STUDY OF SEASONAL DYNAMICS IN RESPIRATORY MICROBIAL FLORA IN EXTENSIVELY RAISED GOATS

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Abstract

An accurate evaluation of the seasonal dynamics of respiratory microbial flora in extensively raised goats represents the first step in early identification of potentially highly pathogenic bacteria in this species. The aim of the study was to monitor the seasonal influence on the bacterial flora of the animals, and therefore a comparative evaluation of changes during winter and spring seasons. The research was carried out on 20 healthy goats, raised under extensive conditions in Transylvania. Nasal discharge samples were cultured on simple media for isolation, and then identified by use of API 20 E and API 20 Staph biochemical tests. During the winter season, out of the total isolated bacterial strains, 26.8% to belonged to E.coli, 14.6% to each Enterobacter aerogenes and Erwinia spp, 12.1% to each Klebsiella pneumoniae and Enterobacter cloacae, 9.7 % to Staphylococcus xylosus and 4.8% to each Chryseomonas luteola and Staphylococcus lentus. During the spring season, changes in both percentages and isolated species soocred. The highest percentages were present in Enterobacter aerogenes (30.5%), followed by each Staphylococcus xylosus and the newly isolated Serratia fonticola (11.2%), sharply decreased E.coli (8.3%) and Erwinia spp. (5.5%), but increased Chryseomonas luteola (8.6%). Rahnella aquatilis (2.7%), Serratia ficaria (5.5%), Serratia liquefaciens (5.5%), Serratia marcescens (2.7%) and Serratia odorifera (8.3%) were present only in the spring season. The bacteria isolated from clinically healty goats could have a highly pathogenic character under critical/stressfull circumstances, which draws the attention to the importance of early identification of pathogens and the acurate sanitary management of the heard

Key words: *bacterial pathogenicity, goats, respiratory system*

INTRODUCTION

In present economical conditions Transylvanian farmers prefer goats raising to other livestock for their major benefits in meat and milk production (Peacock, 2005). Farmers are trying to increase quantitative and qualitative productions by applying god management practices that include rational feeding good housing conditions and disease prevention. Of all of goats maladies, those affecting the respiratory system can cause substantial loss through high morbidity and mortality. Most of the infectious agents that cause respiratory disease are usually common

inhabitants of the respiratory system (Emikpe, 2009). The pathogenic role of commensal organisms can be high considering that these animals sometimes are exposed to poor weather conditions. Furthermore, the carrier estate for various bacteria could have a major economic impact on productivity by decreasing milk production and also can affect the reproductive performance as well by obtaining undeveloped offspring. Although in Romania the goat population is increasing lately, the research directed towards the microbial flora carried by these animals is poor documented. Furthermore, the increasing imports of goats in order to improve the genetic potential of local breeds could also rise the variety of microbiological populations in local animals.
This study aimed to isolate and characterize bacteria from the nasal passageways of clinically healthy goats of local breeds (Carpatina and Alba de Banat) that are raised in extensive system in two antagonistic seasons like winter and late spring. The purpose of the research was to analyze and compare possible differences in bacterial strains isolated during this two seasons and there pathogenic role.

MATERIALS AND METHODS

The survey was carried out on total of 20 clinical healthy goats raised in extensive conditions in Tuşnad village, (Harghita County). From the studied animals were taken 20 samples from the upper respiratory tract in winter (January) and the same number of samples in late spring (May). Samples were collected using sterile swabs with transport medium. The samples were cultivated on simple broth for 24 h at 37^0C and inseminated on glucose agar plates for another 24h at 37^0C, to obtain isolated colonies. For a better identification the isolated colonies were inoculated also on MacConkey agar and Chapman agar. The isolates were identified by the use of API 20 E testing system for *Enterobacteriaceae* family and API 20 Staph. for bacterial colonies raised on Chapman medium (selective medium for *Staphylococcus spp*.).

