BACTERIAL LOAD IN THE HUMAN UPPER RESPIRATORY TRACT

M. LIKA (ÇEKANI)[1],* A. KULLAJ[2], E. NELAJ[3], O. MEÇE[1]

[1]Tirana University, Faculty of Natural Sciences, Department of Biology

[2]Water Enterprise, Microbiological Laboratory

[3]Institute of Public Health, Tirana, Albania

* Author of correspondence; Email: mirela2422@yahoo.com

Abstract:

Most of the surfaces of the upper respiratory tract (including nasal and oral passages, nasopharynx, oropharynx, and trachea) are colonized by normal flora. These organisms are usually regular inhabitants of these surfaces and rarely cause disease. Once a respiratory tract pathogen is in the respiratory tract it colonizes the surfaces causing creating so the conditions to cause a disease. Certain microorganisms considered as etiological agent of disease can cause the disease if they are present in a sufficient number on the respiratory tract and they possess virulent factors that are expressed in any host. The most common bacteria in chronic upper respiratory tract, head and neck infections are anaerobic ones. The distribution of the organism according to the seasons has resulted to have a significant connection. From 700 cases, 502 were negative and 198 cases presented bacterial load. The number of cases resulted to be 41 in spring season, 91 in Summer, 36 in the Autumn and 30 in the Winter season. Most microorganisms predominate in summer rather than *S.pneumococcus* which dominates in the autumn. Source sampling have not resulted organism independent. We noticed that three different sources of different bacteria predominate.

Keywords: microorganisms, upper respiratory tract, etiological agents, *S. aureus, S. pneumococcus*.

1. Introduction

Bacteria in the respiratory tract may be normal flora, but under certain conditions specified yet clear, these organisms can cause disease colonialist different. Certain microorganisms considered as etiological agent of disease if they are present in a number of respiratory tract because they possess virulent factors that are expressed in any host [1].

Upper respiratory tract infections (URI or URTI) are the illnesses caused by an acute infection which involves the upper respiratory tract: nose, sinuses, pharynx or larynx [8, 14, 17]. This commonly includes: tonsillitis, pharyngitis, laryngitis, sinusitis, otitis media, and the common cold. The upper respiratory tract includes the sinuses, nasal passages, pharynx, and larynx. These structures direct the air we breathe from the outside to the trachea and eventually to the lungs for respiration to take place. An upper respiratory tract infection, or upper respiratory infection, is an infectious process of any of the components of the upper airway [9, 13].

Infection of the specific areas of the upper respiratory tract can be named specifically. Examples of these may include rhinitis (inflammation of the nasal cavity), sinus infection (sinusitis or rhino sinusitis) - inflammation of the sinuses located around the nose, common cold (nasal pharynx) - inflammation of the noses, pharynx, hypo pharynx, uvula, and tonsils, pharynx (inflammation of the pharynx, uvula, and tonsils), epiglottises (inflammation of the upper portion of the larynx or the epiglottis), laryngitis (inflammation of the larynx), larynx- tracheas (inflammation of the larynx and the trachea), and tracheas (inflammation of the trachea) [3, 4, 5, 10, 18].

Upper respiratory infections are one of the most frequent causes of doctors' visits with varying symptoms ranging from runny nose, sore throat, cough, to breathing difficulty, and lethargy. In the United States, upper respiratory infections are the most common illness leading to missing school or work [3]. Although upper respiratory infections can happen at any time, they are most common in the fall

and winter months, from September until March. This may be explained because these are the usual school months when children and adolescents spend a lot of time in groups and inside closed doors [12, 18]. Furthermore, many viruses of upper respiratory infection thrive in the low humidity of the winter.

Onset of the symptoms usually begins 1–3 days after the exposure to a microbial pathogen. The illness usually lasts 7–10 days. Group A beta hemolytic streptococcal pharyngitis/tonsillitis (strep throat) typically presents with a sudden onset of sore throat, pain with swallowing and fever [7, 16]. Strep throat does not usually cause runny nose, voice changes or cough. Pain and pressure of the ear caused by a middle ear infection (otitis media) and the reddening of the eye caused by viral Conjunctivitis are often associated with upper respiratory infections.

