

ДАНИ ЗАВОДА
2023
28. СТРУЧНА КОНФЕРЕНЦИЈА

ДА ЛИ ЈЕ ЕПИДЕМИЈА COVID-19 УТИЦАЛА НА АНТИМИКРОБНУ РЕЗИСТЕНЦИЈУ У УКЦС?

Прим мр сци мед др Снежана Јовановић

Прим др сци мед др Милица Јовановић



HIGH-LEVEL MEETING ON ANTIMICROBIAL RESISTANCE



21 SEPTEMBER 2016, UN HEADQUARTERS, NEW YORK

21 September 2016 @ 10:00 am - 6:00 pm

WHO's AMR response 4 key priorities: lead global efforts,
drive public health impact, promote R&D, **monitor AMR
burden and response**
WHO AMR priorities



..... **Antimicrobial resistance (AMR)** has become one of
the biggest threats to global health and endangers
other major priorities, such as human development...



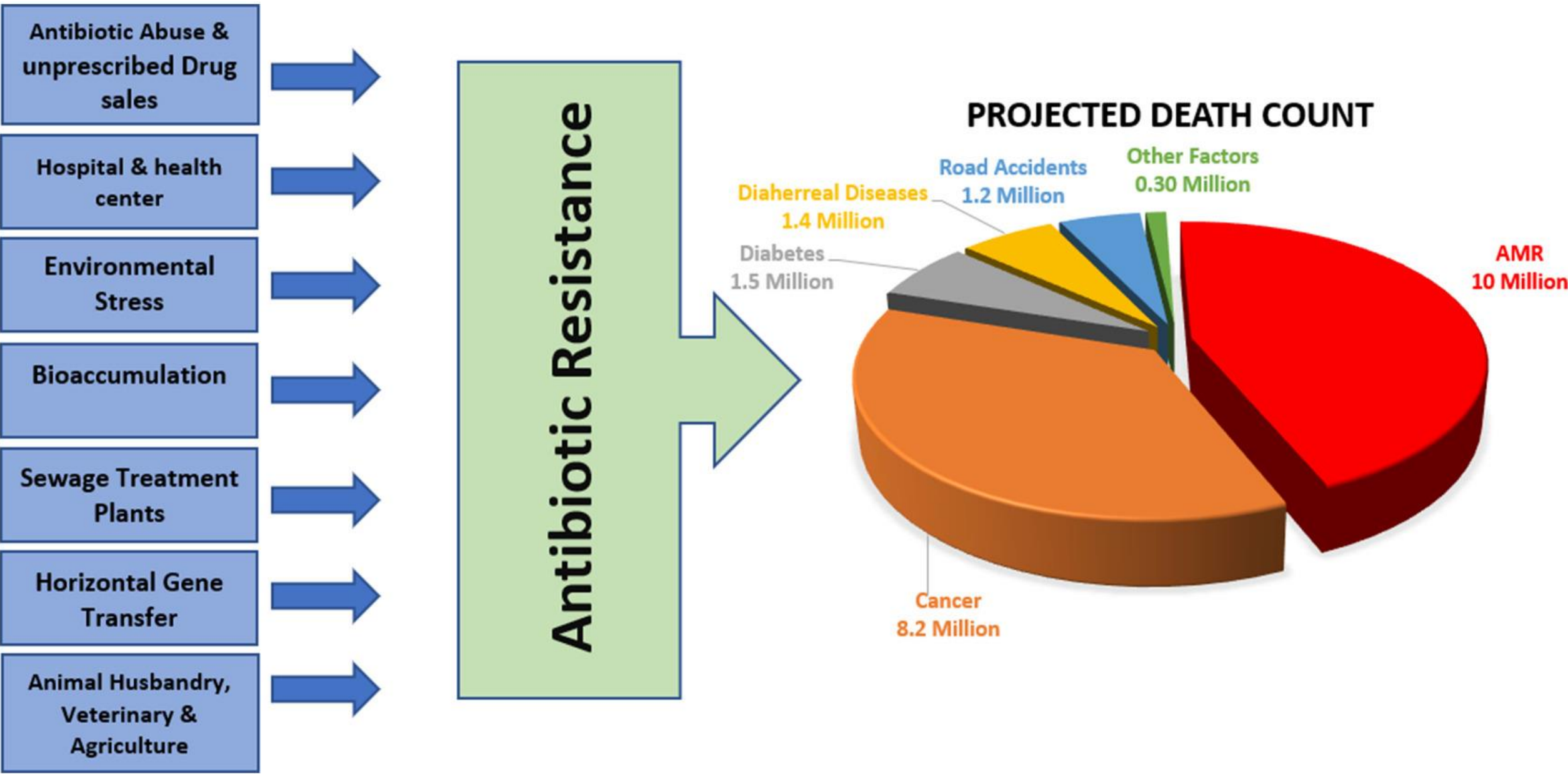


Fig. 1. Anthropogenic disturbances increase Antibiotic Resistance in the environment either directly or indirectly. Due to the pandemic, there is a surge in antibiotic usage in various sectors, especially health care centers and [pharmaceutical industries](#) which will escalate the existing Antimicrobial Resistance burden. According to [Neill \(2014\)](#)

- ❖ AMR was directly responsible for an estimated 1.27 million deaths worldwide, and associated with an estimated 4.95 million deaths, in 2019
- ❖ HIV/AIDS and malaria have been estimated to have caused 860,000 and 640,000 deaths, respectively, in 2019



- ❖ Globally, as of 6:15pm CET, 8 November 2023, there have been **771,820,937** confirmed cases of COVID-19, including **6,978,175 deaths**, reported to WHO.





"COVID-19 has opened people's minds to infectious diseases. Now is a good time to raise awareness of the AMR crisis" - Dr Elizabeth Klemm, BSAC Spring Conference 2021



..ПРИЧА О ДВЕ ПАНДЕМИЈЕ..



...around 87.7% of COVID-19 patients were treated with antibiotics, whereas only 6.9% of patients were co-infected with bacteria /fungal or had a secondary infection...

Data assessing the impact of the COVID-19 pandemic on antimicrobial resistance showed a:

78%

increase in
carbapenem-
resistant
Acinetobacter

32%

increase in
multidrug-resistant
*Pseudomonas
aeruginosa*

13%

increase in MRSA

Healio

Saha, M.; Sarkar, A. Review on Multiple Facets of Drug Resistance: A Rising Challenge in the 21st Century. *J. Xenobiot.* 2021, 11, 197-214

Sidra Ghazali Rizvi, Shaikh Ziauddin Ahammad. COVID-19 and antimicrobial resistance: A cross-study, *Science of The Total Environment*, Volume 807, Part 2, 2022, 150873, ISSN 0048-9697,



30



Review

Impact of COVID-19 pandemic on multidrug resistant gram positive and gram negative pathogens: A systematic review

Usman Abubakar ^{a,*}, Menier Al-Anazi ^b, Zainab alanazi ^c, Jesús Rodríguez-Baño ^{d,e,f}^a Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia^b Faculty of Science, University of Tabuk, Tabuk 71491, Kingdom of Saudi Arabia^c Department of Family Medicine, King Salman Armed Forces Hospital, Tabuk 47512, Saudi Arabia^d Biomedicine Institute of Seville (IBIS)/CSIC, Seville, Spain, CIBERINFEC, Instituto de Salud Carlos III, Madrid, Spain^e Department of Medicine, University of Seville, Madrid, Spain^f Infectious Diseases and Microbiology division, Hospital Universitario Virgen Macarena, Seville, Spain, CIBERINFEC, Instituto de Salud Carlos III, Madrid, Spain

A B S T R A C T

Background: There is paucity of data describing the impact of COVID-19 pandemic on antimicrobial resistance. This review evaluated the changes in the rate of multidrug resistant gram negative and gram positive bacteria during the COVID-19 pandemic.

Methods: A search was conducted in PubMed, Science Direct, and Google Scholar databases to identify eligible studies. Studies that reported the impact of COVID-19 pandemic on carbapenem-resistant *Acinetobacter baumannii* (CRAB), carbapenem-resistant *Enterobacteriaceae* (CRE), extended-spectrum beta-lactamase inhibitor (ESBL)-producing *Enterobacteriaceae*, vancomycin-resistant enterococci (VRE), methicillin-resistant *Staphylococcus aureus* (MRSA) and carbapenem-resistant *Pseudomonas aeruginosa* (CPE) were selected. Studies published in English language from the start of COVID-19 pandemic to July 2022 were considered for inclusion.

