



Evaluation of oral microbial flora and conjunctiva of cats who are suffering upper respiratory system symptoms in Tabriz

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Abstract

Upper respiratory tract disease is one of the most common infectious diseases in cats, caused mainly by bacteria of the family Staphylococcus and Bacillus. This study aims to evaluate oral microbial flora and conjunctiva of cats suffering upper respiratory tract symptoms in Tabriz. For this purpose, 50 cats with bacterial diseases of the upper respiratory system were sampled from the mouth's surface and conjunctiva using sterile swabs after visiting the clinic. After sending the sampling swabs to the bacteriology laboratory of the veterinary school, the samples were placed in the path of bacterial purification. Bacterial genera were identified using McConkey agar, OF, catalase and oxidase tests and Gram staining. Finally, the species tables of each genus and the proposed environments were placed. The results of this study showed that the average bacterial infection in eyes, nasal and conjunctival specimens respectively was 59% of the frequency of Staphylococcus bacteria, Bacillus was 17.9%, Cocobacillus was 7.7%, Redopsus and Streptococcus each were 5.1%, and Colinobacterium and Pasteurella each were 2.6%.

It should be noted that the rate of infection with the bacterium is not the same in all parts (conjunctiva, nose and mouth). As in staphylococcal infection, the highest infection is related to the mouth (61.1%), and the lowest is associated with the nose (54.5%). The average infection rate with Bacillus bacteria in the eyes, mouth and nose is 17.9%, the highest infection after staph. However, the frequency of these bacteria is not the same in all tested areas. The highest frequency of 30% is related to the conjunctiva, and the lowest amount of 11.1% is associated with the mouth. According to the results, the study of the microbial flora in the cats' mouth and conjunctiva eyes with upper respiratory system infection symptoms is a good indicator for the diagnosis and diseases treatment.

Introduction

The respiratory system is responsible for taking oxygen from the environment and expelling carbon dioxide. During the inhalation operation, this system puts the outside air in the vicinity of the cells through the circulatory system, and by exhaling, it removes the CO₂ from the body's metabolism. The respiratory gas exchange always takes place through diffusion and a wet membrane. The members of this system are located in a chamber called the chest [1]. The respiratory system is divided into two parts. The upper respiratory system is air passage, starting from the nostrils and extending to the terminal bronchioles, and includes the nose, larynx, and trachea. The lower respiratory system begins in the respiratory bronchioles and extends to the pulmonary alveoli, responsible for exchanging respiratory gases. Due to the direct connection of the respiratory tract, many pathogens such as bacterial infections, viral infections, fungal infections, neoplasms and traumas affect this area [2, 3].

Upper respiratory tract disease is a common clinical problem in cats worldwide. The pathogens of this system are catting herpes virus type 1 and feline calicivirus. *Bordetella bronchi septica*, a secondary pathogen, and other microorganisms such as *chlamydomphila*, *mycoplasmas*, and aerobic bacteria on the conjunctival surface are more effective in causing eye infections. One reason for this may be the development of healthy vectors in vaccinated cats. Also, cats born to mothers with persistent infection can have clinical symptoms again if the maternal immunity of the disease decreases [4]. Feline herpesvirus (FHV) is a varicose double-stranded DNA virus belonging to the genus *Varicella virus* from the *alpha herpes virina* family. This virus is one of the most critical factors affecting the upper respiratory system. The hiding place of this virus is the facial trigeminal nerves, and 80% of sick cats become carriers of the disease after the disease. The causative agent escapes from the immune system. The risk of recurrence of infection after treatment is high with the difference that the next time the severity of the disease is reduced and antibodies are made against it in the body. Infection with the virus will persist throughout life and recur with stress and corticosteroid therapy [1, 5]. Herpes virus is a significant cause of nasopharyngeal inflammation (FVR) in cats. The virus has a tissue affinity for the conjunctival epithelium, cornea, and upper respiratory tract, as well as neurocytes. In viral herpes infections, after an incubation period of 24 to 48 hours, the acute disease develops with bilateral conjunctivitis, mucous or purulent discharge from the eyes, nose, sneezing and coughing. In severe cases, conjunctiva necrosis and damage to the corneal epithelium can cause scarring. Ocular symptoms in chronic viral herpes infections include mild conjunctivitis to corneal ulcers, keratitis, and keratoconjunctivitis.

