# Antimicrobial Susceptibility of 5,859 Non-Enterobacteriaceae Gram-Negative Organisms Other than *Pseudomonas aeruginosa* Tested Against the Novel Des-F(6)-Quinolone, Garenoxacin (SENTRY Antimicrobial Surveillance Program, 1999 - 2003)


**HS SADER, TR FRITSCHE, MG STILWELL, RN JONES**

**JMI Laboratories, North Liberty, IA, USA**



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JMI Laboratories
North Liberty, IA, USA
www.jmilabs.com
319.665.3370, fax 319.665.3371
ronald-jones@jmilabs.com


## Abstract


**Objective**: To compare the antimicrobial activity of garenoxacin (GRN) and selected antimicrobial agents against 5,859 non-enteric Gram-negative organisms other than *P. aeruginosa* collected as part of the SENTRY Antimicrobial Surveillance Program (1999 - 2003).

**Methods**: The isolates were consecutively collected at > 70 medical centers on six continents from bloodstream, respiratory, urinary and skin and soft tissue infections and tested by NCCLS broth microdilution methods. A GRN susceptible (S) breakpoint of ≤ 2 mg/L was applied for comparison purposes only.

**Results**: The results of major organism groups tested:

| Organism (no. tested) | MIC$_{50}$ | Cum. % inhibited at GRN MIC (mg/L) | | | | |
|---|---|---|---|---|---|---|
| | | ≤0.5 | 1 | 2 | 4 | |
| *Alcaligenes/Achromobacter* spp. (170) | >4 | 5 | 7 | 9 | 19 | |
| *Acinetobacter* spp. (3,260) | 2 | 46 | 49 | 51 | 60 | |
| *Aeromonas* spp. (387) | 0.12 | 79 | 88 | 95 | 97 | |
| *Burkholderia* spp. (180) | 4 | 6 | 18 | 38 | 56 | |
| *Chryseobacterium* spp. (59) | 0.25 | 81 | 90 | 93 | 95 | |
| *N. meningitidis* (130) | ≤0.03 | 100 | 100 | 100 | 100 | |
| *P. multocida* (59) | ≤0.03 | 97 | 97 | 98 | 100 | |
| *S. maltophilia* (1,449) | 2 | 22 | 44 | 66 | 83 | |
| Total (5,859) | 1 | 43 | 51 | 59 | 70 | |

Overall, GRN (MIC$_{50}$, 1 mg/L; 59% S) was more active than ciprofloxacin (MIC$_{50}$, 2 mg/L; 49% S), ceftazidime (MIC$_{50}$, 8 mg/L; 56% S), piperacillin/tazobactam (MIC$_{50}$, 32 mg/L; 45% S) and amikacin. GRN was the most active compound tested against *Chryseobacterium* spp. GRN was also highly active against *Aeromonas* spp. (MIC$_{50}$, 2 mg/L; 95% S), *N. meningitidis* (MIC$_{50}$, ≤ 0.03 mg/L; 100% S) and *P. multocida* (MIC$_{50}$ ≤ 0.03 mg/L; 98% S). Additionally, 83% of *S. maltophilia* strains were inhibited at 4 mg/L of GRN.

**Conclusions:** GRN exhibited reasonable in vitro activity against many of the rarely isolated Gram-negative species and may be an alternative therapy for infections caused by these "difficult to treat" organisms.


## Introduction

The therapy of infections caused by Gram-negative organisms other than Enterobacteriaceae and *Pseudomonas aeruginosa* can present challenges because of the wide diversity of antimicrobial susceptibility patterns. Among the most prevalent of these species, *Acinetobacter* spp. and *Stenotrophomonas maltophilia* can often be multidrug-resistant (MDR) requiring the use of antimicrobial combinations or rarely applied agents such as polymyxins and sulbactam. Yet other Gram-negative genus and species groups (*Neisseria* spp., *Aeromonas* spp.) may be quite susceptible to various antimicrobial classes. The therapy of these infections generally requires guidance by in vitro susceptibility tests and new/novel compounds should be screened against these pathogens for possible use for serious invasive infections. A recent review by Sader et al. (2005) highlights the great diversity of antibiogram patterns among these Gram-negative isolates.

