AMR u doba COVID-19 pandemije

Prof. dr Ivana Ćirković
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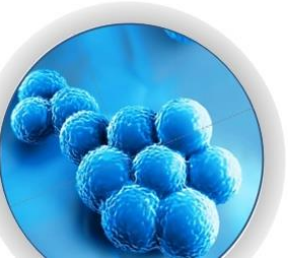


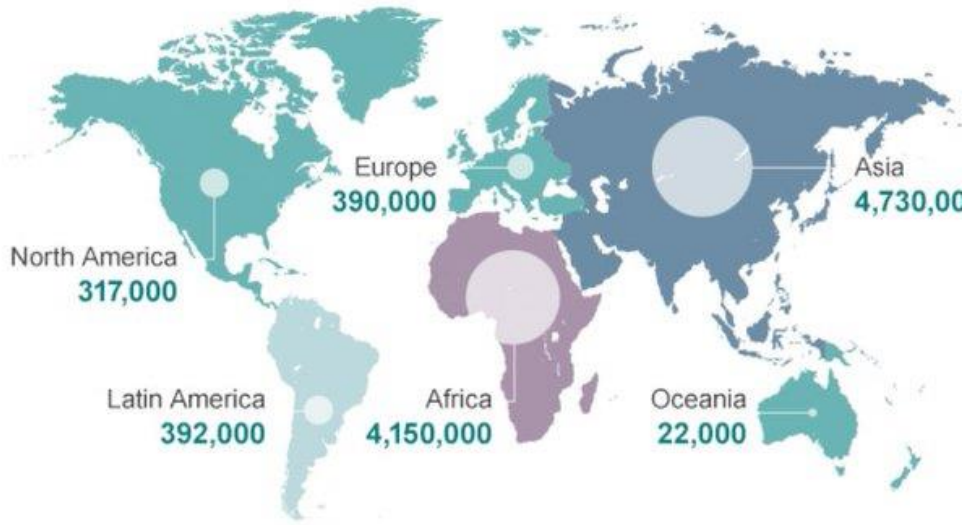
The future if we do not act now

GLOBAL A[illegible]ss the problem of anti[illegible]otic resis[illegible]nce could result in:

10m deaths by 2050

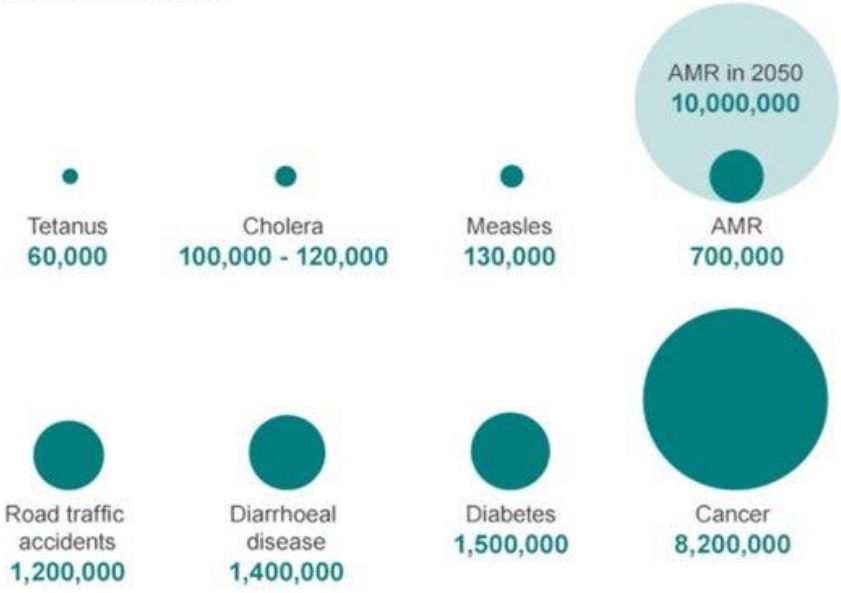
Costing £66 trillion

Deaths attributable to antimicrobial resistance every year by 2050



Source: Review on Antimicrobial Resistance 2014

Deaths attributable to antimicrobial resistance every year compared to other major causes of death



Source: Review on Antimicrobial Resistance 2014

By 2050: more deaths from resistant infections compared to e.g. cancer

http://amr-review.org/

Review on Antimicrobial Resistance

Tackling drug-resistant infections globally

Could COVID-19 lead to an increase in antimicrobial resistance?

2nd September 2020

Mathew Upton, Professor of Medical Microbiology at the university and a co-author on the research, added: "Antibiotics underpin all of modern medicine, but AMR is an issue that could impact millions of lives in the decades to come. Currently, the COVID-19 pandemic is causing immense suffering and loss of life across the globe, but AMR has been – and will remain – one of the most significant threats to global human health.

AMR & COVID-19

Antimikrobna otpornost (AMR) nastaje kada se mikroorganizmi (kao što su bakterije i virusi) izmene nakon izlaganja antimikrobnim lekovima. Ove promene mogu značiti da postaju otporne na lekove koji se koriste za njihovo lečenje. Postoje različite vrste antimikrobnih sredstava koja deluju protiv različitih vrsta mikroorganizama, npr. antibakterijski ili antibiotici protiv bakterija, antivirusna sredstva protiv virusa, antimikotična sredstva protiv gljivica, itd. **Otpornost na antibiotike** uzrokuje uporno prekomerno korišćenje i zloupotreba antibiotika u zdravlju ljudi i životinja.

Antibiotici ne leče niti sprečavaju viruse, uključujući i one koji prozrokuju COVID-19!

Antibiotici deluju samo protiv **bakterijskih infekcija.** Štaviše, neprimerena upotreba antibiotika povećava rizik od otpornosti na antibiotike, što rizikuje sve čak i od blažih infekcija.

Kada pacijenti sa COVID-19 mogu dobiti antibiotike?

Neki pacijenti sa COVID-19 mogu razviti **ko-bakterijske infekcije.** Ako je to slučaj, onda zdravstveni radnici mogu prepisati antibiotike za lečenje sekundarne bakterijske infekcije kod tih pacijenata.

Tačna dijagnoza je ključna!

Tačna dijagnoza je od vitalnog značaja za lečenje. Testiranje pomaže u razlikovanju virusnih (poput virusa koji uzrokuje COVID-19) od bakterijskih infekcija. Zbog toga je daleko manja verovatnoća da će se antibiotici nepotrebno prepisivati i koristiti, što zauzvrat smanjuje rizik od otpornost na antibiotike i optimizuje negu pacijenta.

Nikada se nemojte sami lečiti antibioticima!

Važno je poslušati savete lekara. Ako se ne osećate dobro, potražite lekarsku pomoć i nemojte se sami dijagnostifikovati i lečiti antibioticima. Zapamtite - **uzimajte antibiotike samo ako su vam prepisani.**

Stalno upražnjavajte redovnu higijenu!

Higijena ruku je presudna u doba COVID-19. Upražnjavajte redovnu higijenu ruku kod kuće i u zdravstvenim ustanovama, tako što ćete redovno prati vaše ruke. Kijajte i kašljite u savijeni lakat ili maramicu koju treba baciti u zatvorenu kantu. Ovo su neki od najefikasnijih načina smanjenja širenja mnogih infekcija, uključujući organizme otporne na antibiotike.