Disease transmission is linear. Young cats are more susceptible to the disease due to the presence of carriers and the gap between antibody-mediated protection and maternal immunodeficiency and response to vaccination [3]. Cat calicivirus (FCV) is a single-stranded RNA virus belonging to the Calici Viridae family. Although the virus has a serotype, genetic and antigenic differences between different strains lead to various phenotypic manifestations such as other strains. Cats carry the virus and can be a continuous repellent of the virus for up to two years [4]. In addition to the two diseases that mainly cause upper respiratory system involvement, many diseases such as rhinitis and bronchitis, such as mycoplasma, infectious diseases, fungal infections, damage to foreign bodies, and cancerous masses also affect the system secondarily. Due to the parasitic nature of Mycoplasma disease, this disease was not studied in the present study.

The purpose of this study is to evaluate oral microbial flora and conjunctiva of cats suffering upper respiratory tract symptoms in Tabriz.

Materials and methods

In this study, the statistical population consists of 50 cats with bacterial diseases of the upper respiratory tract. After the cats went to the clinic, their mouth and conjunctiva were sampled using sterile swabs. After sending the sampling swaps to the bacteriology laboratory of the veterinary school, the samples were placed in the path of bacterial purification. Then, bacterial genera were identified using McConkey agar, OF, catalase and oxidase tests and Gram staining. Finally, the species tables were placed and identified using the specific table of each genus and the proposed media. All statistical analyzes were performed using SAS software, and the necessary graphs were drawn using Excel.

Result

Table 1

Shape * Place Cross Tabulation					
Count					
		Place			Total
		Eye	Nose	Oral	
Shape	Cocci	7	8	11	26
	Bacillus	3	3	4	10
	Cocco_Bacillus	0	0	3	3
Total		10	11	18	39

Table 2

Shape * Place Cross Tabulation						
			Place			Total
			Eye	Nose	Oral	
Gram	Cocci	Count	7	8	11	26
		% Within Place	70.0%	72.7%	61.1%	66.7%
	Bacillus	Count	3	3	4	10
		% Within Place	30.0%	27.3%	22.2%	25.6%
	Cocci - Bacillus	Count	1	0	3	4
		% Within Place	100.0%	0.0%	100.0%	75.0%
Total		Count	10	11	18	39
		% Within Place	100.0%	100.0%	100.0%	100.0%

Table 3 Catalase Test

Catalase* Place Cross Tabulation					
		Place			Total
		E	N	O	
Catalase	Count	9	10	16	35
	% Within Place	90.0%	90.9%	88.9%	89.7%
	Count	1	1	2	4
	% Within Place	10.0%	9.1%	11.1%	10.3%
Total	Count	10	11	18	39
	% Within Place	100.0%	100.0%	100.0%	100.0%

Table 4 Oxidase test

Oxidase * Place Cross Tabulation					
		Plate			Total
		Eye	Nose	Oral	
Oxidase	Count	0	2	5	7
	% Within Place	0.0%	18.2%	27.8%	17.9%
	Count	10	9	13	32
	% Within Place	100.0%	81.8%	72.2%	82.1%
Total	Count	10	11	18	39
	% Within Place	100.0%	100.0%	100.0%	100.0%

Table 4 shows that the mean bacterial infection in eyes, nasal, and conjunctival specimens were 59%, Staphylococcus 17.9%, Cocobacillus 7.7%, Redopsos, and Streptococcus, respectively. Which were 5.1%, and Cholinobacterium and Pasteurella each were 2.6%. It should be noted that the rate of infection with these bacteria is not the same in all areas studied. The average infection rate of Bacillus bacteria in the eyes, mouth and nose is 17.9% which is the most common infection after staphylococci. But the abundance of these bacteria is not the same in all test sites. So that in staphylococcal infection, the highest infection is related to the mouth (61.1%), and the lowest is associated with the nose (54.5%).

The highest frequency is associated with the conjunctiva (30%), and the lowest is related to the mouth (11.1%).

Table 5 determining the frequency of microbial species in the eyes, mouth and nose of the studied cats

Genus *Place Cross Tabulation						
Genu s			Place			Total
			Eye	Nose	Oral	
Staphylococcus	Count		6	6	11	23
	% Within Place		60.0%	54.5%	61.1%	59.0%
Bacillus	Count		3	2	2	7
	% Within Place		30.0%	18.2%	11.1%	17.9%
Rhodococcus	Count		1	1	0	2
	% Within Place		10.0%	9.1%	0.0%	5.1%
Streptococcus	Count		0	1	1	2
	% Within Place		0.0%	9.1%	5.6%	5.1%
Corinobacterium	Count		0	0	1	1
	% Within Place		0.0%	0.0%	5.6%	2.6%
Coco Bacillus	Count		0	1	2	3
	% Within Place		0.0%	9.1%	11.1%	7.7%
Pasteurella	Count		0	0	1	1
	% Within Place		0.0%	0.0%	5.6%	2.6%
Total	Count		10	11	18	39
	% Within Place		100.0%	100.0%	100.0%	100.0%

Figure 1-4 shows that the highest infection rate in the collected samples is related to staphylococci (60%). The rate of bacillus infection was also measured at 30%.