Results: Thirty eligible studies were selected and most of them were from Italy (n = 8), Turkey (n = 3) and Brazil (n = 2). The results indicated changes in the rate of multidrug resistant bacteria, and the changes varied between the studies. Most studies (54.5%) reported increase in MRSA infection/colonization during the pandemic, and the increase ranged from 4.6 to 170.6%. Five studies (55.6%) reported a 6.8–65.1% increase in VRE infection/colonization during the pandemic. A 2.4–58.2% decrease in ESBL *E. coli* and a 1.8–13.3% reduction in ESBL *Klebsiella pneumoniae* was observed during the pandemic. For CRAB, most studies (58.3%) reported 1.5–621.6% increase in infection/colonization during the pandemic. Overall, studies showed increase in the rate of CRE infection/colonization during the pandemic. There was a reduction in carbapenem-resistant *E. coli* during COVID-19 pandemic, and an increase in carbapenem-resistant *K. pneumoniae*. Most studies (55.6%) showed 10.4 – 40.9% reduction in the rate of CRPA infection during the pandemic.

Conclusion: There is an increase in the rate of multidrug resistant gram positive and gram negative bacteria during the COVID-19 pandemic. However, the rate of ESBL-producing *Enterobacteriaceae* and CRPA has decrease during the pandemic. Both infection prevention and control strategies and antimicrobial stewardship should be strengthen to address the increasing rate of multidrug resistant gram positive and gram negative bacteria.



MRSA

VRE- 5 studija

CRAB

CRE (K.p.)

ESBL;CR *E. coli*

ESBL+

K. pneumoniae

CRPA





RESEARCH

Open Access



Assessment of antibiotic resistance changes during the Covid-19 pandemic in northeast of Iran during 2020–2022: an epidemiological study

Reza Khoshbakht^{1,2}, Mona Kabiri³, Alireza Neshani^{1,2}, Moha

CR *K. pneumoniae* 71.7%
CR *E. coli* 42.7%
CRAB 88.9%
CR *P. aeruginosa* 91.8%

Abstract

Background: The coronavirus disease 2019 seems to change conditions in the Covid-19 era may be contributing to the rise of antimicrobial resistance. To determine the impact of Covid-19 on antimicrobial resistance (AMR), the purpose of this research was to investigate the trend in antimicrobial resistance changes of *E. coli*, *P. aeruginosa*, *K. pneumoniae*, and *A. baumannii* in Hasheminezhad hospital. This hospital was a Corona center in Mashhad at the onset of this epidemic.

Methods: 1672 clinical samples were collected between January 21, 2020 and January 30, 2022 from patients hospitalized at Hasheminezhad Hospital in Mashhad. Conventional microbiological procedures for identifying gram-negative bacteria and antibiotic susceptibility testing were used, according to the clinical and laboratory standards institute (CLSI) 2021. The two years of the pandemic, from the initial stage of the outbreak until the 6th peak, (January 2020 to and January 2022) were divided into 9 periods according to the seasons.

Results: Highest resistance rates were seen in *E. coli* (615 samples), *K. pneumoniae* (351 samples), *P. aeruginosa* (362 samples) and *A. baumannii* (344 samples) to Ampicillin (89.6%), Ampicillin (98%), Imipenem (91.8%), and Ceftazidime (94.6%), respectively. The largest change in antibiotic resistance was seen between Summer 2020 and Summer 2021 for *K. pneumoniae* with about a 30% rise in antibiotic resistance to Ceftriaxone.

Conclusions: All 4 species evaluated in this study, have shown rising AMR rates during the first year of the pandemic in the northeast of Iran. This study revealed that *E. coli*, *P. aeruginosa*, *K. pneumoniae*, and *A. baumannii* strains in Northern Iran have a higher level of antibiotic resistance than what was measured in similar studies conducted before the pandemic. This will further restrict treatment choices and jeopardize global public health.



УНИВЕРЗИТЕТСКИ КЛИНИЧКИ ЦЕНТАР СРБИЈЕ

Hospital Name	Capacity	Location
1.Chang Gung Memorial Hospital	10,000	Taoyuan, Taiwan
2.West China Medical Center of Sichuan University	4,300	Chengdu, China
3.Chris Hani Baragwanath Hospital	3,500	Johannesburg, South Africa
4.Clinical Center of Serbia	3,478	Belgrade, Serbia
5.Ahmedabad Civil Hospital	2,800	Asarwa, India
6.Beijing Hospital of Traditional Chinese	2,500	Beijing, China
7.Presbyterian Hospital	2,478	New York, USA
8.Jackson Memorial Hospital	2,000	Miami, Florida
9.St. George's Hospital	1,300	London, United Kingdom
10. Aucland City Hospital	1 200	Aucland , New Zeland

+ 1000 кревета од 15.12.2020.
COVID БОЛНИЦА БАТАЈНИЦА

The largest hospitals in the world are:

- 1.Chang Gung Memorial Hospital
2. Clinical Center of Serbia
- 3.West China Medical Center of Sichuan University
- 4.Chris Hani Baragwanath Hospital



МАТЕРИЈАЛ И МЕТОДЕ РАДА

- ❖ **ретроспективна анализа** микробиолошких резултата (антибиограм)
 - Одсек бактериологије на Клиници за инфективне и тропске болести

 - ❖ из **хемокултура** пацијената хоспитализованих у Клиникама УКЦС изоловани су сојеви бактерија
 - Инфективна клиника*, Клиника за пулмологију*, Клиника за грудну хирургију, Клиника за пластичну и реконструктивну хирургију, **Ковид болница Батајница***, **Кожна клиника***, Клиника за ГЕХ, Клиника за неврологију
- * COVID-19 клинике
- ❖ **боце за хемокултуре**: Bactec sistem 9240 (Becton Dickinson Diagnostic Instrument Systems, Sparks, Md.)



МАТЕРИЈАЛ И МЕТОДЕ РАДА

- ❖ идентификација и осетљивост на антимикробне лекове је рађена стандардним микробиолошким методама:
 - диск дифузија
 - одређивањем вредности **MIC**-а целулоидном траком са градијентом концентрације антибиотика - E тестом (bioMerieux, France);
- ❖ и/или у полуавтоматизованом систему **VITEK 2 Compact** (bioMerieux, France); картице : GN;GP, AST GN76, AST XN05, AST N240, AST P580,AST P586

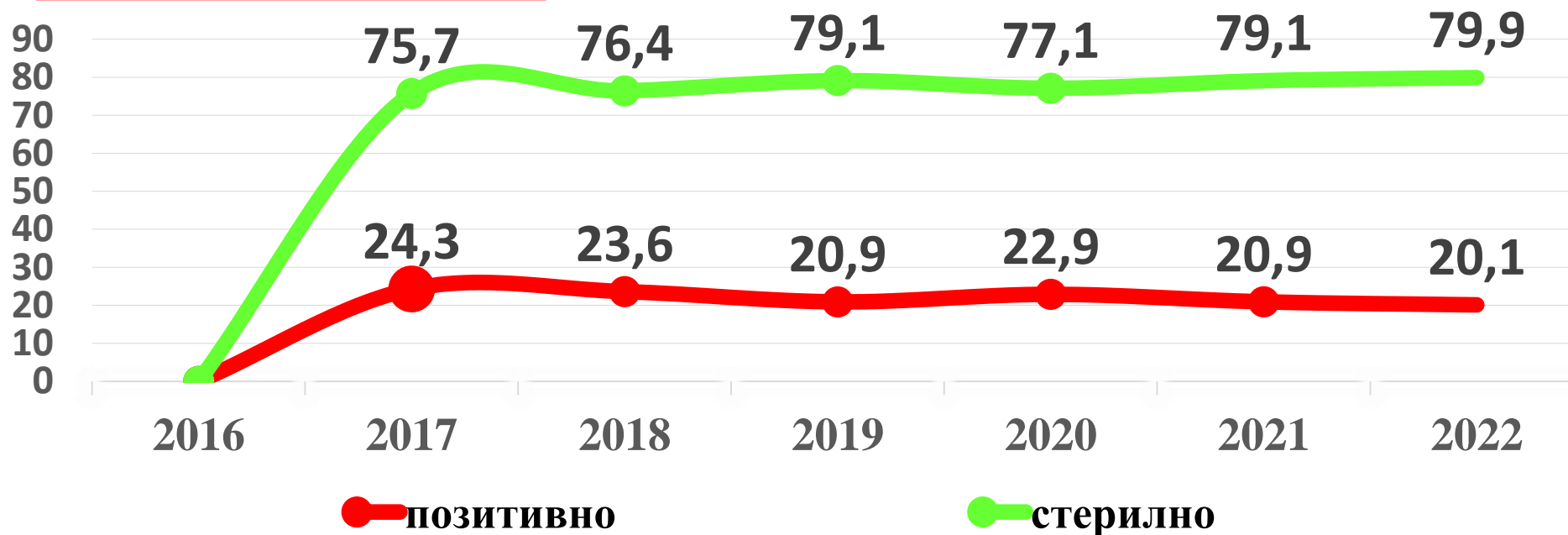


ПРОЦЕНАТ ПОЗИТИВНИХ БОЦА ХЕМОКУЛТУРА ПО ГОДИНАМА

Укупно: 133.604 боца

ГОДИНА	Бр боца ХК
2016	5000
2017	17218
2018	23026
2019	23470
2020	22173
2021	28671
2022	35169