World Health Organization
REGIONAL OFFICE FOR Europe

#COVID19 #Coronavirus
#AMR #antimicrobialresistance

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Stop the **COVID-19 pandemic** from becoming an **AMR catastrophe**

World Health Organization
REGIONAL OFFICE FOR Europe

Why pay attention to antimicrobial resistance?

Antimicrobial resistance (AMR) occurs when microorganisms change and become resistant to antimicrobial drugs used to treat them. There are different types of antimicrobials which work against different types of microorganisms, such as antibacterials or antibiotics against bacteria, antivirals against viruses, and antifungals against fungi.

Because of antibiotic resistance, the world is running out of effective antibiotics to treat infectious diseases. Unless appropriate action is taken, decades of progress in health and medicine risk being undone.

In May 2015, the World Health Assembly (WHA) endorsed a global action plan on AMR and urged all Member States to develop national action plans. WHA72 (May 2019) called for accelerated implementation.

What has antibiotic use got to do with COVID-19?

Up to 15% of patients with severe COVID-19 infection need antibiotics for so called co-infections (bacterial infections they have alongside COVID-19). However, currently available evidence suggests that 75% of COVID-19 patients get antibiotics, meaning that a majority are prescribed antibiotics unnecessarily without having a diagnosis of bacterial co-infection confirmed.

This overuse of antibiotics will drive the development of resistance unless action is taken. It is vital that prescribers pay close attention to guidelines in order to avoid negative long-term consequences. Both COVID-19 and AMR pose a serious public health threat with long-term negative humanitarian and economic consequences. Failure to systematically include AMR-specific activities in the COVID-19 response undermines the global fight against AMR.

Preventing and controlling AMR and COVID-19 is a complex issue which involves many different sectors and requires a comprehensive approach and international cooperation.

Masovno i prekomereno propisivanje antibiotika kod COVID-19 bolesnika - OPRAVDANJE

- Identifikacija/detekcija bakterijske koinfekcije ili superinfekcije kod COVID-19 je izazov (simptomi slični virusnim infekcijama)
- Uprkos saznanju da je COVID-19 virusna infekcija, standardni refleks je da se započne sa antibiotskom terapijom kod pacijenata sa kašljem, temperaturom i rengenskim infiltratima – pokazatelji bakterijske vanbolničke pneumonije
- Racionalnost koja stoji iza odluke propisati antibiotik COVID-19 pacijentu se zasniva i na iskustvu sa gripom, kod koga je pokazana stopa bakterijskih koinfekcija i superinfekcija u 11-35% slučajeva
- Nepostojanje efikasne antivirusne terapije
- Anksioznost zbog visoke stope mortaliteta

Masovno i prekomereno propisivanje antibiotika kod COVID-19 bolesnika - NERACIONALNO

- **In a study of 99 patients with COVID-19 pneumonia in Wuhan Jinyintan Hospital, most patients were given antibiotic treatment** (25% patients were treated with a single antibiotic and 45% patients were given combination therapy); [Chen N *et al.* Lancet 2020; 395: 507–13]
- **In a Chinese study involving 41 COVID-19 patients, all patients were administered with empirical antibiotic treatment;** [Huang C *et al.* Lancet 2020; 395: 497–506]
- **In a review of medical literature (18 full texts), the use of broad-spectrum ABs was widely reported, with 72% of COVID-19 cases receiving AB therapy;** [Rawson TM *et al.* CID 2020; https://doi.org/10.1093/cid/ciaa530]
- **In a study in Dallas on 289 hospitalized COVID-19 patients, antibiotics were given to most patients (93.8%);** [Crotty MP *et al.* medRxiv 2020]
- **In a living meta-analysis and systematic review, over 70% of COVID-19 patients received antibiotics** [Langford BJ et al. https://www.tarrn.org/covid]

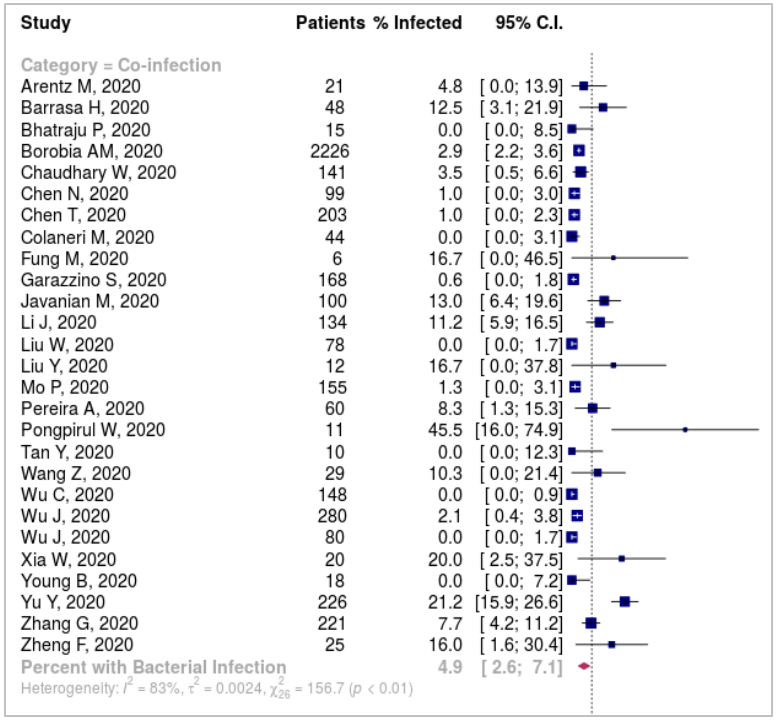
- **MEĐUTIM, studije u prethodnom periodu su pokazale nisku stopu bakterijskih koinfekcija kod COVID-19 bolesnika**

Masovno i prekomereno propisivanje antibiotika kod COVID-19 bolesnika - NERACIONALNO

Bakterijske koinfekcija kod 3-5% COVID-19 bolesnika

Najčešći uzročnici (> 90% slučajeva) - *S. aureus*,

H. influenzae i *S. pneumoniae*



Revidiran stav o upotrebi antibiotika kod hospitalizovanih COVID-19 bolesnika.

Antibiotska terapija se preporučuje:

✓ kod COVID-19 pacijenata kod kojih je radiološki detektovana bakterijska infekcija