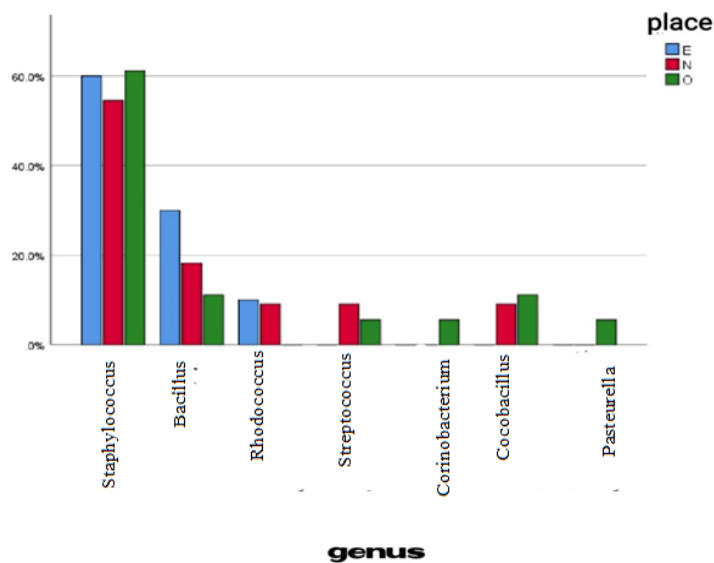


Figure 1 Determination of microbial species in collected samples of cats

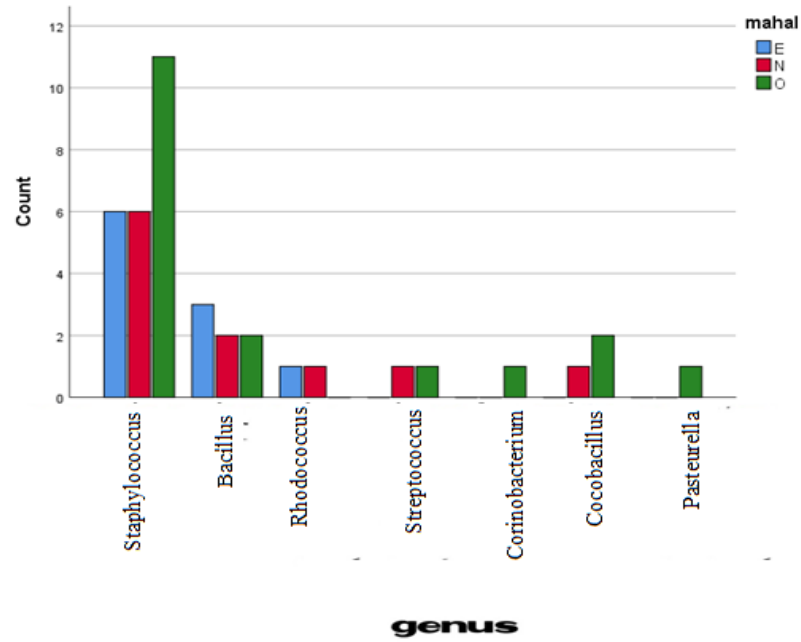


Figure 2 Determination of microbial species in collected samples of cats

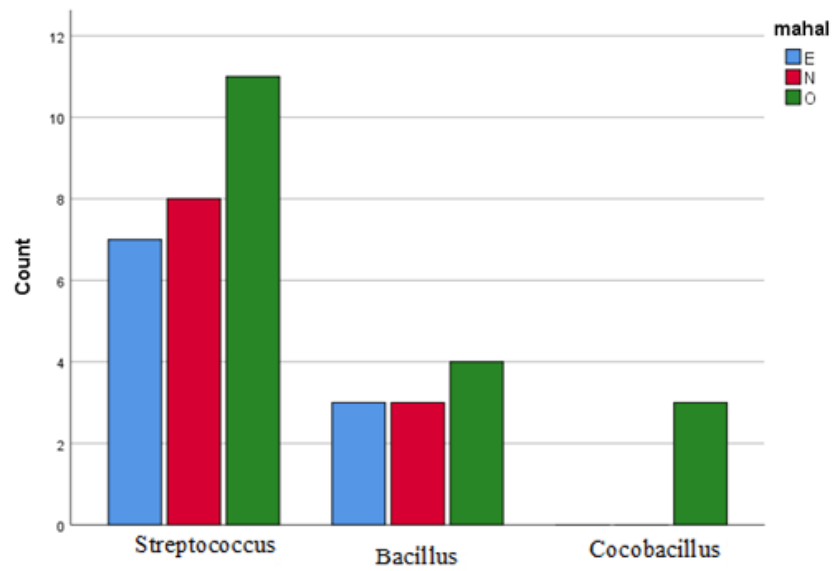


Figure 3 Abundance of microbial species

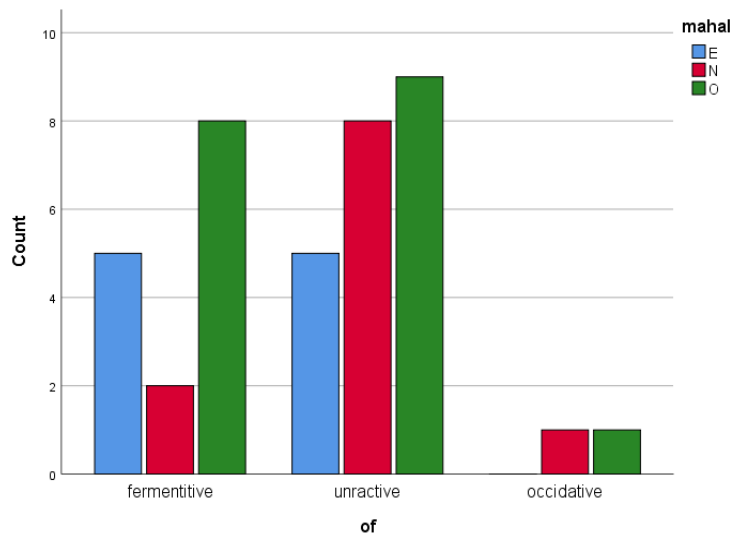


Figure 4

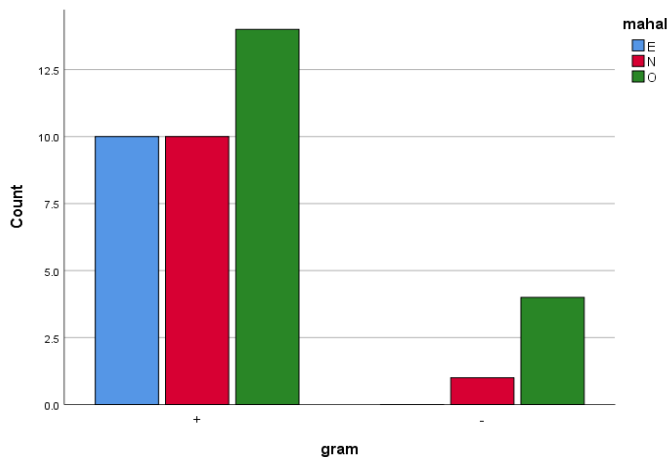


Figure 5

Discussion

Upper respiratory system disease is one of the most common infectious diseases in cats, caused mainly by bacteria of the family *Staphylococcus* and *Bacillus*. It should be noted that cat's upper respiratory tract patients have different viral or microbial causes that can have various symptoms depending on the causative agent. Common viral agents of feline upper respiratory system infections include calicivirus and herpes virus. These two viruses are the leading causes of these diseases in 80-90% of the mentioned diseases. However, occasionally (10-20% of cases), other infectious agents such as *Bordetella* bacteria, *Chlamydia*, *Pasteurella*, *Mycoplasma* or *Reovirus* can also be involved in causing colds alone or together with these two viruses. Most of the causative agents of infectious

diseases of the upper respiratory tract of cats are highly contagious and infect most kittens because their immune systems are underdeveloped. Most pathogens are transmitted to healthy cats through direct contact with a sick cat or contact with infected secretions. Infectious diseases of the upper respiratory system in places where large numbers of cats are kept together, Such as pet stores, orphanages, boarding houses, veterinary centres, shelters, etc., are more common. Short-nosed breeds such as the Persian breed are more susceptible to this disease than other cats (Momtaz et al., 2014).