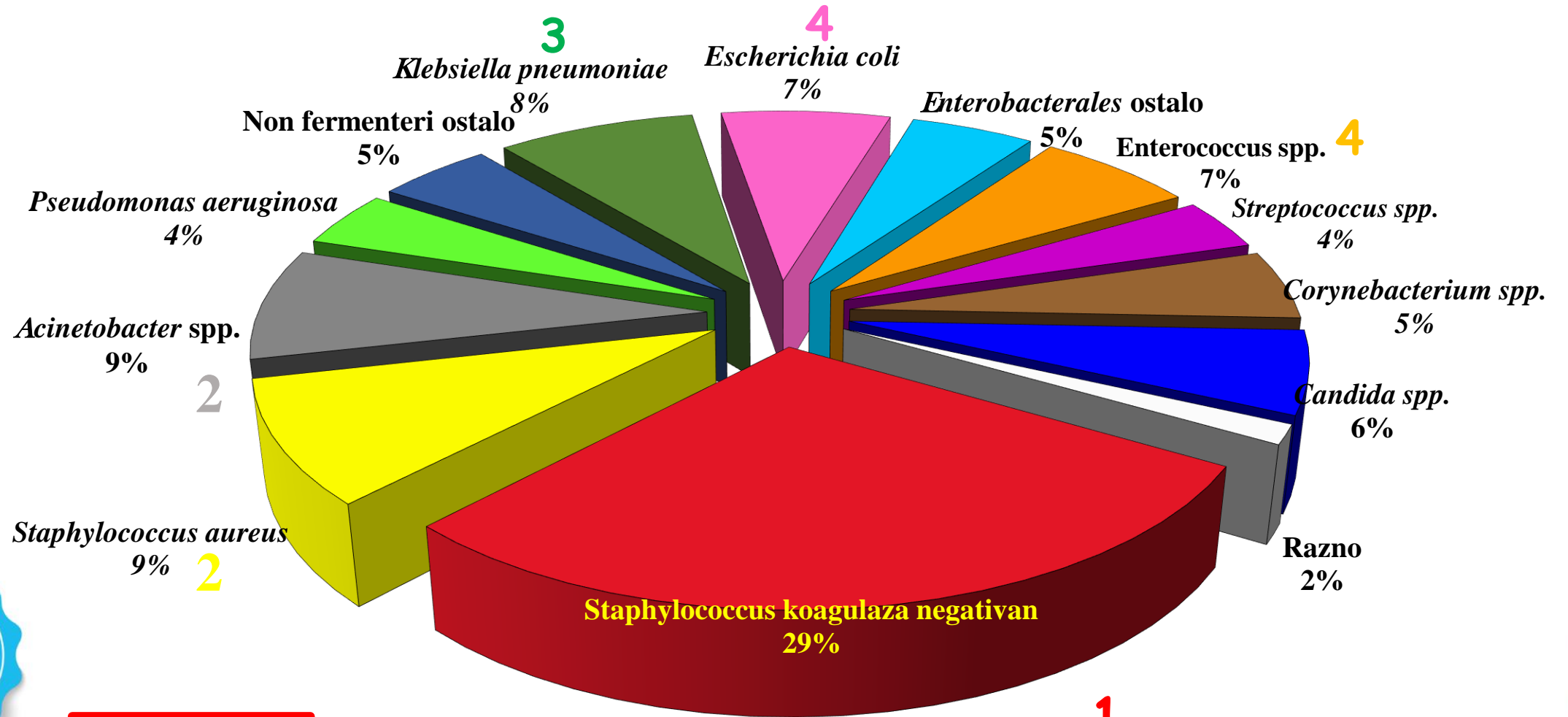
% ПОЗИТИВНИХ БОЦА



хемокултура-ХК

УКЦС 01.01.2017-31.12.2022.

БРОЈ И ВРСТА ПРИМОИЗОЛАТА ИЗ ХЕМОКУЛТУРА (2017.)



n=1053

ОДСЕК ИНФЕКТИВНА КЛИНИКА 01.01.-31.12.2017.



БРОЈ И ВРСТА ПРИМОИЗОЛАТА ОД 01.01.2022. - 31.12.2022. ГОДИНЕ

Vrsta bakterije	Broj primoizolata
2 <i>Acinetobacter</i> spp.	592
<i>E. faecalis</i>	362
<i>E. faecium</i>	276
4 <i>E. coli</i>	423
1 <i>K. pneumoniae</i>	969
<i>P. aeruginosa</i>	177
3 <i>S. aureus</i>	573
<i>S. pneumoniae</i>	48
<i>Salmonella</i> spp.	11
Ukupan br. izolata	3431



- 24 лабораторије
- 80% територије

❖ РЛ за АМР ИЗЈЗ Војводина-Нови Сад



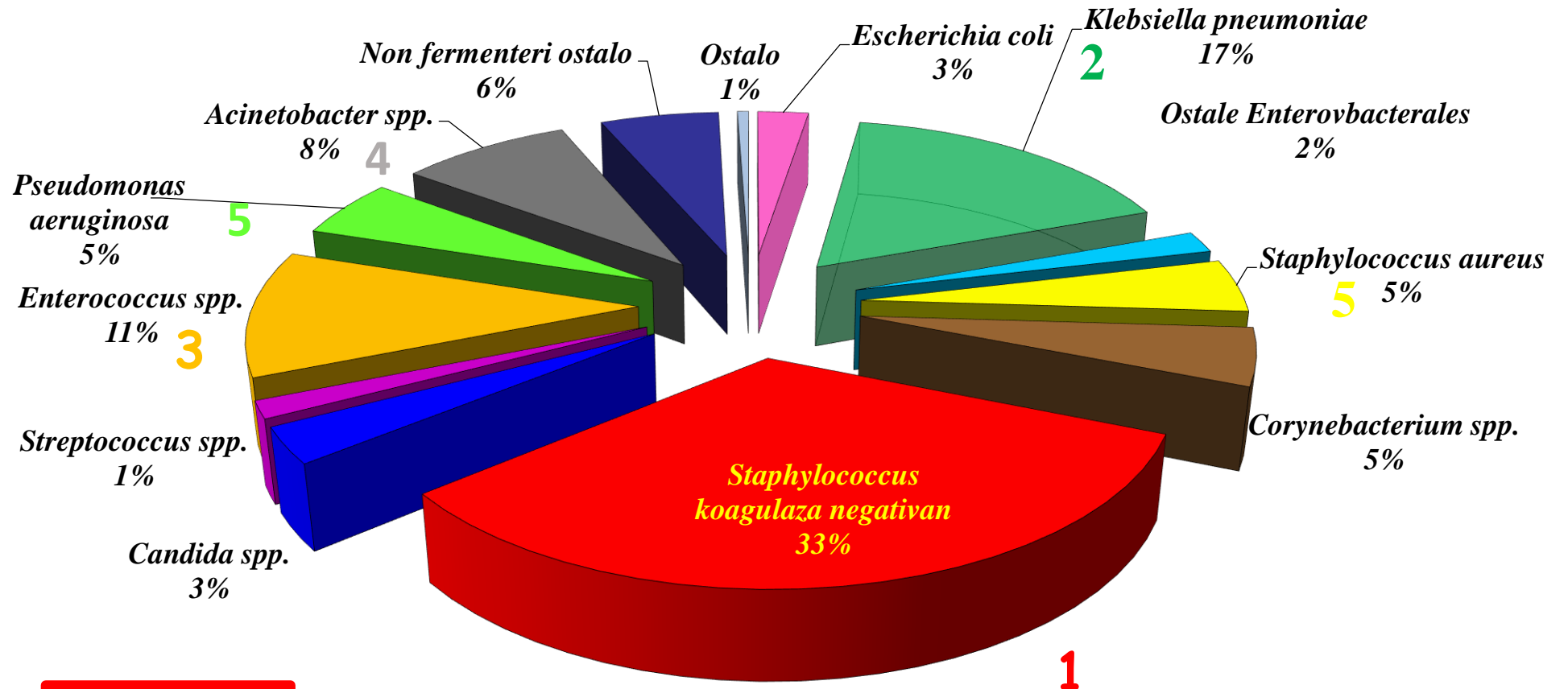
БРОЈ И ВРСТА ПРИМОИЗОЛАТА ИЗ ХЕМОКУЛТУРА - УКЦС (2022.)