✓ u JIL

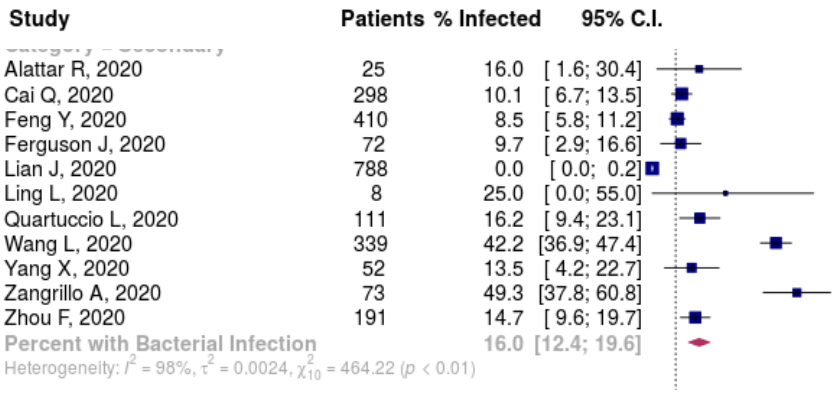
✓kod imunokompromitovanih bolesnika

Masovno i prekomereno propisivanje antibiotika kod COVID-19 bolesnika

Bakterijske superinfekcija kod 15-20% COVID-19 bolesnika

Najčešći uzročnici – *Acinetobacter* spp., *Enterobacterales*,

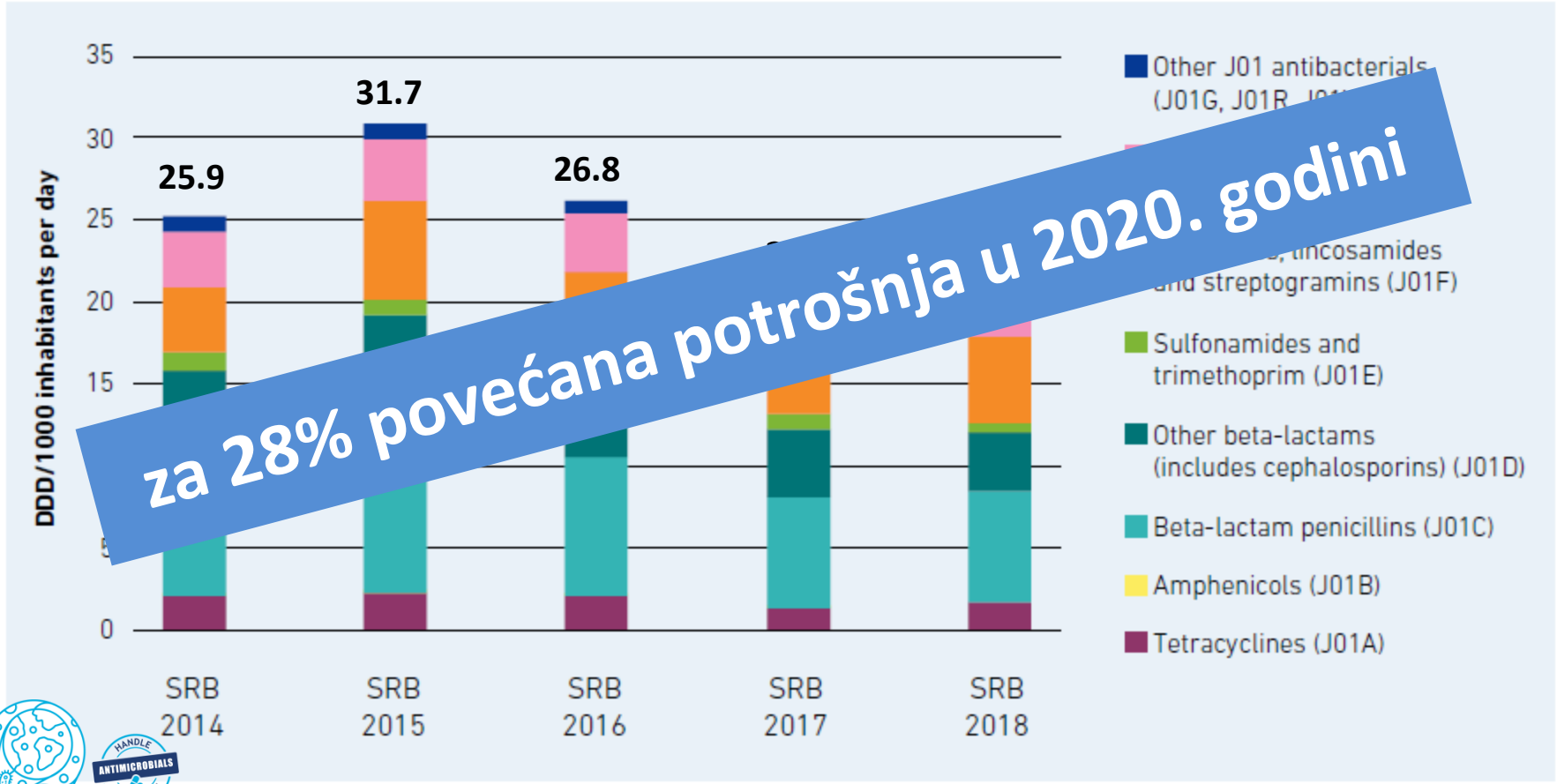
P. aeruginosa i *S. aureus*



✓ **Infekcije krvi česte sekundarne bolničke infekcije kod COVID-19 bolesnika (14,3-36,3%)**

“Antibiotici nisu bombone”
Pregled situacije u Srbiji

✓ Potrošnja antibiotika se prati na nacionalnom nivou i u okviru AMC mreže (WHO)



za 28% povećana potrošnja u 2020. godini

“Antibiotici nisu bombone”
Pregled situacije u EU

Antimicrobial consumption in the EU/EEA (ESAC-Net)

Annual Epidemiological Report for 2020

ecdc
EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

Key facts

- For 2020, twenty-nine countries (27 European Union (EU) Member States and two European Economic Area (EEA) countries - Iceland and Norway) reported data on antimicrobial consumption. Twenty-five countries reported data for both community and hospital consumption; two countries (Germany and Iceland) reported only community consumption, and two countries (Cyprus and Czechia) reported total consumption for both sectors combined.
- The Anatomical Therapeutic Chemical (ATC) classification index with defined daily doses (DDD) 2021 was used for the analysis of both 2020 data and historical data. Antimicrobial consumption is expressed as DDD per 1 000 inhabitants per day.
- In 2020, the mean total (community and hospital sector combined) consumption of antibacterials for systemic use (ATC group J01) in the EU/EEA was 16.4 DDD per 1 000 inhabitants per day (country range: 8.5–28.9). During the period 2011–2020, a statistically significant decrease was observed for the EU/EEA overall, as well as for eight individual countries. A statistically significant increasing trend was observed for two countries.
- The EU/EEA mean total (community and hospital sector combined) consumption of antivirals for systemic use (ATC group J05) was 2.56 DDD per 1 000 inhabitants per day (country range: 0.59–11.19), with no statistically significant trends in the five-year period between 2016–2020.

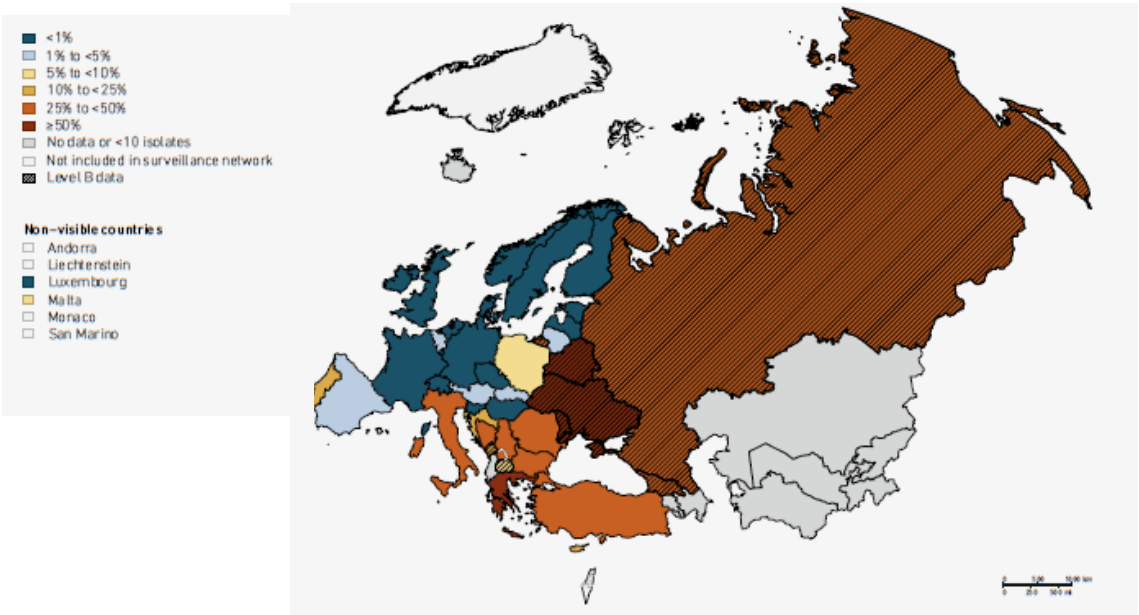
“Antibiotici nisu bombone”
Pregled situacije u Srbiji

