

Katedra i Zakład Mikrobiologii Lekarskiej Akademii Medycznej w Lublinie
Kierownik: dr hab. Maria Kozioł-Montewka

ELŻBIETA MAZUR, JERZY LIGĘZA,
JUSTYNA NIEDŹWIADEK, GRZEGORZ POLAK,
MARIA KOZIOŁ-MONTEWKA, ZYGMUNT HENCNER

Susceptibility to selected antibiotics of Streptococcus pneumoniae and Streptococcus pyogenes strains isolated from patients with respiratory tract infections

Wrażliwość na wybrane antybiotyki szczepów *streptococcus pneumoniae* i *streptococcus pyogenes*, izolowanych od chorych z zakażeniami dróg oddechowych

Streptococcus pneumoniae and *Streptococcus pyogenes* are important pathogens invading respiratory tract. In recent years a number of studies have addressed the frequency of antibiotic resistance among respiratory pathogens and an increased resistance has been reported for commonly used antibiotics (5, 9, 3, 7, 6). The increasing use of antibiotic drugs in mild respiratory tract infections, especially in children, has been suggested as one cause of increasing bacterial resistance (4, 3, 10).

The aim of our study was to evaluate the susceptibility to selected antibiotics among *Str. pneumoniae* and *Str. pyogenes* strains isolated from patients suffering from respiratory tract infections.

MATERIAL AND METHODS

36 *Str. pneumoniae* and 20 *Str. pyogenes* strains isolated during the period from October 1998 through March 1999 have been examined at the Department of Medical Microbiology, University School of Medicine in Lublin. 13 *Str. pneumoniae* strains have been isolated from sputum samples of bronchitis patients, 23 from throat and nose swabs obtained from patients with pharyngitis (7 strains) and sinusitis (16 strains). 19 *Str. pyogenes* strains have been isolated from throat and nose swabs obtained from patients with pharyngitis (15 strains) and sinusitis (4 strains). One strain has been isolated from sputum of bronchitis patient. Bacterial strains have been isolated from hospitalized patients (16 *Str. pneumoniae* and 2 *Str. pyogenes* strains), as well as from outpatients (20 *Str. pneumoniae* and 18 *Str. pyogenes* strains).

Susceptibility to: penicillin, erythromycin, doxycycline, co-trimoxazole, vancomycin, linkomycin, and cefotaxime has been evaluated using disc-diffusion method according to Kirby and Bauer. It has been performed on Mueller-Hinton agar with 5% of sheep blood.

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 (16)	50.0 (18)	5.56 (2)	63.9 (23)	25.0 (9)	11.1 (4)	44.4 (16)	25.0 (9)	30.5 (11)	19.4 (7)	19.4 (7)	61.1 (22)	100 (36)	0 (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 (20)	0 (0)	75 (15)	20 (4)	5 (1)	55 (11)	25 (5)	20 (4)	50 (10)	15 (3)	35 (7)	100 (20)	0 (0)

S – sensitive, I – intermediate, R – resistant

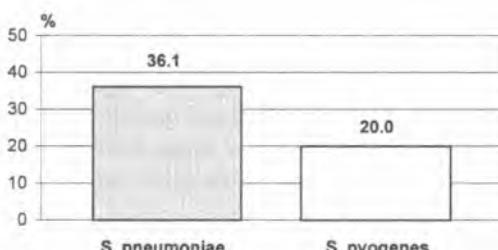


Fig. 1. Multiresistant strains of *Streptococcus pneumoniae* and *Streptococcus pyogenes*

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 overuse of antibiotics and, as a consequence, the selection of multiresistant bacterial strains.

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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 plwocina. Wrażliwość na antybiotyki oceniano metodą dyfuzyjno-krajkową według Kirby-Bauera. Stwierdzono znaczącą oporność izolowanych szczepów na następujące antybiotyki: penicylina, erytromycyna i doksyzykлина (*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.