Garenoxacin (formerly T-3811ME or BMS-284756) is a novel des-F(6)-quinolone that lacks the C6-position fluorine and has a unique difluoromethoxy substitution at position C8. These alterations resulted in a drug with improved potency against both DNA gyrases and topoisomerase IV. Garenoxacin has been described as highly active against important Gram-positive and -negative pathogens including: Enterobacteriaceae, staphylococci, streptococci (*S. pneumoniae*, viridans group species, and ß-haemolytic streptococci), *Acinetobacter* spp. and some other Gram-negative non-fermentative bacilli, *Haemophilus influenzae*, *Moraxella catarrhalis*, atypical respiratory tract pathogens (Mycoplasmas, *C. pneumoniae*, and *Legionella* spp.), many enterococci and anaerobes, especially Gram-positive species. These features are complimented by the high probability of favorable target attainment (AUC/MIC) that has been associated with successful bacterial eradication and minimization of mutational events among indicated species (i.e. low MPC values). These elements of spectrum and potency favor garenoxacin applications for 1) community-acquired respiratory tract infections (CA-RTI; hospitalized or ambulatory patients); 2) skin and soft tissue infections (complicated with mixed flora or uncomplicated); and 3) selected community-acquired intra-abdominal infection indications.

The in vitro testing results for garenoxacin from the SENTRY Antimicrobial Surveillance Program were summarized from 1999 onward to assess the spectrum and potency versus non-fermentative Gram-negative bacilli or coccobacilli, but not *P. aeruginosa*. A total of 5,859 isolates were analyzed from results generated by the reference (National Committee for Clinical Laboratory Standards [NCCLS], currently the Clinical Laboratory Standards Institute [CLSI]) methods as described in document M7-A6 [2003].

## Materials and Methods

Susceptibility testing. All MIC values were generated using broth microdilution methods (CLSI/NCCLS, M6-A7) with panels produced by TREK Diagnostics (Cleveland, Ohio, USA). Mueller-Hinton broth was supplemented where indicated with 2 - 5% lysed horse blood (facultious species including streptococci) and HTM components (*Haemophilus* species). Concurrent quality assurance was maintained via use of CLSI/NCCLS-recommended strains: *E. coli* ATCC 25922 and 35218; *P. aeruginosa* ATCC 27583; *E. faecalis* ATCC 29212; *S. aureus* ATCC 25923 and 29213; *H. influenzae* ATCC 49247 and 49766; and *S. pneumoniae* ATCC 49619. All quality control results were within published MIC ranges (CLSI/NCCLS, M100-S15). Approximately 35 - 40 different antimicrobial agents were processed each year with selected agents compared to garenoxacin in this presentation. A breakpoint for garenoxacin at ≤ 2 mg/L was used for comparison purposes only.

Bacterial strains. The organisms were consecutively collected isolates processed in a central laboratory system (JMI Laboratories, North Liberty, Iowa, USA; Women's and Children's Hospital, Adelaide, Australia; Utrecht University, Utrecht, The Netherlands) using common reference tests. Isolates were derived from a wide variety of clinical sources (Program Objectives) such as: bloodstream (BSI), community-acquired or nosocomial respiratory tract sites (RTI), skin and soft tissue infections (SSTI), urinary tract infections (UTI) and selected patient populations. In this investigation, the isolates were obtained from a wide variety of specimen sources at medical centers in North America (≥ 30 sites in the USA and Canada), Latin America (10 sites), Europe (≥ 30 sites) and the Asia-Pacific region (nine nations plus South Africa). A total of 5,859 organisms met the study definition and were tested against garenoxacin (Table 1). The most common of these, generally unusual, species were the *Acinetobacter* spp. (3,260; five species) and *S. maltophilia* (1,449), together accounting for over 80% of the studied pathogens. Over 90% of these organisms were isolated from blood cultures or high-quality sputum samples.