SPECIES	БРОЈ СОЈЕБА
<i>Klebsiella pneumoniae</i>	970
<i>Acinetobacter baumannii</i> compl.	568
<i>S.aureus</i>	304
<i>P.aeruginosa</i>	270
<i>E.faecium</i>	151
<i>E.coli</i>	144
<i>E.faecalis</i>	111

УКЦС 01.01.-31.12.2022.



БРОЈ И ВРСТА ПРИМОИЗОЛАТА ИЗ ХЕМОКУЛТУРА (2022.)



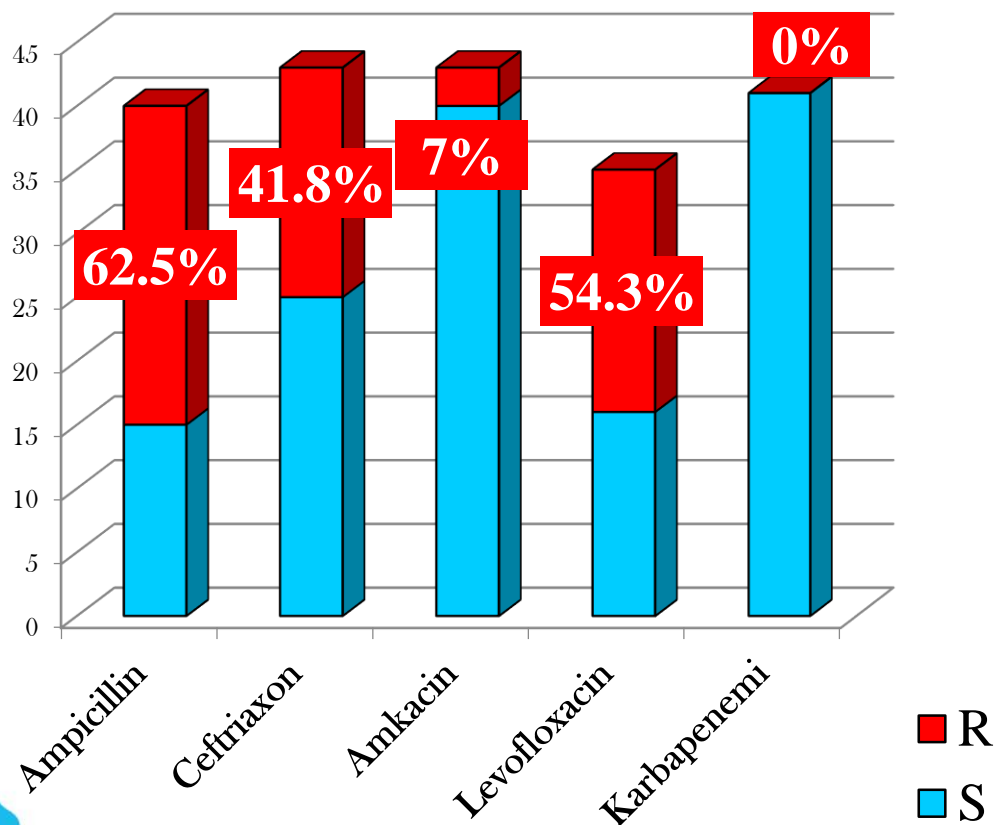
n=2891

ОДСЕК ИНФЕКТИВНА КЛИНИКА 01.01.-31.12.2022.

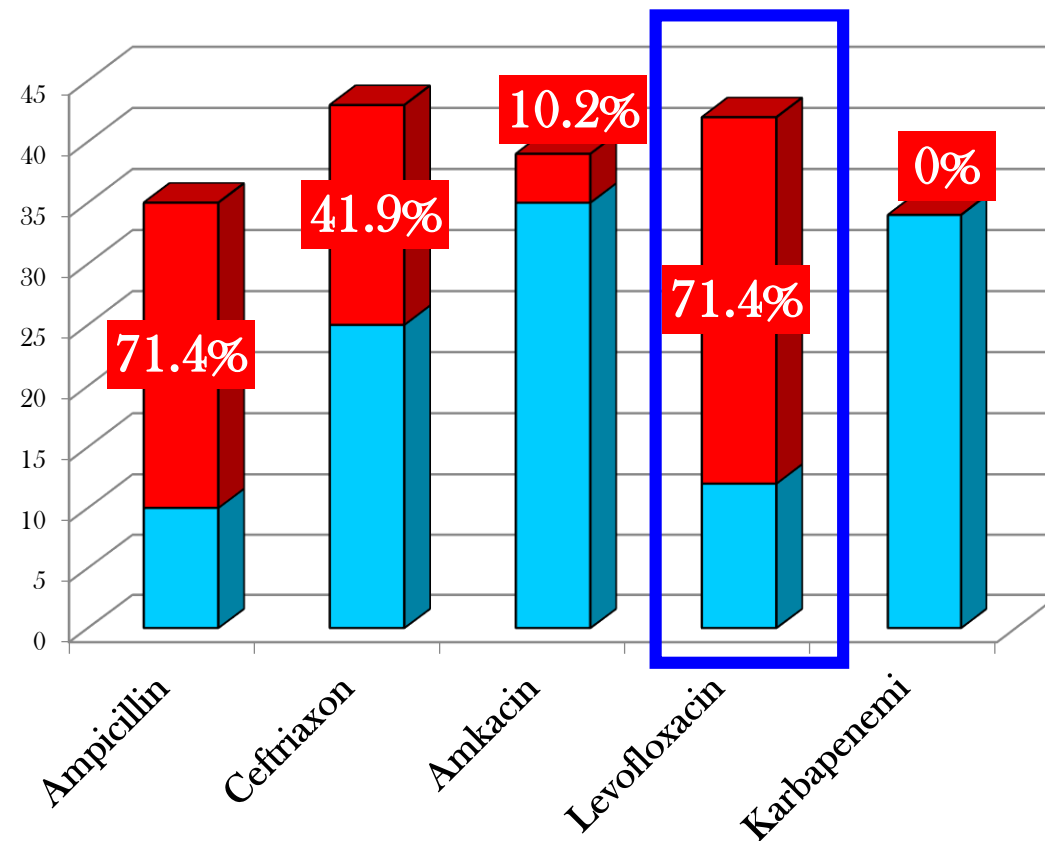


Escherichia coli

❖ 2017: %R



❖ 2022: %R



■ R
■ S



Статистички значајно повећање резистенције:
Levofloxacin: $p=0.009$



2022.