Colonization is more common in symptomatic children, but causation is not established. The different studies assess the association between wheezy symptoms in young children and the presence of bacteria in the airway. 1. Lower respiratory tract illnesses presenting with cough, shortness of breath, or wheeze are common in preschool years. 2. It has been proposed that, for the management of preschool wheeze, a distinction is made between episodic and multiple trigger wheeze. 3. Episodic wheeze is defined as wheeze in discrete episodes of up to two to four weeks' duration, usually triggered by a viral infection, and with the child being well in between [6, 8]. In multi-trigger wheeze, the child has distinct episodes of wheeze but also has intermittent symptoms, such as cough and wheeze at night or in response to exercise, crying, laughter, mist, and cold air, between these episodes.

Viral infections are again the most common triggers, but multi-trigger wheeze is often associated with allergic features, and many children with preschool multi-trigger wheeze progress to chronic asthma. Current guidelines recommend the use of bronchodilators for wheezing episodes.

2. Material and Methods

767 biological ambulatory samples have been collected and analyzed in the microbiological laboratory. Samples were taken from three sources: runny nose, throat secretions,sputum.

Staphylococcus grows well in ordinary terrain, and for this reason we used ground-blood agar, incubation done at 37 °C for 18-24 hours. Colonies are characteristic of smooth, round, shining, golden pigment in white sometimes, not very attached to the surface of the terrain. Colonies are hemolytic [11, 15].

P. aeruginosa grows easily in ordinary bacteriological grounds, and therefore can be used as a simple agar feeder media with or without blood. Incubation is done at 37 ° C in aerobic conditions for 18-24 hours. Developed typical colonies are large, relatively convex, the surface a little too polished, gray and creamy consistency. Around colonies on blood agar terrain can have beta hemolytic zone [1, 15].

Laboratory diagnosis of *Streptococcus pneumoniae* is done through planting in 5-10% blood agar for 24 hours in serum. Cultures incubated for 24 hours at 37°C.
Klebsiella grows in nutrient common media. For the final identification of Klebsiella do indolit test, Methylation red test, Voges-Proskauker test and citrate production.
For differentiation and rapid identification of Proteus reactions carried Hajna media and evidence Christensen urea's in urea-agar, where they give a positive reaction for 2-3 hours.

For *E. Coli* solid media used are: Mac Conkey, eosin methylene blue-agar, bismuth sulphit agar, brilliant green-agar, etc. For their identification used and biochemical tests such as: Proof of Proscauerit Voges, evidence of Methylation red, setting urea's evidence, evidence of use of citrate etc [15].

Identification of streptococci is done through clinical material planted on the field with blood, for which we should note that do not contain sugars

reductionism and not be wet. After an incubation of 18-24 hours, is the reading of cultures [2, 15].

In general, β-hemolytic zone surrounding colonies has size 2 to 4 times larger than the diameter of the colony itself. Tests such as morphology of colonies, their hemolytic activity, evidence of bacitracins, and hydrolysis of beta Lpyrohidronil naphtil amide (PYR) are usually sufficient to distinguish group A *Streptococci β-hemolytic*.

3. Results and Discussion

Biological samples analyzed in the laboratory on blood agar, resulting in bacterial load, which mainly dominated from bacteria such as *S. aureus, S. pneumococcus, P. vulgaris, K. pneumoniae*, etc., which are presented in the figures 1,2,3,4,5,6:

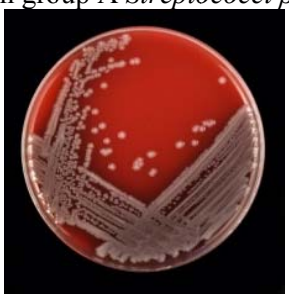

Figure 1: *E.coli*

Figure 2: *K. pneumoniae*

Figure 3: *P.vulgaris*

Figure 4: *S.**aureus***

Figure 5: S. β hemolitik

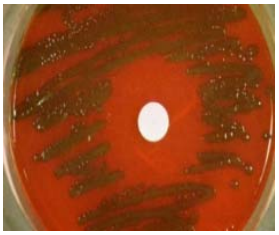

Figure 6: *S. pneumococcus*

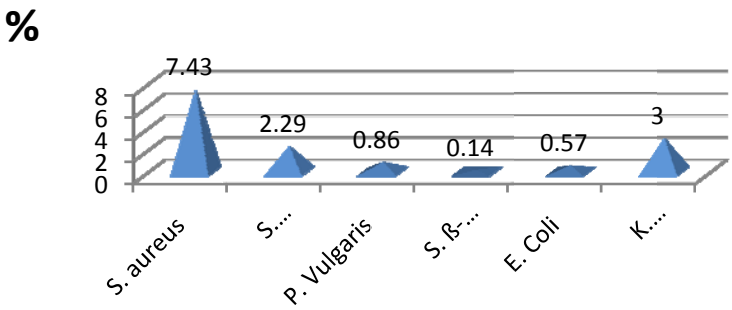

Figure 7: Percentage of cases with bacteria

From figure 7, it is clear the percentage of each bacterium encountered. From the graph we see that the highest percentage is found *S. β hemolytic* by 14%, followed by *S.aureus* with 7, 43%. Less frequently encountered bacterium was *Pseudomonas aeruginosa* with only one case. *Streptococcus ß- hemolytic* are the most likely cause of infections of upper respiratory tract. About 20% of all cases are caused by *Streptococci β hemolytic* tonsil pharyngitis.

It is believed that the incidence of infections caused by *Streptococci β hemolytic* during the last 10-20 years has increased. The prevalence of β hemolytic streptococci in the respiratory tract compared with other bacteria is indicative of a particular skill of this bacterium to invade and reside in the upper respiratory tract.

Table 1: Cases with bacteria according to the seasons

Microorganisms	***Seasons***				***Total***
	Spring	**Summer**	**Autumn**	**Winter**	
Negative	136	173	89	104	502
S.aureus	7	35	2	8	52
S.pneumococcus	2	5	8	1	16
Proteus vulgaris	1	2	0	3	6
S.β hemolitik	28	30	22	18	98
P.aeruginosa	0	1	0	0	1
E.coli	1	3	0	0	4
K. pneumoniae	2	15	4	0	21
Total	**177**	**264**	**125**	**134**	**700**

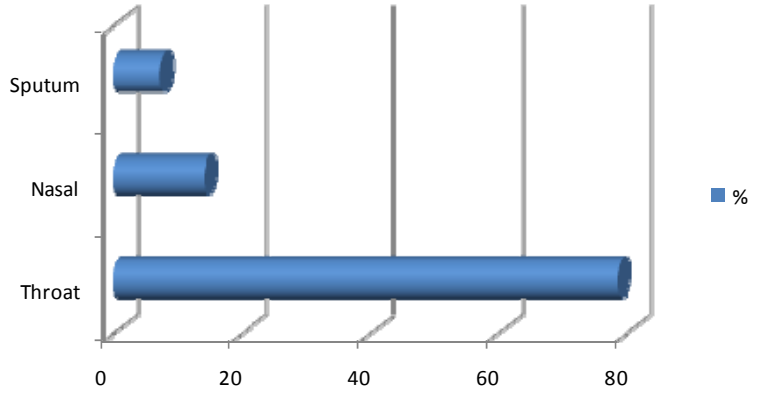

Figure 8. The cases frequencies under the samples source

Table 2: Frequency of microorganisms under the sample source

Microorganisms	***Sources***			*Total*
	Sputum	**Nasal secretions**	**Throat secretions**	
Negative	31	47	424	502
S.aureus	1	43	8	52
S.pneumococcus	1	3	12	16
Proteus vulgaris	0	4	2	6
S.β hemolitik	2	1	95	98
P. aeruginosa	1	0	0	1
E.coli	3	0	1	4
K. pneumoniae	12	1	8	21
Total	**51**	**99**	**550**	**700**