## Results

**Table 1. List of the non-pseudomonas "non-fermentative" Gram-negative organisms tested against garenoxacin (5,859 isolates; SENTRY Program, 1999-2003).**

| Organism | No. tested |
|---|---|
| *Acinetobacter* spp.[a] | 3,260 |
| *Aeromonas* spp.[b] | 387 |
| *Agrobacterium radiobacter* | 17 |
| *Alcaligenes* spp.[c] | 170 |
| *Burkholderia* spp.[d] | 180 |
| *Chryseobacterium* spp.[e] | 59 |
| *Comamonas* spp.[f] | 17 |
| *Neisseria meningitidis* | 130 |
| *Neisseria* spp., saprophytic species | 26 |
| *Ochrobactrum anthropi* | 12 |
| *Pasteurella* spp.[g] | 58 |
| *Pleisiomonas shigelloides* | 14 |
| *Sphingomonas paucimobilis* | 19 |
| *Stenotrophomonas maltophilia* | 1,449 |
| *Vibrio* spp.[h] | 61 |

a. Includes: *A. anitratus* (111), *A. baumannii* (2,456), *A. calcoaceticus* (116), *A. haemolyticus* (10), *A. junii* (18) and *Acinetobacter* spp., NOS (276).
b. Includes: *A. caviae* (87), *A. hydrophila* (210), *A. salmonicida* (one), *A. sobria* (10), *A. veronii* (22) and *Aeromonas* spp., NOS (57).
c. Includes: *A. faecalis* (13), *A. xylosoxidans* (129) and *Alcaligenes* spp., NOS (28).
d. Includes: *B. cepacia* complex (177), *B. gladioli* (one), and *B. multivorans* (two).
e. Includes: *C. gleum* (one), *C. indologenes* (30), *C. meningosepticum* (19) and *Chryseobacterium* spp., NOS (nine).
f. Includes: *Delftia acidovorans* (15), *C. terrigena* (one) and *Comamonas* spp., NOS (one).
g. Includes: *P. haemolytica* (three), *P. multocida* (51) and *Pasteurella* spp., NOS (four).
h. Includes: *V. alginolyticus* (one), *V. cholerae* (six), *V. damsela* (one), *V. fluvialis* (two), *V. parahaemolyticus* (39) and *V. vilnificus* (12).

- The 15 most prevalent genus/species groups were tabulated (Table 1). 80.4% of isolates were identified as *Acinetobacter* spp. (five major species) or *S. maltophilia*. Garenoxacin and 11 comparator agents were tested by reference MIC methods.

**Table 3. Garenoxacin MIC distributions for the uncommonly isolated Gram-negative species (≥ 100 strains tested only).**

| Organism (no. tested) | Cum. of inhibited at MIC (mg/L): | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | ≤0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | |
| *Acinetobacter* spp. (3,260) | 23.7 | 37.1 | 43.4 | 45.1 | 46.2 | 48.6 | (50.8)[a] | 59.9 | |
| *Aeromonas* spp. (387) | 7.5 | 24.8 | 50.9 | 68.2 | 78.8 | 87.9 | (94.8) | 97.2 | |
| *Alcaligenes* spp. (170) | 0.0 | 0.6 | 1.9 | 5.2 | 5.2 | 6.5 | (9.0) | 18.7 | |
| *Burkholderia* spp. (180) | 2.2 | 2.8 | 3.3 | 3.3 | 5.6 | 17.8 | (38.3) | 56.1 | |
| *N. meningitidis* (120) | 98.5 | 100.0 | - | - | - | - | (100.0) | - | |
| *S. maltophilia* (1,449) | 0.2 | 0.4 | 2.8 | 10.4 | 22.2 | 43.8 | (66.0) | 82.9 | |
| All strains (5,859) | 17.6 | 27.1 | 33.3 | 38.0 | 43.1 | 51.0 | (59.0) | 69.5 | |

a. Tentative susceptible breakpoint for comparison purposes only at ≤ 2 mg/L.

- Table 2 lists the antibiograms for the 12 agents with garenoxacin showing greatest activity against: *Neisseria* species (MIC$_{50}$, ≤ 0.03 - 0.06 mg/L) = *P. shigelloides* (MIC$_{50}$, ≤ 0.03 mg/L) = *Vibrio* spp. (MIC$_{50}$, 0.5 mg/L; 100.0% susceptible) > *Pasteurella* spp. (MIC$_{50}$, ≤ 0.03 mg/L; 98.3% susceptible) > *Aeromonas* spp., = *A. radiobacter* = *S. paucimobilis* (MIC$_{50}$, 0.12 mg/L; 94.1 - 94.8% susceptible) > *Chryseobacterium* spp. (MIC$_{50}$ 0.25 mg/L; 93.2% susceptible).
- The most prevalent species, *Acinetobacter* spp. and *S. maltophilia*, were less susceptible (50.8 - 66.0%, respectively) to garenoxacin. The most active agents against *Acinetobacter* spp. were imipenem (83.0% susceptible), amikacin (60.4%), cefepime (50.8%; same as garenoxacin) and the fluoroquinolones as a group (46.1 - 51.0%). Garenoxacin and other newer fluoroquinolones (gatifloxacin and levofloxacin) ranked second to trimethoprim/sulfamethoxazole (91.4% susceptible) versus *S. maltophilia* isolates.
- Garenoxacin was less effective in vitro against *Alcaligenes* (*Achromobacter*) spp., *Burkholderia* spp., and *O. anthropi* (MIC$_{50}$ range, 2 - > 4 mg/L).
- Against all non-*P. aeruginosa* "non-fermentative" Gram-negative organisms (5,859; Table 3), garenoxacin inhibited approximately one-half of the isolates at ≤ 1 or ≤ 2 mg/L.