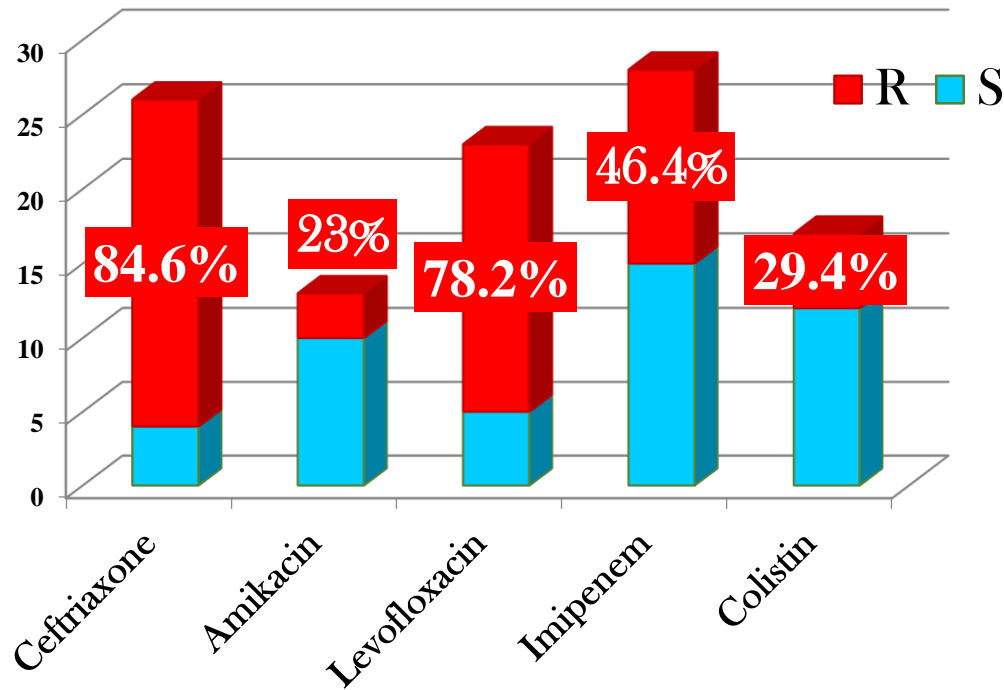
■ 1.1% Colistin
■ 1.5% Meropenem

❖ РЛ за АМР ИЗЈЗ Војводина-Нови Сад

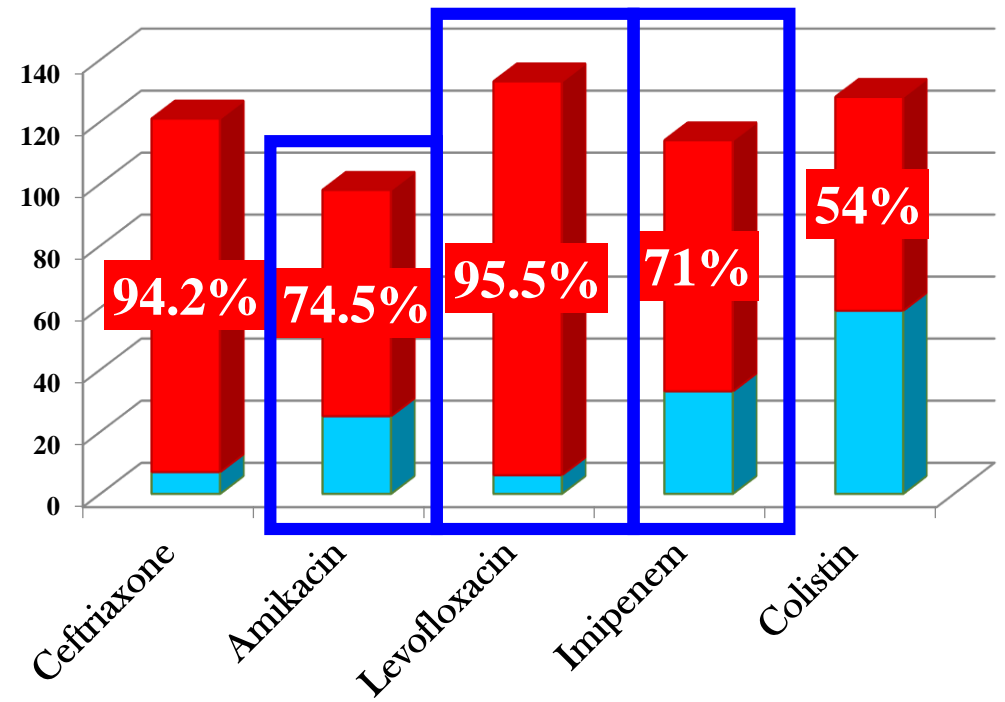


Klebsiella pneumoniae

❖ 2017: %R



❖ 2022: %R



Статистички значајно повећање резистенције :

Amikacin $p=0.0006$ Imipenem $p=0.025$

Levofloxacin $p=0.011$



2022.