✓ Rezistencija bakterija na antibiotike se prati na nacionalnom nivou i u okviru CAESAR mreže (WHO)

Central Asian and European
Surveillance of Antimicrobial Resistance

Annual report 2020

Fig. 2.5 Percentage of invasive *K. pneumoniae* isolates resistant to carbapenems in the WHO European Region (EARS–Net and CAESAR), by country or area, 2019



“Antibiotici nisu bombone”
Pregled situacije u Evropi

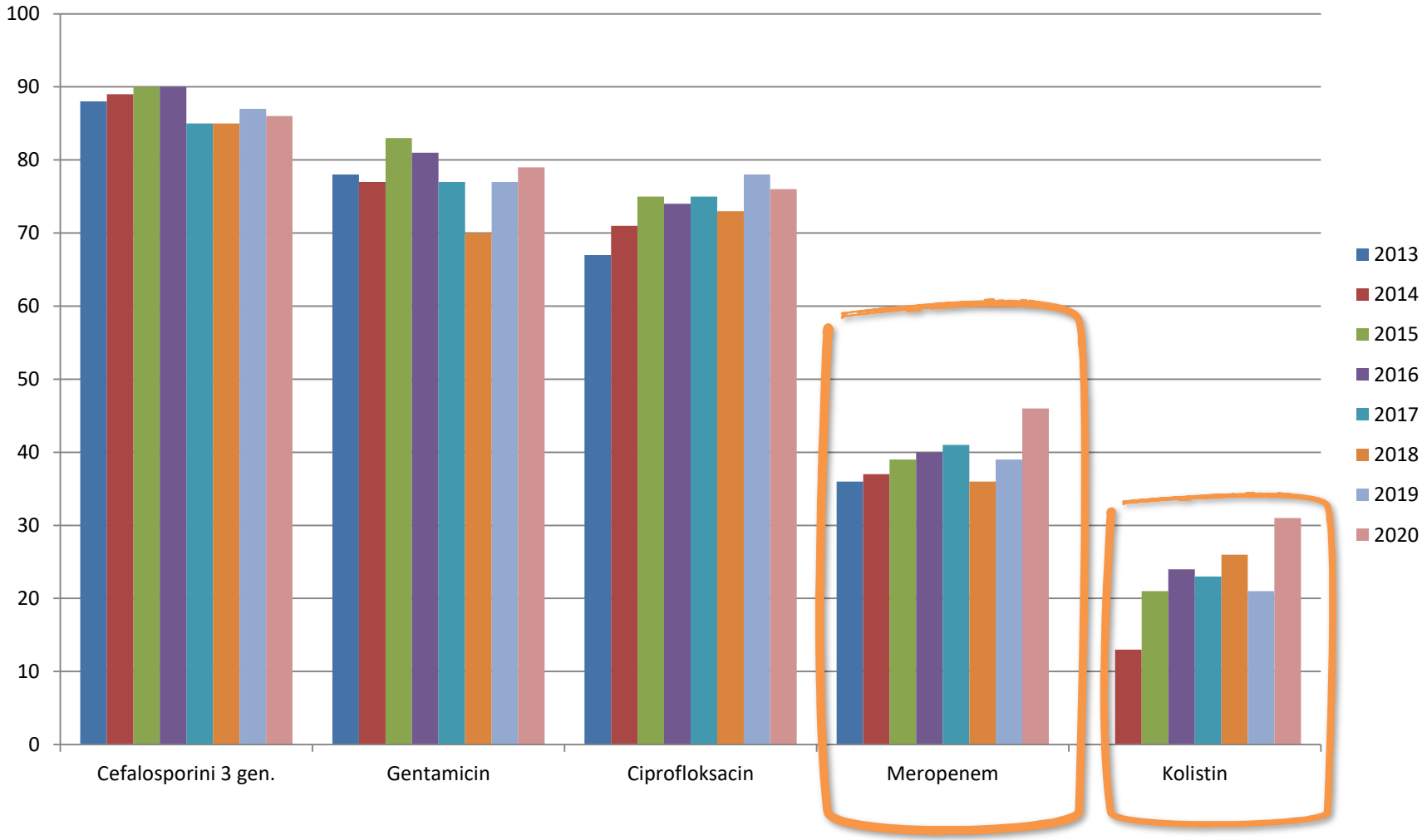
ecdc
EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

World Health Organization
REGIONAL OFFICE FOR Europe

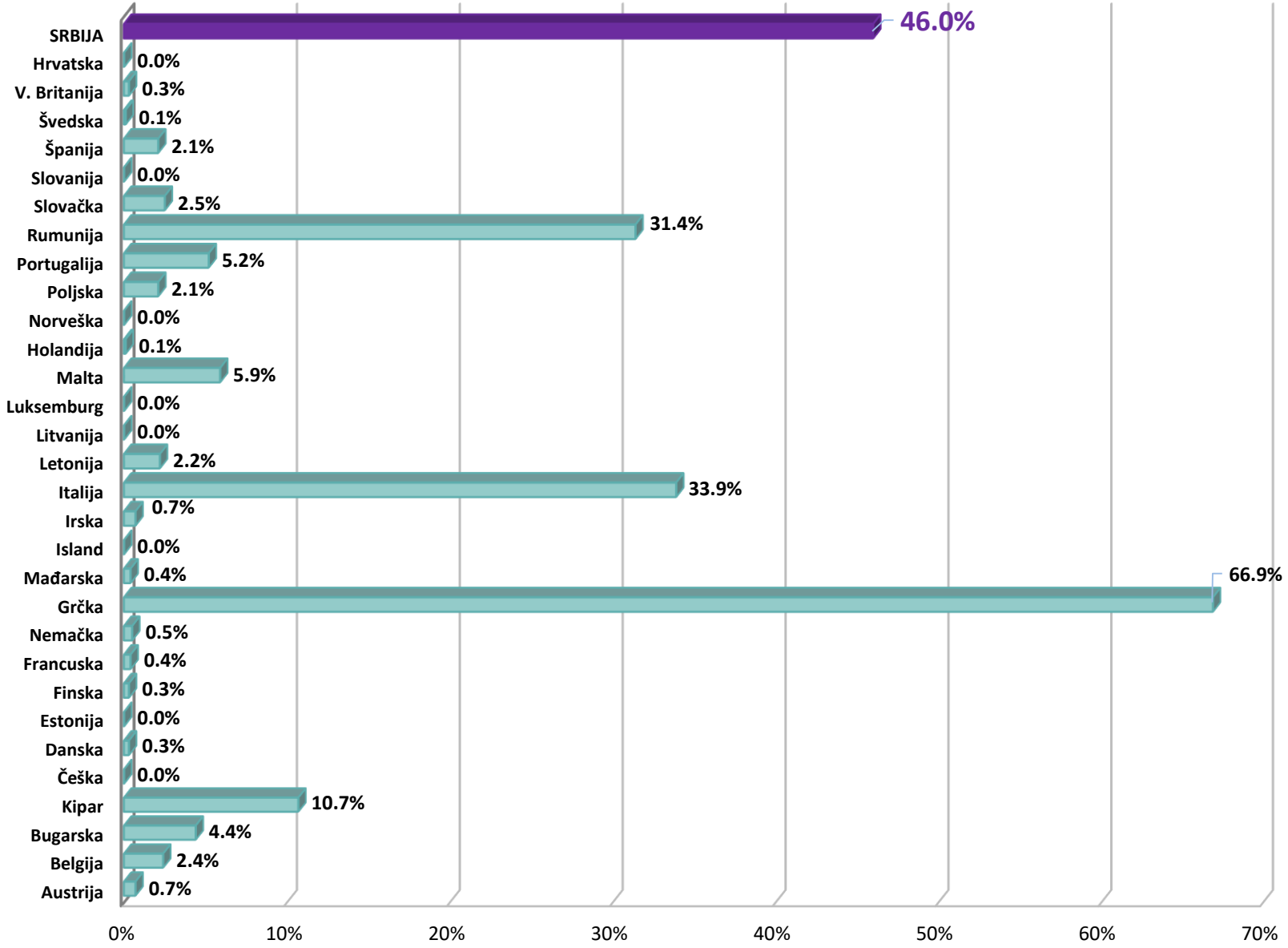
Surveillance of antimicrobial resistance in Europe, 2020 data

