

RESULTS

Among *Str. pneumoniae* strains, 8 (25%) have been fully or moderately resistant to erythromycin and doxycycline – 6 of them have been also resistant to penicillin. As a total, 13 strains (36.1%) have appeared to be multiresistant and have been fully or intermediately resistant to two or three antibiotics (penicillin, erythromycin and doxycycline). 8 of them have been isolated from outpatients and 5 from hospitalized patients.

Among *Str. pyogenes* strains, 5 (25%) have been moderately or fully resistant to erythromycin, 4 of them have been also resistant to linkomycin and 3 of them have been also resistant to cefotaxime. As a total, 4 strains (20%) have appeared to be multiresistant and have been fully or intermediately resistant to two or three antibiotics (erythromycin, linkomycin and cefotaxime). All they have been isolated from outpatients.

Tab. 1. Susceptibility of *Streptococcus pneumoniae* strains to selected antibiotics

	Penicillin			Erythromycin			Doxycycline			Co-trimoxazole			Vankomycin	
	S	I	R	S	I	R	S	I	R	S	I	R	S	R
%	44.4	50.0	5.56	63.9	25.0	11.1	44.4	25.0	30.5	19.4	19.4	61.1	100	0
n	(16)	(18)	(2)	(23)	(9)	(4)	(16)	(9)	(11)	(7)	(7)	(22)	(36)	(0)

Tab. 2. Susceptibility of *Streptococcus pyogenes* strains to selected antibiotics

	Penicillin		Erythromycin			Linkomycin			Cefotaxime			Vankomycin	
	S	R	S	I	R	S	I	R	S	I	R	S	R
%	100	0	75	20	5	55	25	20	50	15	35	100	0
n	(20)	(0)	(15)	(4)	(1)	(11)	(5)	(4)	(10)	(3)	(7)	(20)	(0)

S – sensitive, I – intermediate, R – resistant

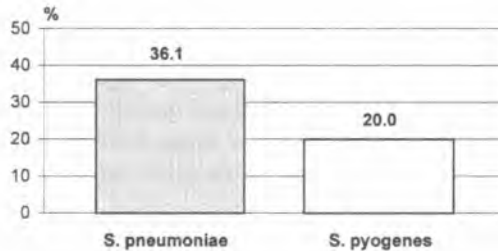


Fig. 1. Multiresistant strains of *Streptococcus pneumoniae* and *Streptococcus pyogenes*

DISCUSSION

Streptococcus pneumoniae is an important causative pathogen of otitis media, sinusitis, bronchitis, pneumonia, and meningitis. Accordingly, resistance to *Str. pneumoniae* takes an extreme clinical importance.

In 1963 tetracycline resistance was firstly reported. In 1967 reports followed of erythromycin and penicillin resistance (10). Reports of drug-resistant pneumococcal infections in Australia and South Africa in the 1960s and 1970s were followed by reports of their spread to many other countries. Spain, Hungary and Poland are the main centres of resistance in Europe (1).

In recent years significant levels of penicillin-resistant *Str. pneumoniae* has been detected in the USA and Europe (10, 6). Resistance rates has ranged from 1 to 50% in Europe (2, 8). When *Str. pneumoniae* develops resistance to penicillin, it typically manifests resistance to most other antibiotics, including cephalosporins, macrolides, and co-trimoxazole. In contrast, strains of penicillin-resistant *Str. pneumoniae* generally remain susceptible to vancomycin and the newer fluoroquinolones (10). In our study we have observed high penicillin, co-trimoxazole, doxycycline, and erythromycin resistance rate among *Str. pneumoniae* strains. 20 strains (55.6%) have appeared to be moderately or fully resistant to penicillin. 6 of them have been also fully or intermediately resistant to erythromycin and doxycycline. All the examined strains have been susceptible to vancomycin.

Streptococcus pyogenes remains exquisitely sensitive to penicillin, and penicillin-resistant isolates have not been described (10). In contrast with the lack of penicillin resistance, macrolide resistance has occurred at the troublesome rate, particularly in the countries such as Finland and Japan (10). In our study all the examined *Str. pyogenes* strains have also appeared to be sensitive to penicillin but marked resistance to erythromycin, linkomycin, and cefotaxim has been noticed. 4 strains (20%) have appeared to be fully or moderately resistant to two or three of the above mentioned antibiotics. Interestingly, most multiresistant *Str. pneumoniae* and *Str. pyogenes* strains have been isolated from out-patients.