RESULTS AND DISSCUTIONS

Even thought the samples were taken from clinical healthy goats we have isolated a large number of bacteria, most of them with increased pathogen potential The bacteria isolated in the winter and spring and there percentage are presented in the following table:

Table1. Number of bacterial strains and there percentage

Bacterial strains isolated from upper respiratory tract	Number of bacterial strains and there percentage			
	Winter	Bacterial organisms/total isolates (%)	Spring	Bacterial organisms/total isolates (%)
E coli	11	26.8	3	8.3
Erwinia spp.	6	14.6	2	5.5
Enterobacter cloacae	5	12.1	-	-
Enterobacter aerogenes	6	14.6	11	30.5
Chriseomonas luteola	2	4.8	3	8.6
Klebsiella pneumonie	5	12.1	-	-
Rahnella aquatilis	-	-	1	2.7
Serratia ficaria	-	-	2	5.5
Serratia fonticola	-	-	4	11.2
Serratia liquefaciens	-	-	2	5.5
Serratia marcescens	-	-	1	2.7
Serratia odorifera	-	-	3	8.3
Staphilococcus xylosus	4	9.7	4	11.2
Staphilococcus lentus	2	4.8	-	-
TOTAL	41	100	36	100

Escherichia coli it is a bacteria frequently involved in enteric disorders both in animals and humans, in most cases rebellious at treatment with ordinary antibiotics. The most severe cases are the ones of which the infection with pathogenic strains of *E.coli* afects the youg kids, because the survaving animals are phisicaly and economicaly dameged (Onderka and Wishart, 1988). The number of bacterial strains of *Escherichia coli* isolatede in winter is higher than in spring, one pssible cause can be the housing conditions, goats are restricted to limited space in barns during winter, but in spring are free on pasture and have more open space.

Klebsiella pneumoniae it is a world wide spred bacteria that can be resposable for artritis, and septicemic outbrecks in kids and newborns (Bernabe et all.1998) but is more frequent resonsable for pneomonya and necrotic damege of the lungs (Răpuntean et all., 2005). *Enterobacter aerogenes* and *Enterobacter*

cloacae are most frequntly responsable for enteric, respiratory and urinary infections (Lederberg et all., 2000).

Erwinia spp. are bacteria that are more common associated with plants rot but certain species are involved in pathogenic activity especially in patients with immunodeficiency. To explain the pathogenic role of *Erwinia spp* in animals, scientists made different genetic test involving genes sampling from *E.coli* and other bacteria from *Enterobacteriaceae* family (Chatterjee et all., 1972). The increased number of *Erwinia spp.* isolated in winter can be explain because in this season animals receive supplements of potatoes, carrots that can be contaminated with this bacterial strains.

Staphylococcus xylosus is a comensale bacteria on the surface of the skin common to hummans and animals (Schleifer et all 1975). An major fact that can not be ignored is that a few strins of *Staphylococcus xylosus* are responsable for opportunistic infections in hummans and animals (cows, shepp and lactating goats) (Pinna et all., 1999).

Staphylococcus lentus is a bacteria that can be associated with skin infectios in sheep, goats and swine (Quinn et all., 2003).The lactating goats are sensitive to the pathogenic mechanism of the *Staphylococcus lentus* strains that produce mastitis (Schleifer et al., 1975).

Chryseomonas luteola has an unclear habitat but it is frequently found in water, soil and other dump environments. Previous studies showed that *Chryseomonas luteola* may cause primarly septicemia, meningitis, osteomyelitis endocarditis, peritonoitis and it is capable to infect critically ill patients who have undergone surgical operations (Chihab et al., 2004).

During the spring season, the bacterial profail changes and is noticed a predominance of bacterial strains from *Serratia spp.* The notable changes in the bacterial population coincide with the normal changes of exploitation system in the spring season, the animals kept on the fields to pasture have full freedom of movement and are directly affected by weather conditions.. In the spring season we isolated a number of bacterial strains belonging to *Serratia spp.: Serratia fonticola, Serratia ficaria, Serratia liquefaciens, Serratia marcescens, Serratia odorifera*

Enterobacter aerogenes was the most isolated bacteria in the spring season, aspect notate in the table above. *Enterobacter aerogenes* may cause hospital related infections to the immunosuppressed patients, but in general it is an opportunist bacteria that aggravates symptoms in chronic diseases (Janda et al., 2006).The most frequent infections in which *Enterobacter aerogenes* has a major inpact are: respiratory related infections, gastroenteritis, urinary tract infections and nervous system infections (Lederberg et al., 2000).

