



214019, PO Box 5,  
Smolensk, Russia  
Tel.: +7 (0812) 611301/27  
Fax: +7 (0812) 611294  
E-mail: zvall@antibiotic.ru  
http://www.antibiotic.ru

# ACTIVITY OF OLD AND NEW FLUOROQUINOLONES AGAINST NOSOCOMIAL METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS FROM A TRAUMA HOSPITAL

V.A. Kretchikov<sup>1</sup>, A.V. Dekhnich<sup>1</sup>, S.I. Pylyayeva<sup>2</sup>, G.A. Kochetkov<sup>2</sup>, R.S. Kozlov<sup>1</sup>

<sup>1</sup> Institute of Antimicrobial Chemotherapy, Smolensk, Russia <sup>2</sup> Institute of Traumatology and Orthopaedics, N. Novgorod, Russia

443

## ABSTRACT

**Purpose:** Ciprofloxacin (CIP) has a deficient anti-gram-positive activity. Levofloxacin (LVF) and moxifloxacin (MFX) retain gram-negative activity with enhanced activity against gram-positives including multiresistant strains.

**Methods:** A total of 70 nosocomial MRSA isolates from N. Novgorod Institute of Traumatology and Orthopaedics (Russia) were studied. Oxacillin-resistance was detected by agar-screening test. MICs to CIP, LVF, MFX were determined by agar dilution method. Interpretation of results for CIP and LVF were performed according to NCCLS recommendations. Intermediately resistant and resistant strains were considered as non-susceptible.

**Results:** Against all isolates the following MIC<sub>90</sub> (MIC ranges [mg/l]) were found: 2 (0.125-8) for CIP, 0.5 (0.125-4) for LVF, 0.125 (0.015-2) for MFX. Against ciprofloxacin-susceptible MRSA the following MIC<sub>90</sub> (MIC ranges) were observed: 0.5 (0.125-1) for CIP, 0.25 (0.125-0.5) for LVF, 0.03 (0.015-0.125) for MFX. Against non-susceptible to CIP strains (22.9%) MIC<sub>90</sub> (MIC ranges) were: 1 (0.5-4) for LVF, 0.125 (0.06-2) for MFX. One isolate was intermediately resistant to LVF (MIC=4 mg/l) and had MIC=2 mg/l for MFX.

**Conclusions:** These data confirm high potency of MFX against methicillin-resistant *S.aureus*. MFX was 2-8-fold more active than LVF and 16-fold than CIP. However, MFX has reduced activity against non-susceptible to CIP isolates, so the clinical potential of MFX against these strains is doubtful.

## OBJECTIVE

To compare *in vitro* activity of old (ciprofloxacin) and new (levofloxacin and moxifloxacin) fluoroquinolones against methicillin-resistant *S.aureus*.

## METHODS

**Strains:** A total of 70 nosocomial wound MRSA isolates were collected from patients hospitalised in Nizhniy Novgorod Institute of Traumatology and Orthopaedics (Russia) in 2000. Bacterial cultures were re-identified in a reference laboratory of Institute of Antimicrobial Chemotherapy (Russia) by standard biochemical methods and stored at 70°C in glycerol broth.

**Susceptibility testing:** Oxacillin-resistance was proved by agar-screening test. Minimal inhibitory concentrations (MICs) to ciprofloxacin, levofloxacin and moxifloxacin were determined by agar dilution method in Mueller-Hinton II agar (BBL). Interpretation of results for ciprofloxacin and levofloxacin were performed according to the NCCLS guidelines (2001). Intermediately resistant and resistant strains were considered as non-susceptible.

**Quality control:** *S.aureus* ATCC 29213 was used as the reference strain.

## RESULTS

Overall, 70 MRSA isolates were tested. Moxifloxacin was the most active agent with MIC<sub>90</sub> for all isolates 0.125 mg/l compared with 0.5 mg/l for levofloxacin and 2 mg/l for ciprofloxacin (see Table).

Against ciprofloxacin-susceptible isolates MIC<sub>90</sub> were as follows: 0.5 for ciprofloxacin, 0.25 for levofloxacin and 0.03 for moxifloxacin.

Among all collected strains 16 (22.9%) were non-susceptible to ciprofloxacin. Against these isolates the following MIC<sub>90</sub> were observed: 1 mg/l for levofloxacin and 0.125 mg/l for moxifloxacin.

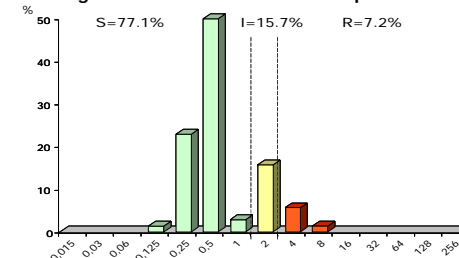
One isolate was intermediately resistant to levofloxacin (MIC=4 mg/l) and had MIC=2 mg/l for moxifloxacin.

MIC distributions are presented on Figures 1-3.

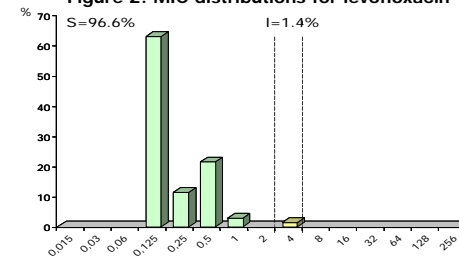
**Table. *In vitro* activity of CIP, LVF, MFX against MRSA**

Agent	MIC <sub>50</sub> (mg/l)	MIC <sub>90</sub> (mg/l)	MIC range (mg/l)
<b>All strains (n=70)</b>			
Ciprofloxacin	0.5	2	0.125-8
Levofloxacin	0.125	0.5	0.125-4
Moxifloxacin	0.03	0.125	0.015-2
<b>Ciprofloxacin-susceptible (n=54)</b>			
Ciprofloxacin	0.5	0.5	0.125-1
Levofloxacin	0.125	0.25	0.125-0.5
Moxifloxacin	0.03	0.03	0.015-0.125
<b>Ciprofloxacin-non-susceptible (n=16)</b>			
Ciprofloxacin	2	4	2-8
Levofloxacin	0.5	1	0.5-4
Moxifloxacin	0.125	0.125	0.06-2

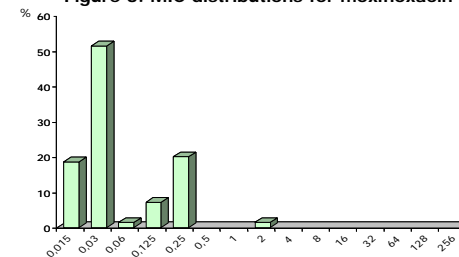
**Figure 1. MIC distributions for ciprofloxacin**



**Figure 2. MIC distributions for levofloxacin**



**Figure 3. MIC distributions for moxifloxacin**



## CONCLUSIONS

- Moxifloxacin was 2-8 fold more active than levofloxacin and 16-fold more active than ciprofloxacin against methicillin-resistant *S.aureus*.
- Moxifloxacin has reduced activity against ciprofloxacin-non-susceptible MRSA, so its clinical potential in infections caused by these strains needs further investigation.