**Table 2. Garenoxacin activity compared to 11 other antimicrobials tested against 15 groups of uncommonly isolated Gram-negative organisms (SENTRY Program, 1999 - 2003); the most prevalent genus/species groups.**

| Organism (rank; no. tested)/antimicrobial agent | MIC (mg/L) | | % by category:[a] | |
|---|---|---|---|---|
| | 50% | 90% | Susceptible | Resistant |
| ***Acinetobacter* spp. (3,260)** | | | | |
| Garenoxacin | 2 | >4 | (50.8)[b] | (40.1) |
| Ciprofloxacin | >2 | >2 | 46.1 | 53.0 |
| Levofloxacin | 4 | >4 | 49.9 | 38.2 |
| Gatifloxacin | 2 | >4 | 51.0 | 34.7 |
| Ceftriaxone | 32 | >32 | 28.1 | 49.0 |
| Ceftazidime | 16 | >16 | 46.9 | 45.3 |
| Cefepime | 8 | >16 | 50.8 | 34.4 |
| Piperacillin/Tazobactam | 32 | >64 | 46.0 | 41.3 |
| Imipenem | 0.5 | >8 | 83.0 | 14.1 |
| Gentamicin | 8 | >8 | 47.0 | 47.9 |
| Amikacin | 8 | >32 | 60.4 | 35.7 |
| Trimethoprim/Sulfamethoxazole | >1 | >2 | 46.0 | 52.4 |
| ***Aeromonas* spp. (387)** | | | | |
| Garenoxacin | 0.12 | 2 | (94.8) | (2.8) |
| Ciprofloxacin | ≤0.25 | ≤0.25 | 97.9 | 1.6 |
| Levofloxacin | ≤0.03 | 0.25 | 98.4 | 1.3 |
| Gatifloxacin | ≤0.03 | 0.25 | 98.2 | 1.6 |
| Ceftriaxone | ≤0.25 | 2 | 96.4 | 2.1 |
| Ceftazidime | ≤2 | ≤2 | 96.9 | 2.8 |
| Cefepime | ≤0.12 | 0.25 | 99.2 | 0.5 |
| Piperacillin/Tazobactam | 4 | >64 | 74.2 | 11.6 |
| Imipenem | 0.5 | 2 | 96.9 | 1.8 |
| Gentamicin | ≤2 | ≤2 | 96.9 | 2.1 |
| Amikacin | 2 | 8 | 97.9 | 0.5 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | 82.7 | 16.0 |
| ***Agrobacterium radiobacter* (17)** | | | | |
| Garenoxacin | 0.12 | 1 | (94.1) | (5.9) |
| Ciprofloxacin | ≤0.25 | ≤0.25 | 94.1 | 5.9 |
| Levofloxacin | 0.06 | 0.25 | 94.1 | 0.0 |
| Gatifloxacin | 0.06 | 0.5 | 94.1 | 0.0 |
| Ceftriaxone | 2 | 4 | 94.1 | 5.9 |
| Ceftazidime | 16 | >16 | 29.4 | 29.4 |
| Cefepime | 2 | 8 | 100.0 | 0.0 |
| Piperacillin/Tazobactam | 8 | 32 | 88.2 | 0.0 |
| Imipenem | ≤0.5 | ≤0.5 | 100.0 | 0.0 |
| Gentamicin | 4 | 8 | 82.4 | 5.9 |
| Amikacin | 16 | 32 | 82.4 | 5.9 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | 70.6 | 17.6 |
| ***Alcaligenes* spp. (170)** | | | | |
| Garenoxacin | >4 | >4 | (9.0) | (81.3) |
| Ciprofloxacin | >2 | >2 | 22.4 | 54.1 |
| Levofloxacin | 2 | >4 | 65.3 | 15.9 |
| Gatifloxacin | 2 | >4 | 60.0 | 17.1 |
| Ceftriaxone | >32 | >32 | 14.1 | 52.4 |
| Ceftazidime | 4 | >16 | 84.1 | 11.2 |
| Cefepime | 16 | >16 | 21.2 | 42.9 |
| Piperacillin/Tazobactam | 1 | 16 | 90.0 | 7.6 |
| Imipenem | 2 | 4 | 91.8 | 4.7 |