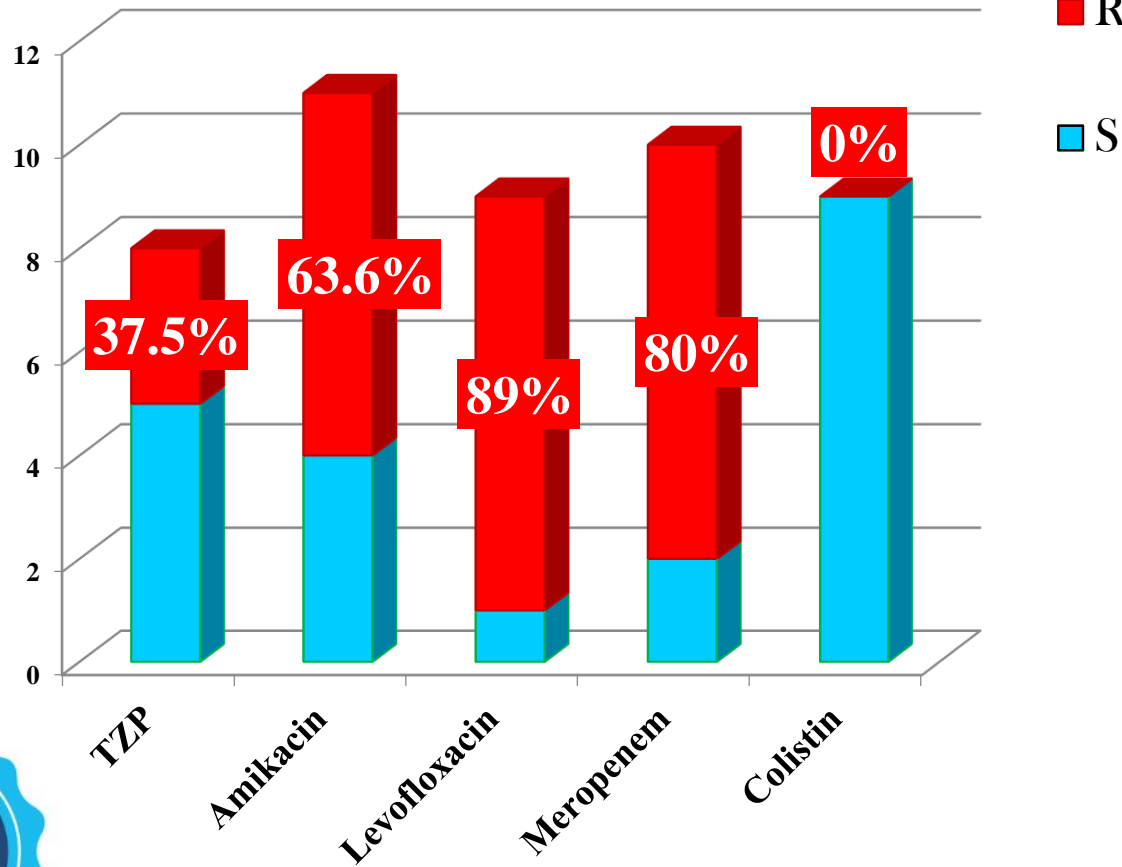
■ 35,4% Colistin

■ 65.7% Meropenem

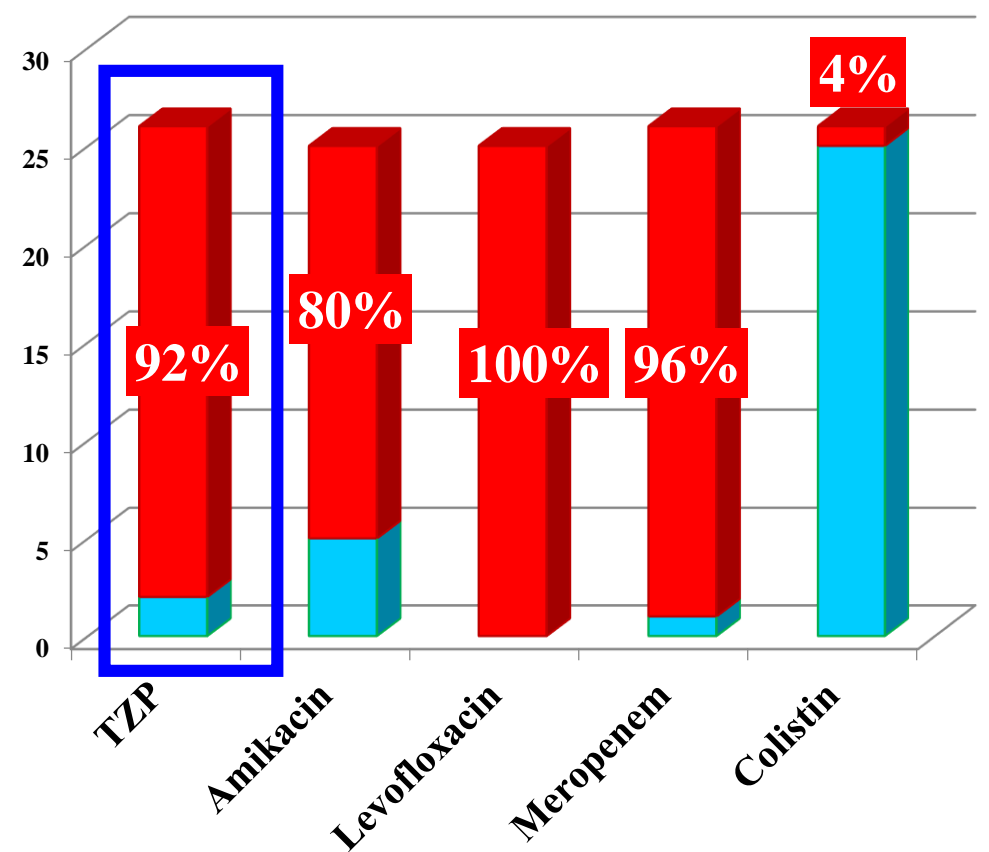


Pseudomonas aeruginosa

❖ 2017: %R



❖ 2022: %R



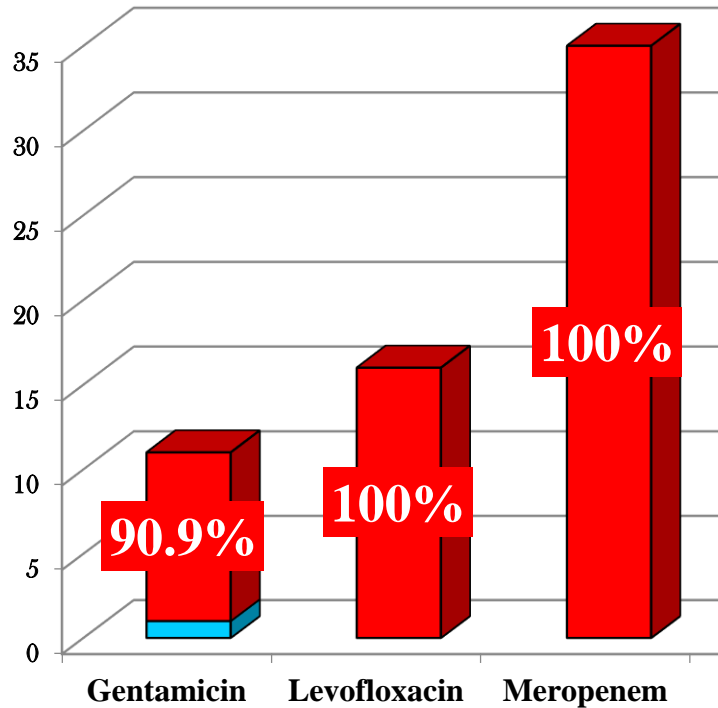
Статистички значајно повећање резистенције :
Piperacillin-Tazobactam (TZP): $p=0.004$



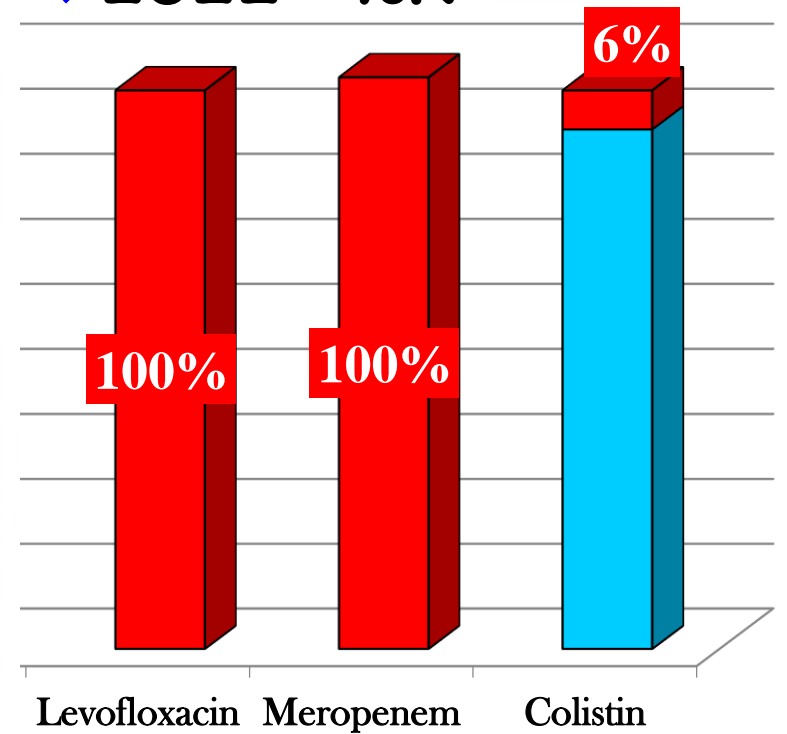
2022.
■ 1.3% Colistin
■ 49.4% Meropenem

Acinetobacter spp.

❖ 2017: %R



❖ 2022: %R

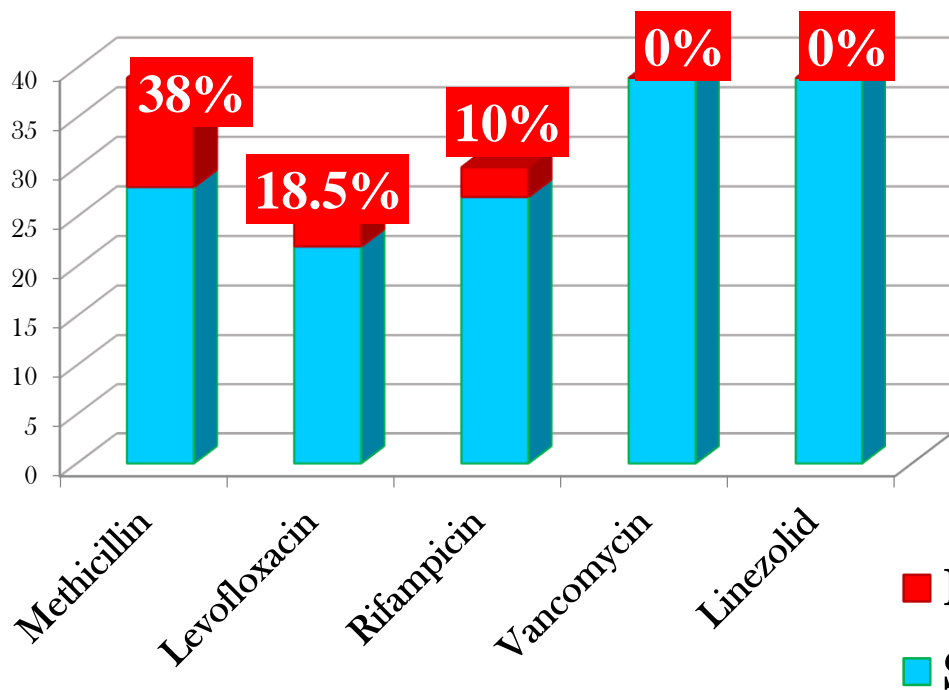


2022.
■ 1.9% Colistin
■ 97.5% Meropenem

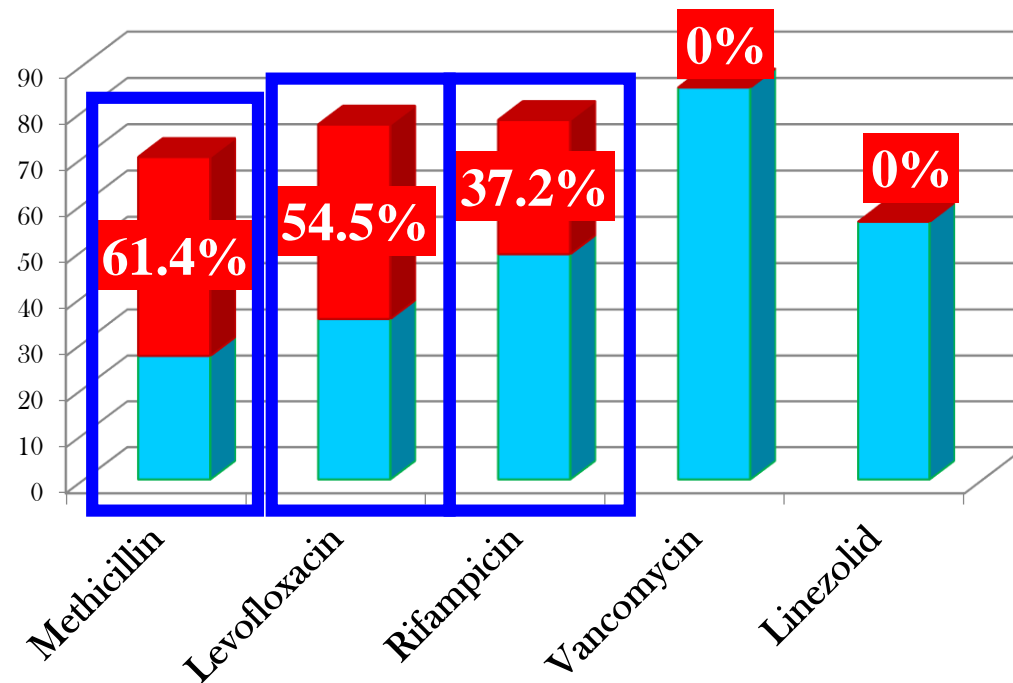


Staphylococcus aureus

❖ 2017: %R



❖ 2022: %R



■ R
■ S

Статистички значајно повећање резистенције:

Methicillin: $p=0.001$

Levofloxacin: $p=0.009$

Rifampicin: $p=0.011$



2022.