CONCLUSIONS

1. Increasing resistance to most frequently used antimicrobial drugs among respiratory pathogens indicates the necessity of establishing the microbiological examination in every case of infection.
2. Antibiotic policy should be created and strictly followed to avoid the over-use of antibiotics and, as a consequence, the selection of multiresistant bacterial strains.

REFERENCES

1. Christenson B., Sylvan S.P.E., Noreen B.: Carriage of multiresistant *Streptococcus pneumoniae* among children attending day-care centres in the Stockholm area. Scand. J. Infect. Dis., 29, 555-558, 1997.

2. Čižman M., Paragi M., Jovan-Kuhar N., Gubina M., Oražem A., Pokorn M. and the Slovenian meningitis group: Antimicrobial resistance of invasive *Streptococcus pneumoniae* in Slovenia, 1993–1995. *Scand. J. Infect. Dis.*, 29, 251–254, 1997.
3. Cohen M.L.: Epidemiology of drug resistance: Implications for a post-antimicrobial era. *Science*, 257, 1050–1055, 1992.
4. Hamilton-Miller J.M.T.: The emergence of antibiotic resistance: myths and facts in clinical practice. *Intensive Care Med.*, 16 (Suppl. 3), S206–S211, 1990.
5. Hammond M.L., Norriss M.S.: Antibiotic resistance among respiratory pathogens in pre-school children. *Med. J. Aust.*, 163, 239–242, 1990.
6. Henning C., Bengtsson L., Jorup C., Engquist S.: Antibiotic resistance in *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Streptococcus pyogenes* in respiratory tract infections in outpatients. *Scand. J. Infect. Dis.*, 29, 559–563, 1997.
7. Holmström L., Nyman B., Rosengren M., Wallander S., Ripa T.: Outbreaks of infections with erythromycin-resistant group A streptococci in child day care centres. *Scand. J. Infect. Dis.*, 22, 179–185, 1990.
8. Jacobs M.R., Dagan R., Appelbaum P.C., Burch D.J.: Prevalence of antimicrobial-resistant pathogens in middle ear fluid: multinational study of 917 children with acute otitis media. *Antimicrob. Agents Chemother.*, 42, 589–595, 1998.
9. Pallares R., Linares J., Vadillo M., Cabellos C., Manresa F., Viladrich P.F., et al.: Resistance to penicillin and cephalosporin and mortality from severe pneumococcal pneumonia in Barcelona, Spain. *N. Engl. J. Med.*, 333, 474–480, 1995.
10. Spach D.H., Black D.: Antibiotic resistance in community-acquired respiratory tract infections: current issues. *Ann. Allergy Asthma Immunol.*, 81, 293–303, 1998.

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STRESZCZENIE

Celem naszej pracy była ocena wrażliwości na wybrane antybiotyki szczepów *Streptococcus pneumoniae* i *Streptococcus pyogenes*, pochodzących od chorych z zakażeniami dróg oddechowych. Badaniem objęto 36 szczepów *Str. pneumoniae* i 20 szczepów *Str. pyogenes*, izolowanych od pacjentów ambulatoryjnych i szpitalnych w okresie od października 1998 r. do marca 1999 r. Materiały do badań stanowiły wymazy z jamy nosowo-gardłowej i płwocina. Wrażliwość na antybiotyki oceniano metodą dyfuzyjno-krążkową według Kirby-Bauera. Stwierdzono znaczącą oporność izolowanych szczepów na następujące antybiotyki: penicylina, erytromycyna i doksycyklina (*Str. pneumoniae*), erytromycyna, linkomycyna, cefotaksym (*Str. pyogenes*) oraz występowanie szczepów wieloopornych, których odsetek dla *Str. pneumoniae* wynosił 36,1%, a dla *Str. pyogenes* – 20%. Narastająca oporność na najczęściej stosowane antybiotyki wśród bakterii infekujących drogi oddechowe wskazuje na konieczność wykonywania antybiogramu dla każdego izolowanego szczepu. Powinna również zostać stworzona i rygorystycznie przestrzegana strategia stosowania antybiotyków w praktyce klinicznej i ambulatoryjnej, co zabezpieczy przed nadużywaniem antybiotyków i powstawaniem szczepów wieloopornych.