1. *Acinetobacter* spp.
2. *Enterococcus faecalis* i *Enterococcus faecium*

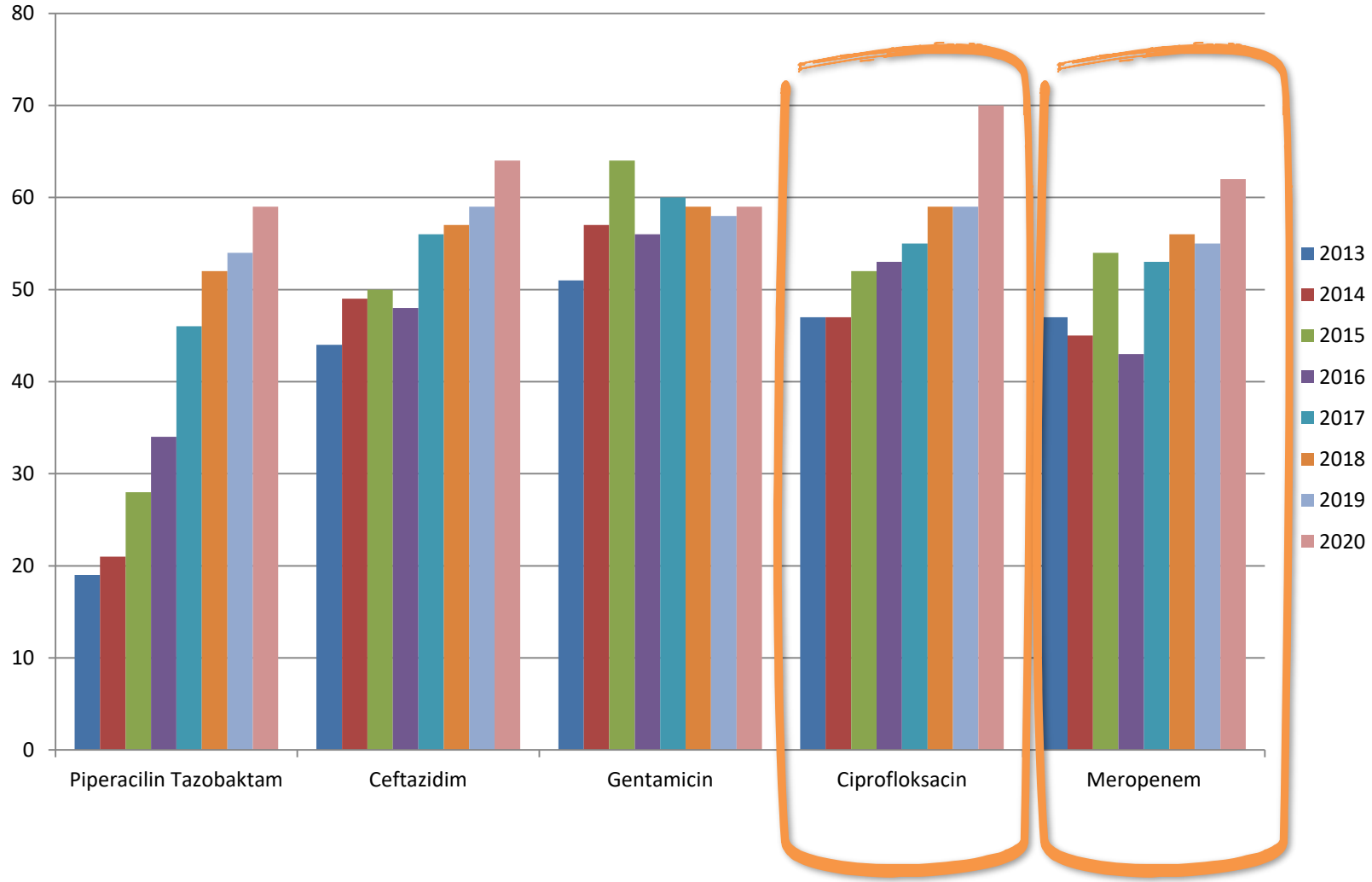
***Klebsiella pneumoniae*: rezistencija na antibiotike u Srbiji, 2013-2020.**