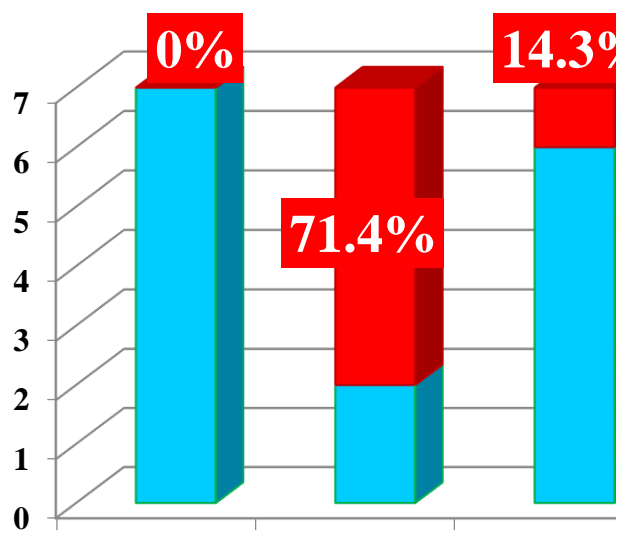
■ 28.6% Methicillin



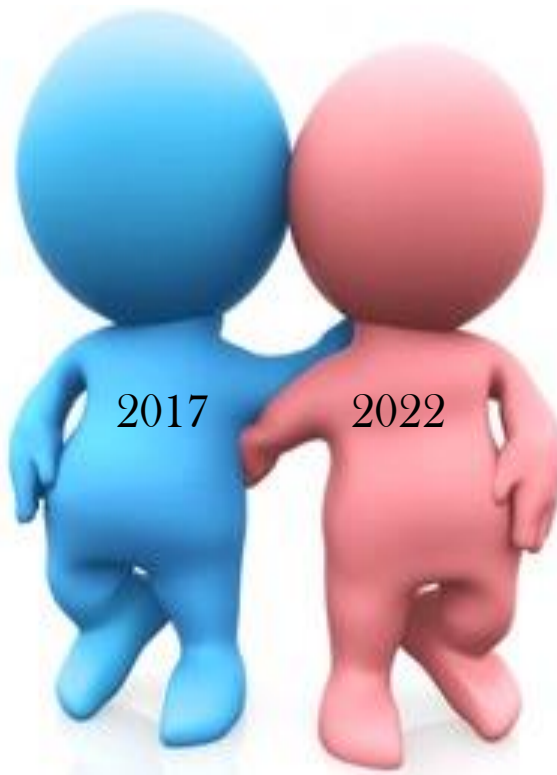
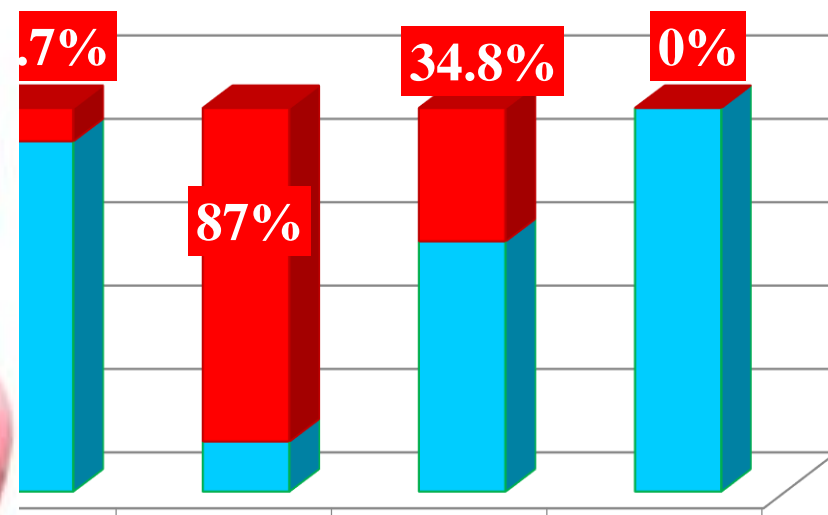
Enterococcus faecalis



❖ 2017: %R



❖ 2022: %R



2022.
■ 69.2% Gentamicin VD

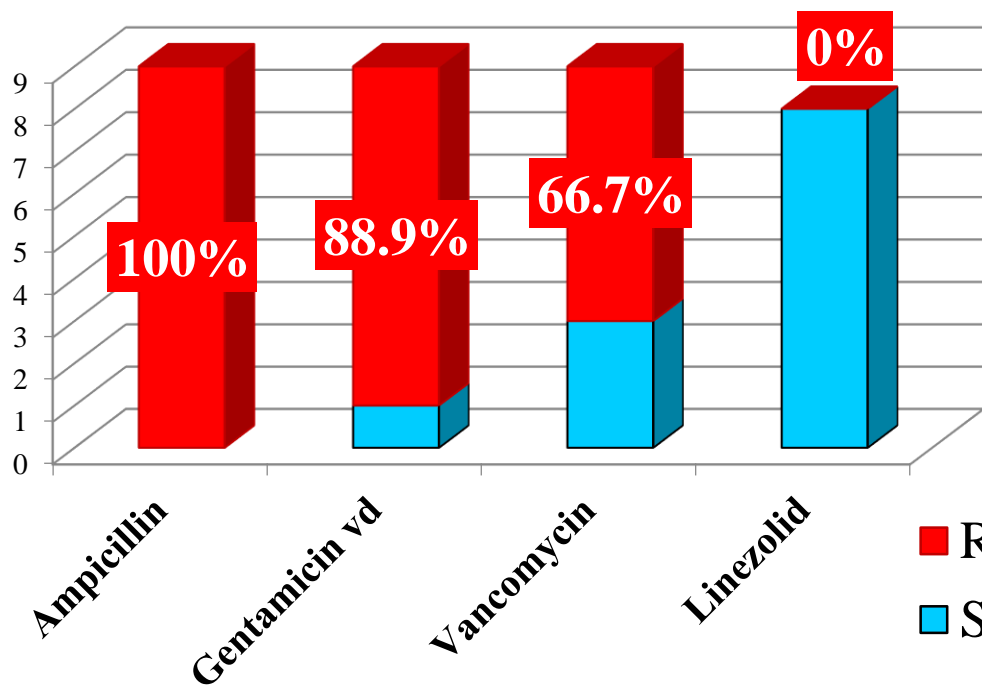
❖ РЛ за АМР ИЗЈЗ Војводина-Нови Сад



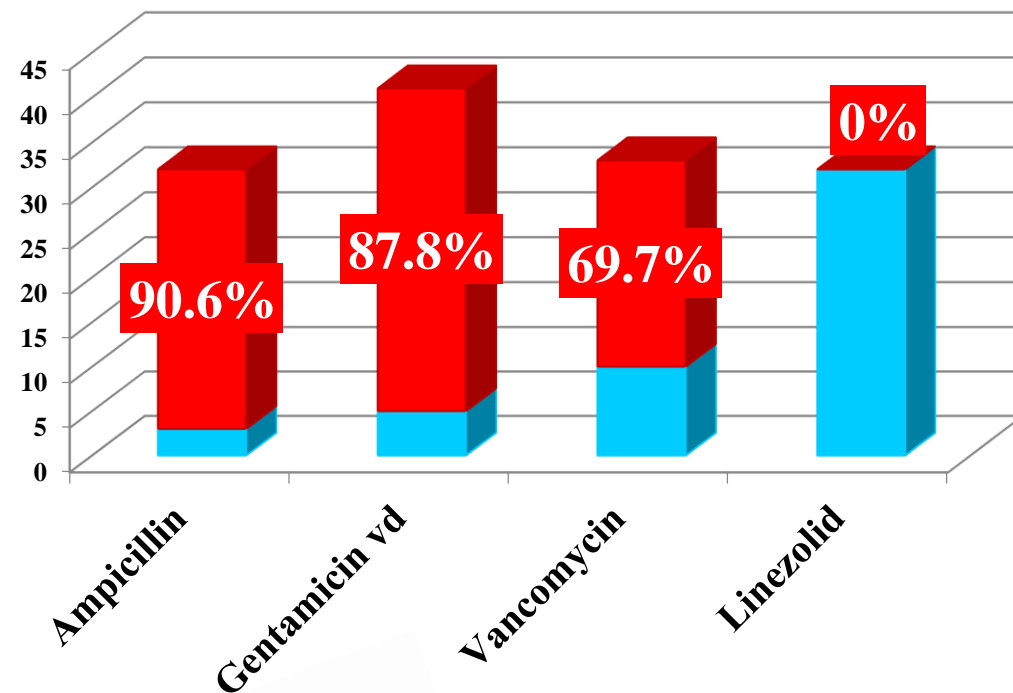
Enterococcus faecium



❖ 2017: %R



❖ 2022: %R



■ R
■ S



2022.

■ 53.1% Vancomycin

ИМА РАЗЛИЧИТИХ РЕЗУЛТАТА.....