| Gentamicin | >8 | >8 | 18.8 | 77.6 |
| Amikacin | >32 | >32 | 20.6 | 72.8 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | 84.4 | 13.6 |
| ***Burkholderia* spp. (180)** | | | | |
| Garenoxacin | 4 | >4 | (38.3) | (43.9) |
| Ciprofloxacin | 1 | >2 | 54.4 | 31.1 |
| Levofloxacin | 2 | >4 | 67.2 | 18.3 |
| Gatifloxacin | 1 | >4 | 67.8 | 18.3 |
| Ceftriaxone | 16 | >32 | 47.8 | 23.9 |
| Ceftazidime | ≤2 | 16 | 86.7 | 8.9 |
| Cefepime | 8 | >16 | 66.1 | 19.4 |
| Piperacillin/Tazobactam | 4 | 64 | 77.8 | 9.4 |
| Imipenem | 4 | >8 | 55.6 | 15.6 |
| Gentamicin | >8 | >8 | 8.9 | 86.1 |
| Amikacin | >32 | >32 | 14.4 | 70.0 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | 65.0 | 25.0 |
| ***Chryseobacterium* spp. (59)** | | | | |
| Garenoxacin | 0.25 | 2 | (73.2) | (5.1) |
| Ciprofloxacin | 0.5 | >2 | 72.9 | 10.2 |
| Levofloxacin | 0.5 | 2 | 91.5 | 6.8 |
| Gatifloxacin | 0.25 | 2 | 93.2 | 3.4 |
| Ceftriaxone | 32 | >32 | 15.3 | 23.7 |
| Ceftazidime | 4 | >16 | 59.3 | 39.0 |
| Cefepime | 1 | >16 | 67.8 | 18.6 |
| Piperacillin/Tazobactam | 4 | 64 | 88.1 | 1.7 |
| Imipenem | >8 | >8 | 25.4 | 71.2 |
| Gentamicin | >8 | >8 | 10.2 | 84.7 |
| Amikacin | >32 | >32 | 52.5 | 32.2 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | 50.8 | 28.8 |
| ***Comamonas* spp. (17)** | | | | |
| Garenoxacin | 0.25 | 4 | (82.4) | (5.9) |
| Ciprofloxacin | ≤0.25 | >2 | 88.2 | 11.8 |
| Levofloxacin | 0.12 | >4 | 93.8 | 0.0 |
| Gatifloxacin | 0.06 | 2 | 100.0 | 0.0 |
| Ceftriaxone | 1 | 32 | 82.6 | 0.0 |
| Ceftazidime | ≤2 | ≤2 | 100.0 | 0.0 |
| Cefepime | 1 | 2 | 100.0 | 0.0 |
| Piperacillin/Tazobactam | ≤0.5 | 4 | 100.0 | 0.0 |
| Imipenem | 0.5 | 1 | 94.1 | 0.0 |
| Gentamicin | >8 | >8 | 11.8 | 82.4 |
| Amikacin | >32 | >32 | 18.8 | 81.2 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | ≤0.5 | 94.1 | 5.9 |
| ***N. meningitidis* (130)** | | | | |
| Garenoxacin | ≤0.03 | ≤0.03 | (100.0) | (0.0) |
| Ciprofloxacin | ≤0.25 | ≤0.25 | - | - |
| Levofloxacin | ≤0.03 | ≤0.03 | - | - |
| Gatifloxacin | ≤0.03 | ≤0.03 | - | - |
| Ceftriaxone | ≤0.25 | ≤0.25 | - | - |
| Ceftazidime | ≤2 | ≤2 | - | - |
| Cefepime | ≤0.12 | ≤0.12 | - | - |
| Piperacillin/Tazobactam | ≤0.5 | ≤0.5 | - | - |
| Imipenem | ≤0.5 | ≤0.5 | - | - |
| Gentamicin | ≤2 | ≤2 | - | - |
| Amikacin | 4 | 8 | - | - |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | - | - |
| ***Neisseria* spp. (26)** | | | | |
| Garenoxacin | 0.06 | 0.25 | (100.0) | (0.0) |