Table 3: Frequency of microorganisms for each age group

Microorganisms	*Age group*				*Total*
	(0-20]	(20-40]	(40-60]	(60-80]	
Negative	259	124	87	32	502
S.aureus	19	20	8	5	52
S.pneumococcus	11	1	3	1	16
Proteus vulgaris	0	2	3	1	6
S.β hemolitik	70	18	8	2	98
Pseudomonas	0	0	1	0	1
E.coli	0	3	1	0	4
Klebsiella pneumoniae	2	6	4	9	21
Total	**361**	**174**	**115**	**50**	**700**

Frequency analysis in different seasons indicates greater frequency of analysis in the summer season with 264 cases or 37.71% of individuals. Three other seasons have almost approximate value. We see in the table 1 that the bacterium that dominates in the summer season is *S.aureus* with 35 cases followed by *S. β hemolytic* with 30 cases.

Another bacterium found more in the summer season is *Klebsiella pneumonia* in 15 cases for these bacteria didn't found in the winter season. In the spring appear with greater dominance compared to other bacteria with *S. β hemolytic* whose distribution in four seasons has been more or less the same.

Samples were taken from three different sources whose frequency is presented in Figure 8. It seems clear that the samples analyzed faced more with the highest percentage, 78.6%, samples were taken from the throat. 14.1% of samples were from nasal secretions and 7.3% were sputum.

In Table 2 we see that more bacteria encountered, which is dominated almost entirely *Klebsiella pneumonia* in 12 cases. This bacterium and found to have throat secretions of 8 cases and nasal secretions with only one case. In nasal secretions the one that dominates is *S.aureus*, which in two other sources we find much less. *S. β hemolytic* throat secretions dominate while two other sources is rarely found, with 1 case in nasal secretions and sputum in 2 cases.

In the study population received, 71.71% or 502 individuals tested negative in their cultures so do not encounter any microorganisms (Table 3). Microorganisms encountered more resulted *S. β-hemolytic* by 14%, or 98 cases, followed by *S. aureus* with 7.4%, 52 cases. Organism encountered only one case was encountered Pseudomonas of 40-60 years age group.

In terms of seasons 37.7% of those analyzed were found in summer, which has dominated *S.aureus* with 35 cases, followed by *S. β hemolytic* with 30 cases. In the autumn season dominated followed by *S. β hemolytic* and *S.pneumococcus*.

4. Conclusions

Anaerobic bacteria are common in chronic upper respiratory tract and head and neck infections. Anaerobes are the most predominant components of the normal human pharyngeal bacterial flora, and are therefore a common cause of bacterial infections of the upper respiratory tract that are of endogenous origin. Because of their fastidious nature, anaerobes are difficult to isolate from infectious sites and are often overlooked. Anaerobic bacteria can be recovered in chronic otitis media and sinusitis, and play a role in tonsillitis. Their isolation requires appropriate methods of collection, transportation, and cultivation of specimens. Treatment of anaerobic infections is complicated by the slow growth of these organisms, by their polymicrobial nature, and by the growing resistance of anaerobic bacteria to antimicrobials.

Individuals were analyzed with a mean age of 24, 77 years. The average age of women was 26.43% and

22.49% that of men, so the frequency of encounter by gender is almost invariably distinct.

Microorganisms encountered more in sexes have been *S. β hemolytic* followed by *S.aureus*. In both sexes it's no significant difference between the frequencies of microorganisms encountered.

Analyzed age groups 0-20 years have been that which has dominated the *S. β hemolytic*. In the 20-40 age group has dominated *S. aureus* in the 40-60 age groups has dominated *S. aureus* and *S. β hemolytic* while the 60-80 age groups has dominated *Klebsiella pneumonia*.