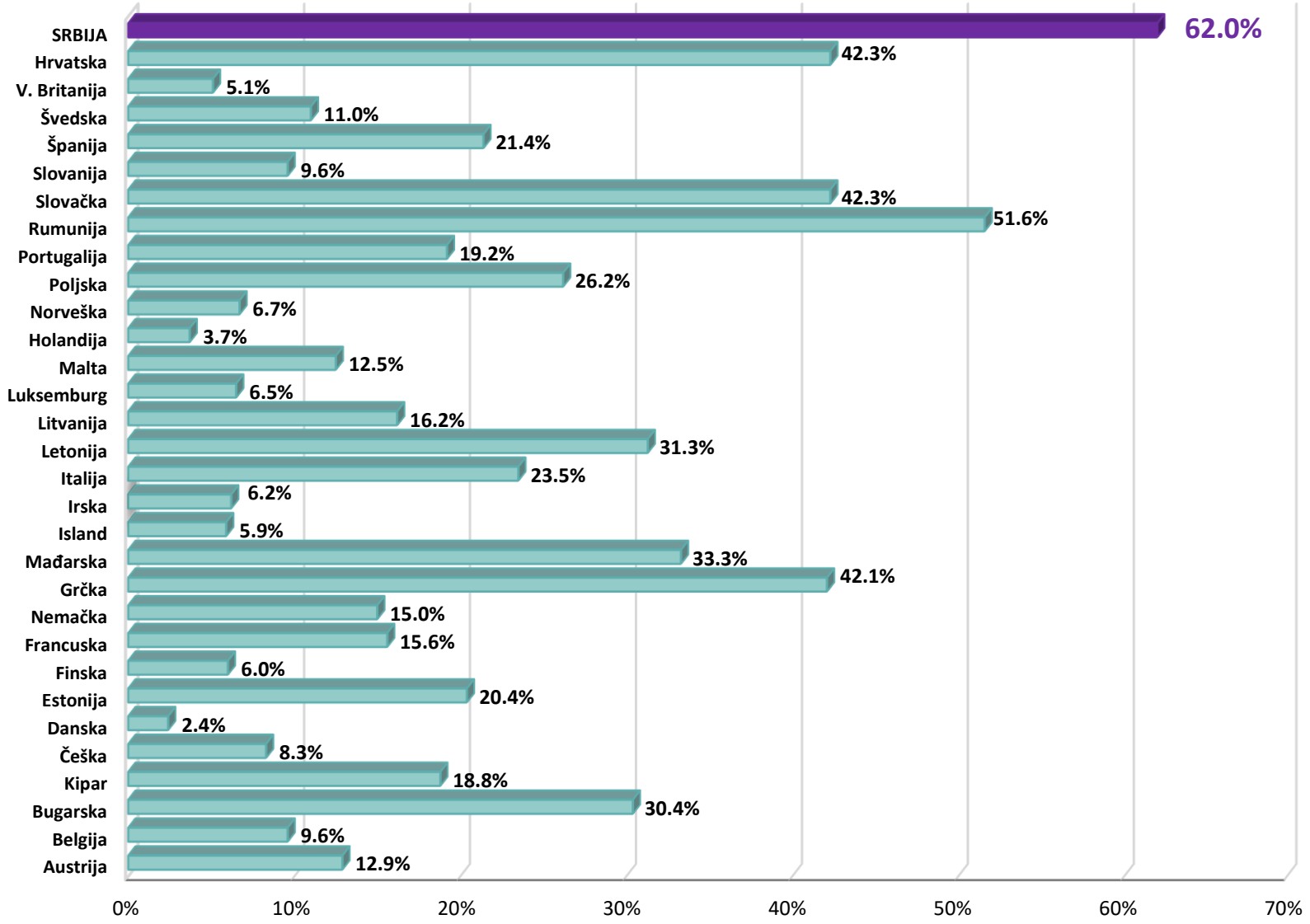
Proporcije karbapenem-rezistentnih izolata ***Klebsiella pneumoniae*** u Evropi



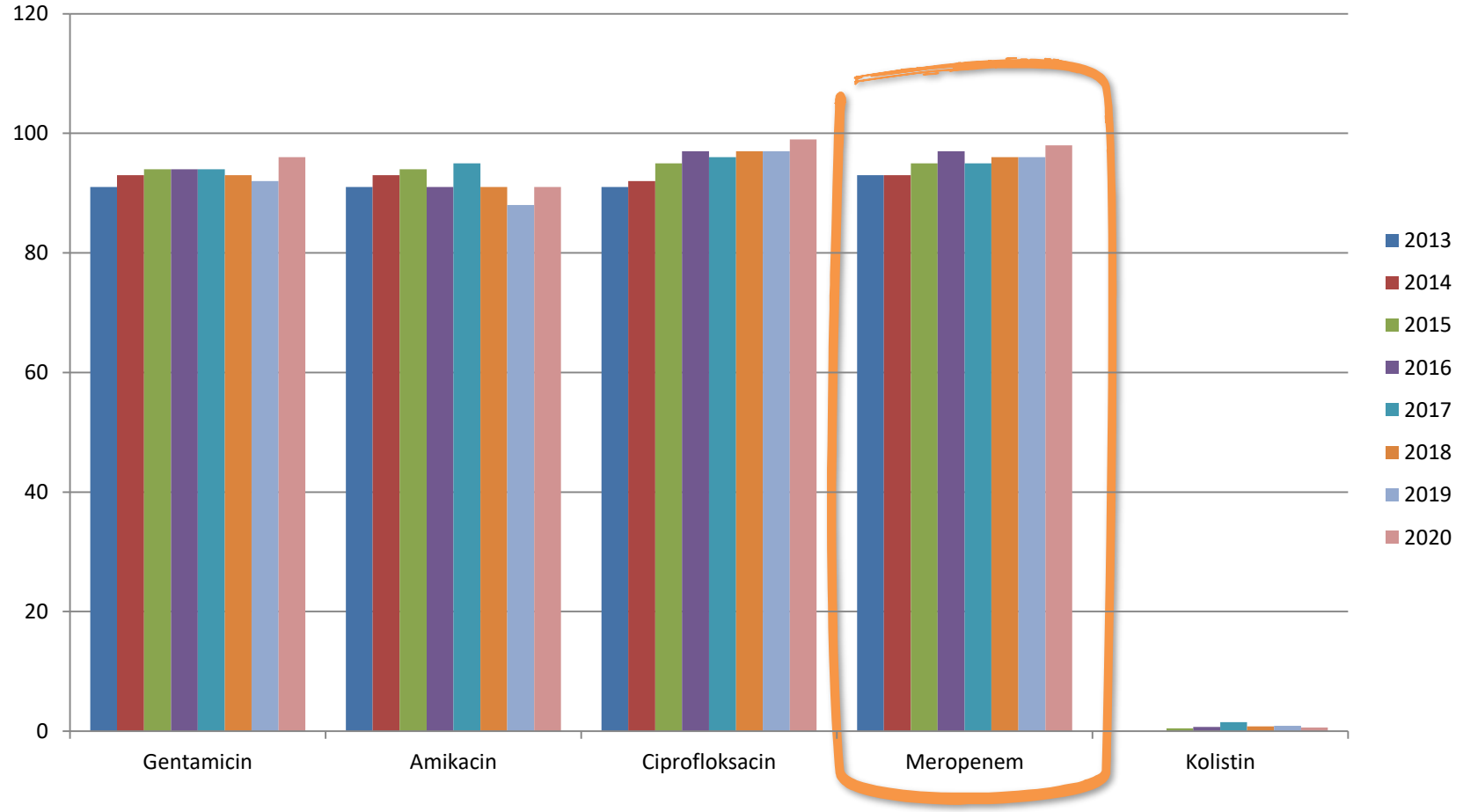
***Pseudomonas aeruginosa*: rezistencija na antibiotike u Srbiji, 2013-2020.**



