drugs, prescribing a diet and improving housing conditions. The selection of such proposed means of therapy ensured the faster recovery of sick animals; the treatment usually lasted 9–10 days, while the basic therapeutic schemes of the clinic were used, and the duration of treatment exceeded 1–2 weeks. Since the virus circulates widely among homeless and domestic cats, stable cells are created and constantly maintained at the expense of hidden virus carriers.

The leading importance in the fight against infectious rhinotracheitis belongs to specific prevention using vaccines registered in Ukraine. We studied 25 cats of another group, immunized with vaccines of 4 types. The results of the study of the effectiveness of various vaccines for the prevention of infectious rhinotracheitis in cats are shown in Table 3.

Table 3
Effectiveness of various vaccines for preventive immunizations of cats

| Group of animals | Vaccines | Didn't get sick | | Got sick | |
|------------------|-----------------------|-----------------|-----|-----------------|----|
| | | absolute amount | % | absolute amount | % |
| 1 | «PureVaxRCPCH» | 6 | 86 | 1 | 14 |
| 2 | «Zoetis Felocell 4» | 7 | 100 | 0 | 0 |
| 3 | «Nobivac TRICAT Trio» | 7 | 100 | 0 | 0 |
| 4 | «Feligen CRP» | 5 | 71 | 2 | 29 |

Thus, according to the conducted studies, it was established that Nobivak TRICAT Trio and Zoetis Felocell 4 have the best level of effectiveness among the vaccines used in the experiment. According to the results of observations, the specified biological drugs provided 100 % efficiency. That is, none of the animals involved in the experiment fell ill with infectious rhinotracheitis during the observation period (30 days).

4. Discussion

Infectious respiratory diseases of cats are caused by one or several viral and (or) bacterial pathogens. The reported prevalence of FHV-1 is extremely variable, ranging from 20 % to 50 % [1–5]. *Bordetella bronchiseptica* has a reported prevalence of less than 15 % [15–17].

This is the epidemiological study of associated infectious rhinotracheitis in cats on the basis of a private veterinary clinic in the city of Kharkiv in 2021–2023. 48 cats with signs of respiratory tract damage were examined in the clinic. FeHV-1 DNA was not detected in 12 animals (25.5 %). No diagnostic titers of antibodies to FeHV-1 were detected in the blood sera of 48 sick animals at the beginning of the disease. However, in the blood sera of 29 animals (60.4 %) at the stage of recovery, a diagnostic increase in titers of antibodies to FeHV-1 was established.

Bacteriological examination of bronchial mucus of sick animals revealed by *Bordetella bronchiseptica*, *Pasteurella* spp., *Staphylococcus* spp., *Streptococcus* spp., and *Haemophilus felis*. In order to introduce effective treatment of associated infectious rhinotracheitis, the sensitivity of the bacterium *Bordetella bronchiseptica* to antibiotics was determined. The *Bordetella bronchiseptica* cultures were sensitive to cefamycin, ampicillin, and amoclanid. One of the main means of the therapeutic scheme was the use of immunomodulators such as interferon, fosprinil or immunofan.

The use of non-traditional methods of treating animals has become a very interesting direction in developing veterinary practice. Medicinal herbs, acupuncture, and homoeopathy are practised [20, 21]. Encouraging results in terms of speeding up the recovery of sick cats were obtained as a result of the inclusion in therapeutic schemes of means for stimulating intracellular exchange processes and for increasing non-specific resistance of homoeopathic drugs such as «Engistol» in the form of joint injections with the drug «Mucosa compositum», «Coenzyme compositum».

Research limitations. This is the first epidemiological study of feline infectious rhinotracheitis complicated by *Bordetella bronchiseptica* in the Kharkiv region.

Further research will be aimed at:

- the introduction of regular epizootological monitoring with the selection of circulating strains of the virus in a certain region with the determination of their virulence in order to analyze their compliance with the composition of vaccine antigens;
- the study of the level of general resistance and colostral immunity of susceptible young animals before the introduction of vaccination.

5. Conclusions

This is the epidemiological study of feline infectious rhinotracheitis complicated by *Bordetella bronchiseptica* in the Kharkiv region. 48 cases of feline infectious rhinotracheitis complicated by bacteria of various species have been identified. *Bordetella bronchiseptica* was isolated from 50 % of cats.

Homoeopathic therapy relieves the symptoms of the disease, promotes faster recovery, and is an addition to the main treatment methods.

The main specific measure of disease prevention is timely vaccination (inoculation), the effectiveness of which, according to our research, ranges from 71 % to 100 %.

Conflict of interest

The authors declare that there is no conflict of interest in connection with this paper, as well as the published results of the study, including the financial aspects of conducting the study, obtaining and using its results, as well as any non-financial personal relationships.

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Availability of data

Data will be available upon reasonable request.

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