| Ciprofloxacin | ≤0.25 | ≤0.25 | - | - |
| Levofloxacin | ≤0.03 | 0.25 | - | - |
| Gatifloxacin | ≤0.03 | 0.12 | - | - |
| Ceftriaxone | ≤0.25 | ≤0.25 | - | - |
| Ceftazidime | ≤2 | ≤2 | - | - |
| Cefepime | ≤0.12 | 0.25 | - | - |
| Piperacillin/Tazobactam | ≤0.5 | ≤0.5 | - | - |
| Imipenem | ≤0.5 | ≤0.5 | - | - |
| Gentamicin | ≤2 | ≤2 | - | - |
| Amikacin | 4 | 8 | - | - |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | - | - |
| ***Ochrobactrum anthropi* (12)** | | | | |
| Garenoxacin | 2 | >4 | (50.0) | (16.7) |
| Ciprofloxacin | ≤0.25 | 1 | 91.7 | 8.3 |
| Levofloxacin | 0.25 | 2 | 91.7 | 8.3 |
| Gatifloxacin | 0.5 | 2 | 91.7 | 8.3 |
| Ceftriaxone | 8 | >32 | 25.0 | 58.3 |
| Ceftazidime | >16 | >16 | 25.0 | 75.0 |
| Cefepime | 16 | >16 | 33.3 | 59.0 |
| Piperacillin/Tazobactam | >64 | >64 | 33.3 | 66.7 |
| Imipenem | ≤0.5 | 1 | 100.0 | 0.0 |
| Gentamicin | ≤2 | >8 | 83.3 | 16.7 |
| Amikacin | 8 | 32 | 83.3 | 0.0 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | 83.3 | 16.7 |
| ***Pasteurella* spp. (58)** | | | | |
| Garenoxacin | ≤0.03 | ≤0.03 | (98.3) | (0.0) |
| Ciprofloxacin | ≤0.25 | ≤0.25 | 100.0 | 0.0 |
| Levofloxacin | ≤0.03 | 0.06 | 100.0 | 0.0 |
| Gatifloxacin | ≤0.03 | ≤0.03 | 100.0 | 0.0 |
| Ceftriaxone | ≤0.25 | ≤0.25 | 100.0 | 0.0 |
| Ceftazidime | ≤2 | ≤2 | 100.0 | 0.0 |
| Cefepime | ≤0.12 | 0.25 | 100.0 | 0.0 |
| Piperacillin/Tazobactam | ≤0.5 | ≤0.5 | 100.0 | 0.0 |
| Imipenem | ≤0.5 | ≤0.5 | 100.0 | 0.0 |
| Gentamicin | 4 | 8 | 84.5 | 15.5 |
| Amikacin | 0.5 | 16 | 94.7 | 5.3 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | 89.5 | 10.5 |
| ***Pleisiomonas shigelloides* (14)** | | | | |
| Garenoxacin | ≤0.03 | 0.5 | (100.0) | (0.0) |
| Ciprofloxacin | ≤0.25 | 0.5 | 92.9 | 0.0 |
| Levofloxacin | ≤0.03 | 0.5 | 100.0 | 0.0 |
| Gatifloxacin | ≤0.03 | 0.25 | 100.0 | 0.0 |
| Ceftriaxone | ≤0.25 | ≤0.25 | 100.0 | 0.0 |
| Ceftazidime | ≤2 | ≤2 | 100.0 | 0.0 |
| Cefepime | ≤0.12 | ≤0.12 | 100.0 | 0.0 |
| Piperacillin/Tazobactam | ≤0.5 | ≤0.5 | 100.0 | 0.0 |
| Imipenem | ≤0.5 | 1 | 100.0 | 0.0 |
| Gentamicin | 4 | 8 | 85.7 | 0.0 |
| Amikacin | 16 | 32 | 85.7 | 0.0 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | ≤0.5 | 92.9 | 7.1 |
| ***Sphingomonas paucimobilis* (19)** | | | | |
| Garenoxacin | 0.12 | 2 | (94.7) | (0.0) |
| Ciprofloxacin | ≤0.25 | 1 | 94.7 | 5.3 |
| Levofloxacin | 0.25 | 2 | 94.7 | 5.3 |
| Gatifloxacin | 0.06 | 1 | 89.5 | 5.3 |
| Ceftriaxone | 2 | 16 | 78.9 | 5.3 |