This study indicates that the average bacterial infection in eyes, nasal and conjunctival specimens were 59%, *Bacillus* 17.9%, *Cocobacillus* 7.7%, *Redopsos* and *Streptococcus* was 5.1% each and *Cholinobacterium* and *Pasteurella* each were 2.6%. It should be noted that the rate of infection with these bacteria is not the same in all parts (conjunctiva, nose and mouth), so that in infection with *staphylococcus*, the highest infection is related to the mouth (61.1%), and the lowest is associated with the nose (54.5%). In a study, the prevalence of herpes virus type 1 and calicivirus in unvaccinated cats in Tehran was studied molecularly and clinically; for this purpose, respiratory and conjunctival swabs were taken from 16 sick cats and 26 healthy cats. PCR and RT-PCR techniques were used to track the virus genome. The results showed that the prevalence of FCV in sick cats was 100%, and FHV was 43%. The most common clinical symptoms were corneal and conjunctival ulcers (Helpers et al., 2013). The results of this study are consistent with the results of the present study in terms of the frequency of upper respiratory tract microbes in the conjunctiva and eyes of sick cats.

In the study of Mumtaz and his colleagues, they use of PCR test to detect the presence of *chlamydomphila* fleas in ocular swabs of domestic cats in Tehran and Isfahan and The relationship between infection rate and variables such as age, sex, history of previous vaccination and the presence of respiratory lesions in cats was performed by molecular method (PCR). Out of 224 cats studied, 40 cats (17.85%) had *chlamydomphila* fleece genome by PCR. The frequency of infection with these pathogenic microorganisms in seemingly healthy cats (without ocular and respiratory complications) was 12.5%. The group of cats with ocular complications was 17.85% [6]. The results of this study are consistent with the present study in terms of the frequency of pathogens in the eyes, nose and mouth. In the present study, the highest infection with *Bacillus* bacteria in 30% is related to the conjunctiva, and the lowest amount of 11.1% is associated with the mouth.

In a study in Australia, ocular and ophthalmic swabs were obtained from 104 domestic cats with upper respiratory system infections in terms of infection with the three causative agents of *Chlamydia psittaci*, herpes virus and cat calicivirus. PCR examined them. Herpes virus was detected

in 18 cats (17.3%) and *Chlamydia psittaci* in 12 samples (11.5%) of domestic cats. The above study is not consistent with the present study in terms of results because, in the present study, the frequency of bacteria is higher, so that 59% of the pathogens of the upper respiratory system of cats were related to *Staphylococcus* bacteria. The reason for this difference may be that due to some problems, it is challenging to detect respiratory pathogens, especially viral agents, in swabs taken from mucosal surfaces; because viral particles are so small and sensitive, the presence of the RNase enzyme in the mucosal surfaces of the mucosa can also reduce the probability of detecting viruses such as cat calicivirus [7].

The present study showed that ocular lesions similar to conjunctivitis and loss of ocular secretion, and respiratory complications are the most acute symptoms of cats with bacterial pathogens. Rampazo et al. reported a significant relationship between the presence of pathogenic bacteria in conjunctivitis. More than a quarter of cats infected with the herpes virus and one-fifth of cats infected with *Chlamydia felis* do not show any obvious clinical signs [8]. In the present study, seemingly healthy cats may also have carried the pathogenic bacteria. This may be due to the latent transmission period of the disease and its subclinical forms, which were described by researchers such as Kang and Park in 2008.

Observing hygienic principles and carrying out a regular vaccination program in cat breeding centres is crucial in reducing the prevalence of respiratory infections in cats. In the present study, the frequency of bacterial infection in the cats that had a history of a regular vaccination program (especially triple vaccination of cats) was significantly lower than the group of cats who had not been vaccinated before.

Conclusion

According to the results of this study, the frequency of bacteria infecting the upper respiratory system of cats is not the same as:

The mean bacterial infection in eyes, nasal and conjunctival specimens was 59%, *Staphylococcus* 17.9%, *Cocobacillus* 7.7%, *Redopsus* and *Streptococcus* 5.1% and *Colinobacterium*, respectively. *Pasteurella* each was 2.6 per cent. In infection with staphylococci, the highest infection is related to the mouth (61.1%), and the lowest is associated with the nose (54/5%). The average infection rate with *Bacillus* bacteria in the eyes, mouth and nose is 17.9%, the highest infection after *Staphylococcus*. However, the highest frequency of is related to the conjunctiva (30 %), and the lowest amount of is associated with the mouth (11.1 %).

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