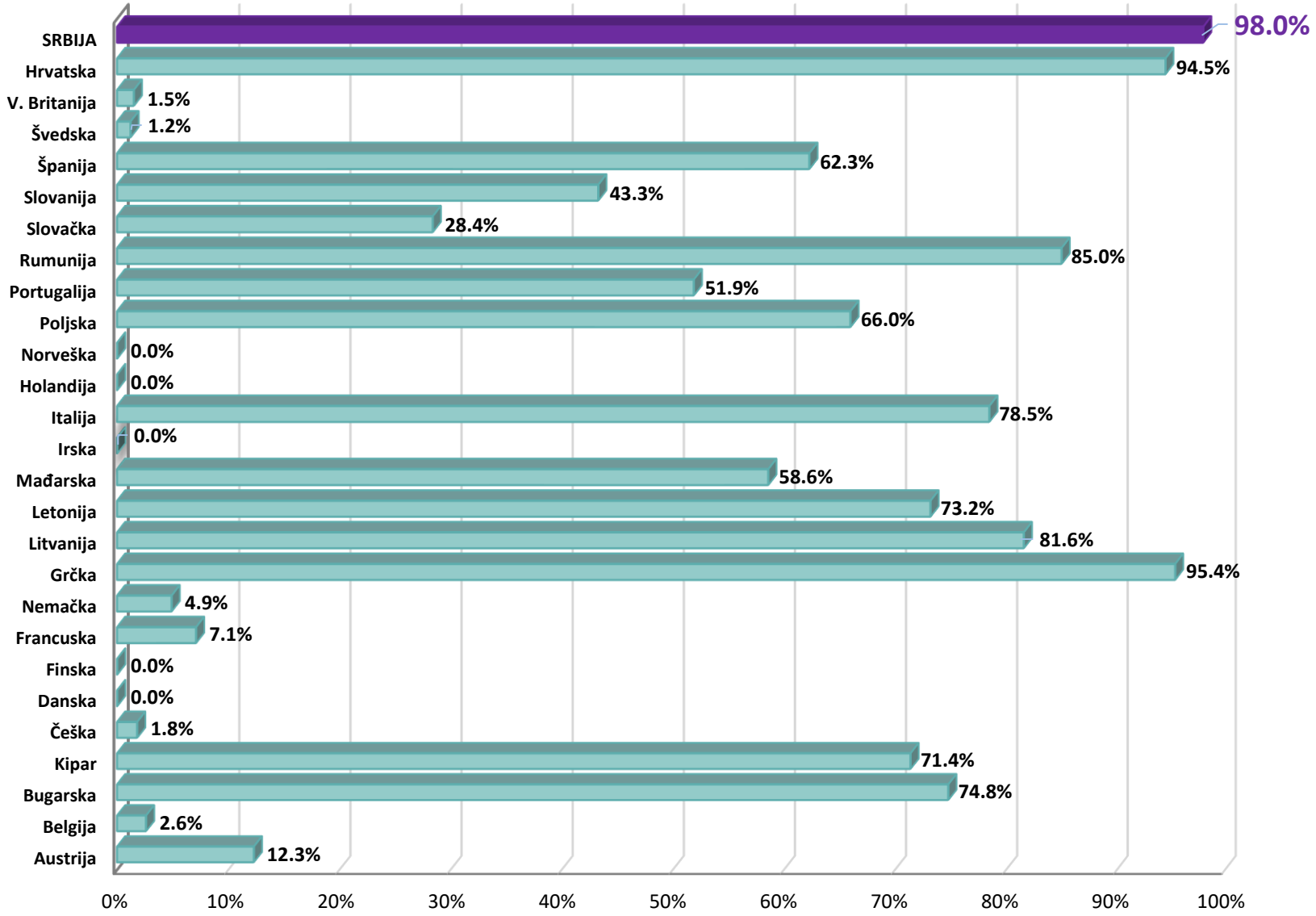
Proporcije karbapenem-rezistentnih izolata ***Pseudomonas aeruginosa*** u Evropi



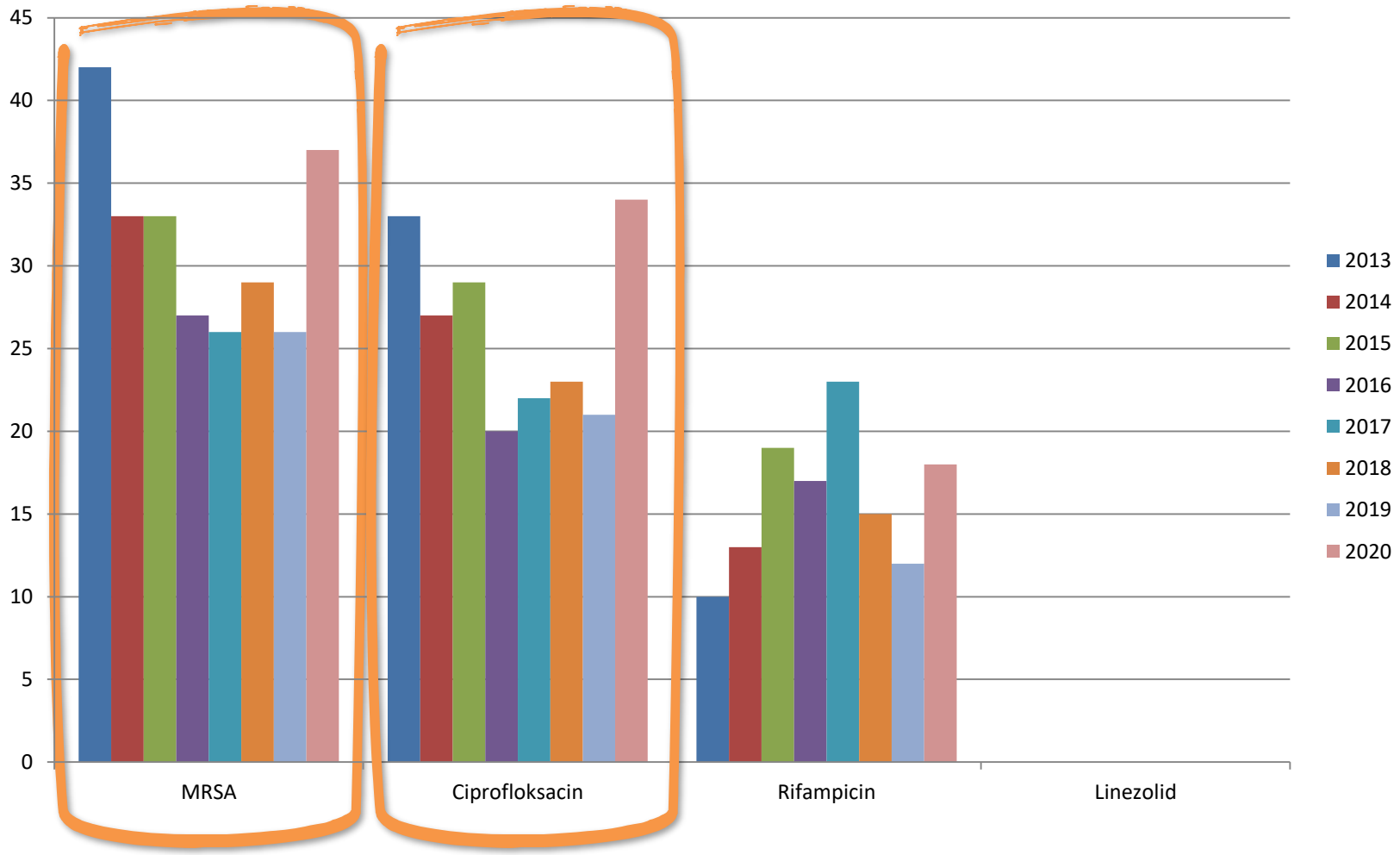
***Acinetobacter* spp.:** rezistencija na antibiotike u Srbiji, 2013-2020.