6. References

1. Andoni R, Ibro M.: **Stafilokoku, Streptokoku dhe diagnozat.** *Bakterologjia klinike*, 2004: 30-39, 63-85.
2. Adam D: **Group A Streptococci in 1999s**, *Jornual of Antimicrobial Chemotherapy, 45, topicsT_1,*2000, **1-2**: 67-72.
3. Brien K.L, Beall B, Barret NL, Aeslak P.R, Reingold A, Farley AM.M, Danila R, Zell E.R, Facklam R, Scwartz B, Schuchat A: **Epidemiology of invasive group A Streptococcus Disease in the United States, 1995-1999**, *Clinical infectious Disease*, 2002:**35:** 268-276.
4. Boersma, W. G., A. Lowenberg, Y. Holloway, H. Kuttschrutter, J. A. Snijder, H. Koeter: **The role of antigen detection in pneumococcal carriers: a comparison between cultures and capsular antigen detection in upper respiratory tract secretions**. *Scand J. Infect. Dis*. 1993, **25:**51–56.
5. Fischetti V. A: **Streptococcal M protein**. *Scientific American Journal* 1991, **264**:58-65.
6. Foy, H. M., B. Wentworth, G. E. Kenny, J. M. Kloeck, and J. T. Grayston: **Pneumococcal isolations from patients with pneumonia and control subjects in a prepaid medical care group**. *Am. Rev. Respir. Dis*. 1975, 1**11**:595–603.
7. Feclam R, Washington J.A: **Streptococcus related catalase negative gram positive coccus**. *Manual of clinical Microbiology*. 1991, **5**:238-257.
8. Graevenitz, A: **Which species should be isolated from throat cultures**? *Eur. J. Clin. Microbiol*. 1983, **2**:124.
9. Gunnarsson, R. K., S. E. Holm, and M. Soderstrom: **The prevalence of potential pathogenic bacteria in nasopharyngeal samples from healthy children and adults**. *Scand. J. Prim. Health Care* 1998, **16:**13–17.
10. Hamzaraj E: **Mikroorganizmat si patogjenë të njeriut**.In: *Mikrobiologjia e përgjithshme* 2007: 236-269.
11. Hysko M: **Disa teknika për diagnostifikimin e agjentëve patogjenë.** *Manual,i mikrobiologjisë* 2007: 278-280.
12. Hendley, J. O., M. A. Sande, P. M. Stewart, and J. M. J. Gwaltney: **Spread of *Streptococcus pneumoniae* in families. I. Carriage rates and distribution of types**. *J. Infect. Dis*. 1975, **132:** 55–61.
13. Jacoby P, Watson K, Bowman J, Taylor A, Riley TV, Smith DW: **Modeling the co-occurrence of *Streptococcus pneumoniae* with other bacterial and viral pathogens in the upper respiratory tract**. *Appling Microbiology* 2007: 137-139.
14. Masters, P. L., W. Brumfitt, R. L. Mendez, and M. Likar: **Bacterial flora of the upper respiratory tract in Paddington families, 1952-4.** *Br. Med. J.* 1958, **14**: 1200–1205.
15. Papajorgji M, Kero A: **Përcaktimi i aerogenëve**. *Manual bazë mbi metodat diagnostike mikrobiologjike* 2001: 22-25.
16. St Sauver J, Marrs CF, Foxman B, Somsel P, Madera R, Gilsdorf JR. **Risk factors for otitis media and carriage of multiple strains of *Haemophilus influenzae* and *Streptococcus pneumoniae.*** *Emerg Infect Dis*. 2000, **6**: 622–30.
17. Wagner, D.C: ***Arcanobacterium haemoliticum*, biology of the organism and diseases in man**. *Pediatr. Infect. Dis. J* 1991, **10**:933.
18. Watt, J. P., K. L. O'Brien, S. Katz, M. A. Bronsdon, J. Elliott, J. Dallas, M. J.Perilla, R. Reid, L. Murrow, R. Facklam, M. Santosham, and C. G. Whitney: **Nasopharyngeal versus oropharyngeal sampling for detection of pneumococcal carriage in adults**. *J. Clin. Microbiol*. 2004, **42:** 4974–4976.