| Ceftazidime | 8 | >16 | 68.4 | 31.6 |
| Cefepime | 4 | >16 | 68.4 | 15.8 |
| Piperacillin/Tazobactam | 1 | 32 | 84.2 | 5.3 |
| Imipenem | ≤0.5 | 1 | 100.0 | 0.0 |
| Gentamicin | ≤2 | >8 | 89.5 | 10.5 |
| Amikacin | 0.5 | 16 | 94.7 | 5.3 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | >2 | 89.5 | 10.5 |
| ***Stenotrophomonas maltophilia* (1,449)** | | | | |
| Garenoxacin | 2 | >4 | (66.0) | (17.1) |
| Ciprofloxacin | 1 | >2 | 30.2 | 39.7 |
| Levofloxacin | 1 | 4 | 87.5 | 5.8 |
| Gatifloxacin | 1 | 4 | 87.5 | 5.5 |
| Ceftriaxone | >32 | >32 | 1.3 | 93.0 |
| Ceftazidime | 8 | >16 | 51.1 | 35.1 |
| Cefepime | 16 | >16 | 26.3 | 43.5 |
| Piperacillin/Tazobactam | >64 | >64 | 12.4 | 60.1 |
| Imipenem | >8 | >8 | 0.6 | 98.7 |
| Gentamicin | >8 | >8 | 12.4 | 80.7 |
| Amikacin | >32 | >32 | 14.8 | 73.7 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | ≤0.5 | 91.4 | 3.9 |
| ***Vibrio* spp. (61)** | | | | |
| Garenoxacin | 0.5 | 0.5 | (100.0) | (0.0) |
| Ciprofloxacin | ≤0.25 | ≤0.25 | 100.0 | 0.0 |
| Levofloxacin | 0.06 | 0.12 | 100.0 | 0.0 |
| Gatifloxacin | 0.12 | ≤0.25 | 100.0 | 0.0 |
| Ceftriaxone | ≤0.25 | ≤0.25 | 98.4 | 1.6 |
| Ceftazidime | ≤2 | ≤2 | 100.0 | 0.0 |
| Cefepime | 0.25 | 0.5 | 100.0 | 0.0 |
| Piperacillin/Tazobactam | ≤0.5 | ≤0.5 | 98.4 | 0.0 |
| Imipenem | ≤0.5 | ≤0.5 | 100.0 | 0.0 |
| Gentamicin | ≤2 | 4 | 98.4 | 0.0 |
| Amikacin | 4 | >8 | 98.4 | 0.0 |
| Trimethoprim/Sulfamethoxazole | ≤0.5 | ≤0.5 | 96.7 | 1.6 |

a. Susceptibility criteria of the CLSI/NCCLS (2005) as applied to Enterobacteriaceae.
b. Garenoxacin MIC breakpoint of ≤ 2 mg/L, for comparison purposes only.

## Conclusions

- Garenoxacin, a novel des-F(6)-quinolone, demonstrated variable potencies against 5,859 strains of Gram-negative non-Enterobacteriaceae organisms (not *P. aeruginosa*), suggesting that in vitro testing would aid in guiding chemotherapy.
- Ten of the 15 genus/species groups analyzed exhibited ≥ 82.4% susceptibility (range, 82.4 - 100.0%) to garenoxacin at ≤ 2 mg/L. However, only 50.8% of *Acinetobacter* spp. isolates and 66% of *S. maltophilia* isolates were susceptible to garenoxacin. This level of activity is comparable to other newer fluoroquinolones.
- Garenoxacin appears to be a promising, broad-spectrum fluoroquinolone with activity against many uncommonly isolated Gram-negative pathogens (e.g. 59.0% of 5,859 strains were inhibited at ≤ 2 mg/L).

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