The bacteria belonging to *Serratia spp* have an high pathogenicity in the respiratory tract. *Serratia odorifera* is a bacterial strain most frequently isolated from plants, and seldom is accused to produce respiratory infections in humans and animals. (Chmel et al., 1988). *Serratia fonticola* it is accused to be responsible for

respiratory infections in birds and has high pathogen potential for immune suppressed animals, it can also cause enteritis and diarrhea. (Choresca et al., 2008). *Serratia liquefaciens* it is an bacterial strain responsible for hospital related infections especially in the respiratory tract . There are surveys that show the presence of *Serratia liquefaciens* in goat hard paste cheese, as frequently contaminant, but the presence of this bacterial strein in the upper respiratory tract remains a mystery (Martin-Platero et al., 2009). *Serratia ficaria,* was for the first time isolated in 1979, and is a part of figs ecosystem and other akin trees like mulberry tree. Is pathologic action was revealed in few cases of biliary infections and septicemia (Stock, 2003). *Serratia marcescens* it is a worldwide bacterial strain that was thought to be harmless for more than two decades but more recent studies proved that this assumption was wrong. *Serratia marcescens* has a high level of pathogenicity and is involved in various infections affecting humans and animals. Most common infections with *Serratia marcescens* are urinary infections, endocarditis, miocarditis, and most frequent respiratory infections (Hejazi et al., 2004).

Rahnella aquatilis is a bacterial strain most often isolated from water, and wetlands. This bacteria is rarely involved in human and animals infections because of low virulence but may cause complications in immunossuppresed patients. Of the few case reports of *Rahnella aquatilis* in literature most describe infections are located in the urinary tract a patient with renal transplant, and sputum from a patient with chronic lymphocytic leukemia and emphysema (Carinder et al., 2001).

CONCLUSIONS

In our study we identified bacterial strains that normally are present in the respiratory tract of healthy goats that are raised in shelters but also bacterial strains with high pathogenicity that can cause harm in optimal conditions.

We observed notable differences in bacterial populations in the different seasons, winter and spring, and a major cause can be the housing conditions. In winter goats are raised in shelters, a compact and protective environment, and in this season we isolated from the upper respiratory tract *E.coli*, in 26.8% of the bacterial strains. *E.coli*, is a bacterial strain that normay populates the digestive field, but in shelter compact conditions can be found in the upper respiratory tract and is a major pathogen for both, human and animals.

The isolation of *Klebsiella pneumoniae* from goats represent a high risk for human contamination considering that this agent is implicated also in respiratory pathology. *Klebsiella pneumoniae* was isolated in winter, and can be a high pathogen also for the newborn kids.

The identification of *Staphylococcus xylosus* and *Staphylococcus lentus* in winter season suppose a risk for kids and workers in the shelter environment.

The detection in the winter season of bacterial strain like *Chryseomonas luteola* and *Erwinia spp* can be attribute to the food sources, since they populate succulent vegetables, food supplements for goats in this season.

The changes in the bacterial populations isolated in spring season, is directly related with housing conditions, the goats are raised on the pasture, in open field. Notable is the dominance of *Enterobacter aerogenes* 30% of total bacterial strains isolated an opportunist bacteria that produce respiratory related infections.

Isolation and identification of various bacterial strains of *Serratia species* like *Serratia fonticola, Serratia ficaria, Serratia liquefaciens, Serratia marcescens, Serratia odorifera* warns against posible infections since thease are potentialy pathogenic bacteria in immunosuppressed patients.

Identification of bacterial strains as *Rahnella aquatilis* most likly isolated from wetlands supose a riske because of the implication of this pathogen to imunocompromised patients.

All bacterial species isolated from goats in winter and spring season have a high risk of pathogenicity in proper conditions, therefore is necessary to take safety measures when handling goats, kids and respect proper hygiene protocols for public health in general.

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