KBC "Dr Dragiša Mišović-Dedinje"



КЛИНИЧКИ ЦЕНТАР СРБИЈЕ
КЛИНИКА ЗА ПУЛМОЛОГИЈУ



УНИВЕРЗИТЕТСКИ КЛИНИЧКИ ЦЕНТАР СРБИЈЕ (УКЦС)
СЛУЖБА ЗА МЕДИЦИНСКУ МИКРОБИОЛОГИЈУ
Лабораторијски одсек за бактериологију и микологију на Поликлиници КЦС

Име пацијента:

BRES PETAR

Дат. рођења: 5.12.1956

Упутилац: Клиника за пулмологију
Dnevna bolnica za interventnu pulmologiju

ЛБО: 26200765639

Наручилац: Dr Milivojević Ivan

Пол: М

Бр. историје/протокола: PULM-4772/2022

Дијагноза: J189

Врста узорка: **Aspirat
bronha**Лаб. број протокола: **9184**

Узоркован: 30.12.2022

Коментар: studijski broj 201002

Примљен: 30.12.2022 11:46

Direktni mikroskopski
preparat

Videne su epitelne ćelije, gram +/- koke, gram +/- bacili, gram +/- kokobacili, polimorfonuklearni leukociti u velikom broju

Bakteriološki pregled

Izolovana je:

1.000.000.00 cfu/ml

Mikološki pregled

Gljive iz roda Candida nisu izolovane

Napomena

Identifikacija i antibiogram su rađeni na aparatu VITEK 2 COMPACT. Konačan nalaz.

ГРУПЕ АНТИ.	АНТИБИОТИЦИ	1.	2.	
Penicilini	Amoxicillin	R		
	Amoxicillin+inhibitor β-laktamaze	R		
	Ampicillin	R		
	Piperacilin/Tazobactam	R >32		
	Ertapenem	R		
Karbapenemi	Imipenem MIC µg/ml	R		
	Meropenem MIC µg/ml	R >8		
	Meropenem/Vaborbactam MIC µg/ml	R		
	Imipenem/Relebactam MIC µg/ml	R >=32		
Cefalosporini	Cefiderocol MIC µg/ml	S		
	Ceftolozane/Tazobactam MIC µg/ml	R	>=256	
	Ceftazidime/avibactam	R		
	Cefepime	R >32		
	Cefotaxime	R		
	Ceftazidime	R		
	Ceftriaxone	R		
	Cefuroxim	R		
	Aminoglikozidi	Amikacin	R	
		Gentamicin	R	
Ciprofloxacina		R		
Hinoloni	Levofloxacina	R		
	Moksifloxacina	R		
	Chloramphenicol	R		
Ostalo	Trimethoprim/Sulfamethoxazole	R		
	Colistin MIC µg/ml	R 16		
	Tigecycline MIC µg/ml	R 2		

S - осветљив, стандардни режим дозирања I - осветљив, повећана изолационост
R - резистент
* - Изолационост микроорганизама антибиотику зависи од дозе, начина примене и расположивости антибиотика на месту инфекције



УНИВЕРЗИТЕТСКИ КЛИНИЧКИ ЦЕНТАР СРБИЈЕ (УКЦС)
СЛУЖБА ЗА МЕДИЦИНСКУ МИКРОБИОЛОГИЈУ
Лабораторијски одсек за бактериологију на Ургентном центру КЦС

Име пацијента:

15.8.1955

Упутилац: Urgentni centar
ODELJENJE HIRURGIJE 2

ЛБО: [REDACTED]

Наручилац: Zečević Marko

Пол: М

Бр. историје/протокола: UCS-3342/2023

Дијагноза: K404

Врста узорка: **Bris rane-
abdomen**Лаб. број протокола: **2045**

Узоркован: 20.03.2023

Напомена: doneto u dk.bujonu

Примљен: 20.03.2023 10:38

Bakteriološki pregled
aerobno

Izolovani su:

1. Proteus mirabilis

veliki broj

2. Klebsiella-Enterobacter spp.

srednji broj

Bakteriološki pregled
anaerobno

U radu

Mikološki pregled

Gljive iz roda Candida nisu izolovane

Napomena

Bakterije iz roda Salmonella, Shigella nisu izolovane.

ГРУПЕ АНТИ.	АНТИБИОТИЦИ	1.	2.
Penicilini	Amoxicillin	S	R
	Amoxicillin+inhibitor β-laktamaze	S	S
	Ampicillin	S	R
	Piperacilin/Tazobactam	S	S
Karbapenemi	Imipenem	I	S
	Meropenem	S	S
Cefalosporini	Cefepime	S	S
	Cefotaxime	S	S
	Ceftazidime	S	S
Aminoglikozidi	Ceftriaxone	S	S
	Amikacin	S	S
	Gentamicin	S	S
Hinoloni	Ciprofloxacina	S	S
	Levofloxacina	S	S
Ostalo	Chloramphenicol	S	S
	Trimethoprim/Sulfamethoxazole	S	S

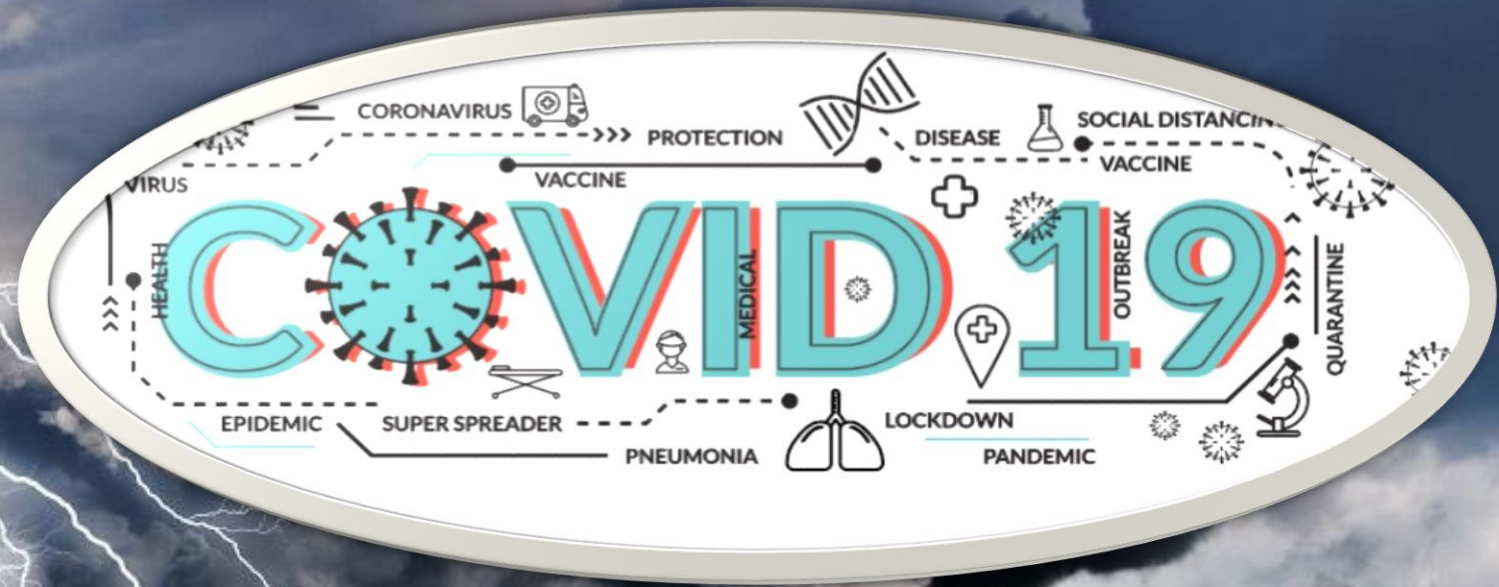
S - осветљив, стандардни режим дозирања I - осветљив, повећана изолационост*
R - резистент
* - Изолационост микроорганизама антибиотику зависи од дозе, начина примене и расположивости антибиотика на месту инфекције

Одобен: 22.03.2023 10:57

пацијент: Breković Petar 2045

микробиолошки налаз је валидан без печата и потписа





“Most of the solutions that we need for pandemics, we need for AMR ... We'd be very silly as a world to leave AMR out of any pandemic treaty”





Први Контилијум у КЦС је одржан децембра 2015.;
март 2020.- јануар 2022. COVID-19



Први Контилијум у новој згради УКЦС је одржан 20 априла 2022.





Од јануара до августа 2022. године:

- ❖ одржано је **28 конзилијума Тима за контролу употребе антибиотика** у УЦ УКЦС
- ❖ приказано је **332 пацијента** (највише са одељења ЈИЛ Б - 132, ЈИЛ А - 73)
- ❖ 23.08.2022. године - приказано 23 пацијента (највећи број)
 - **просечно 15 пацијената по конзилијуму**
- ❖ пријављени су и пацијенти са Клинике за хематологију и Клинике за ортопедију УКЦС





Learn from yesterday, live
for today, plan for
tomorrow and hope for the
future.



ХВАЛА НА ПАЖЊИ !