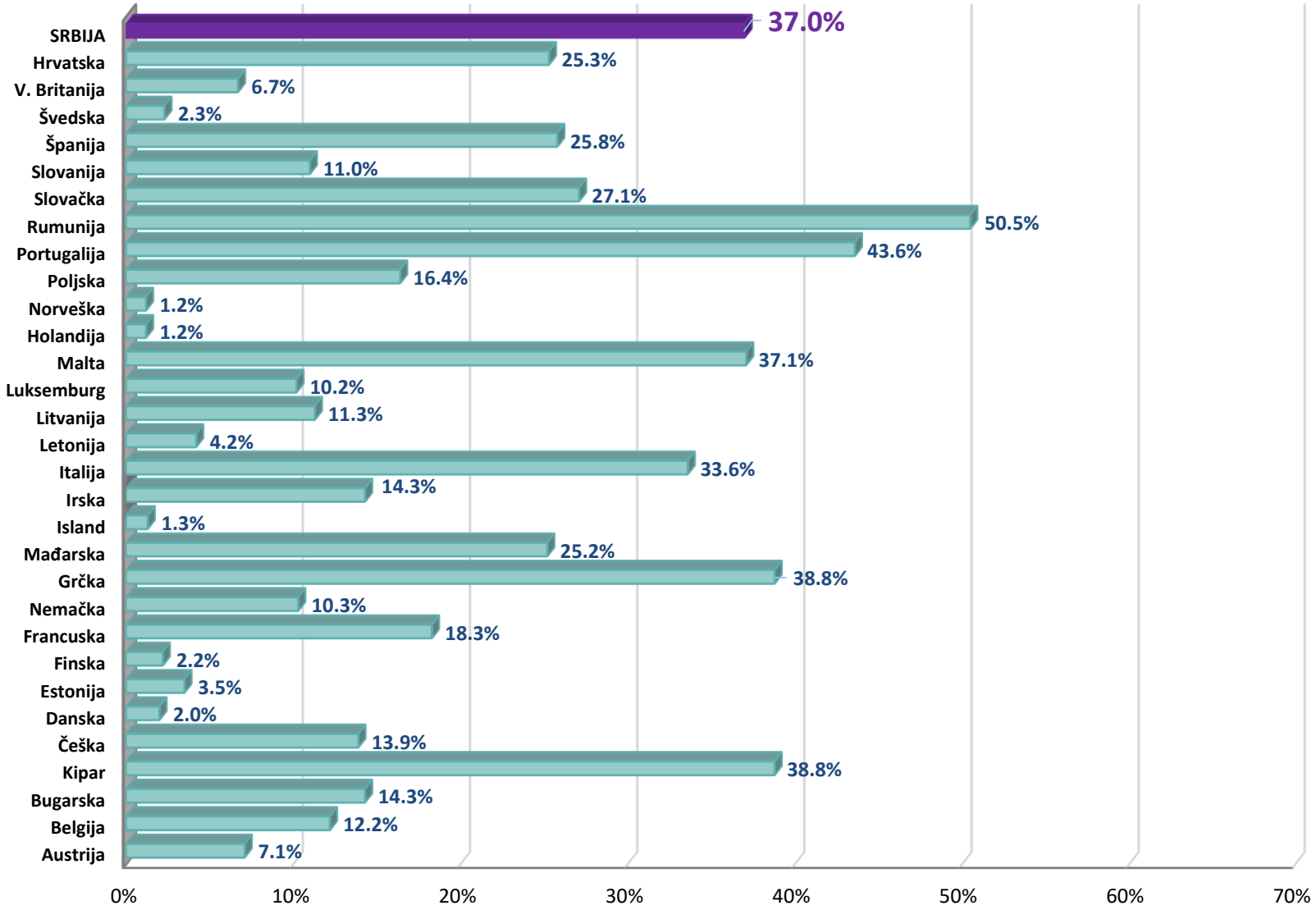
Proporcije karbapenem-rezistentnih izolata ***Acinetobacter* spp.** u Evropi



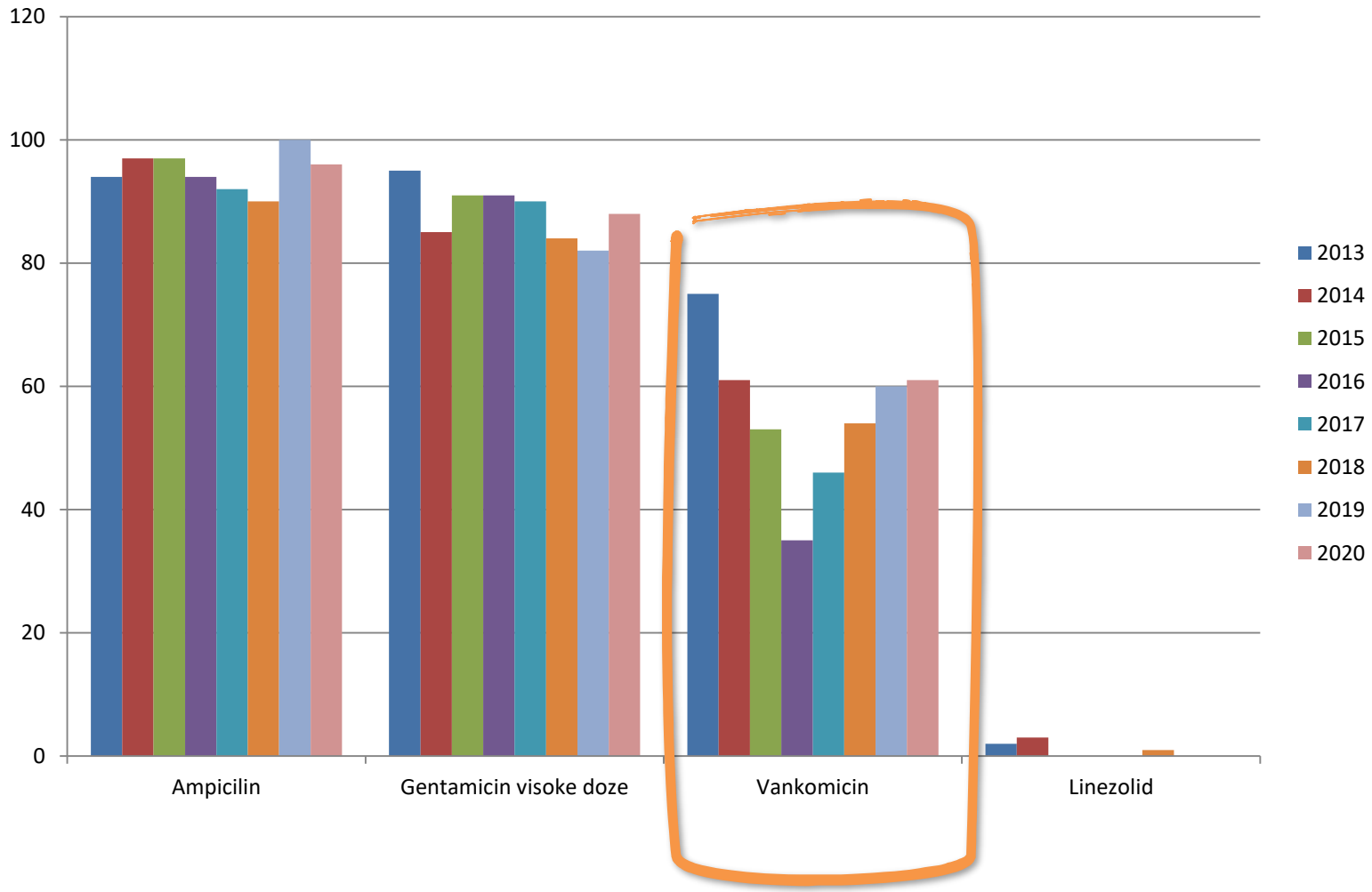
***Staphylococcus aureus*: rezistencija na antibiotike u Srbiji, 2013-2020.**



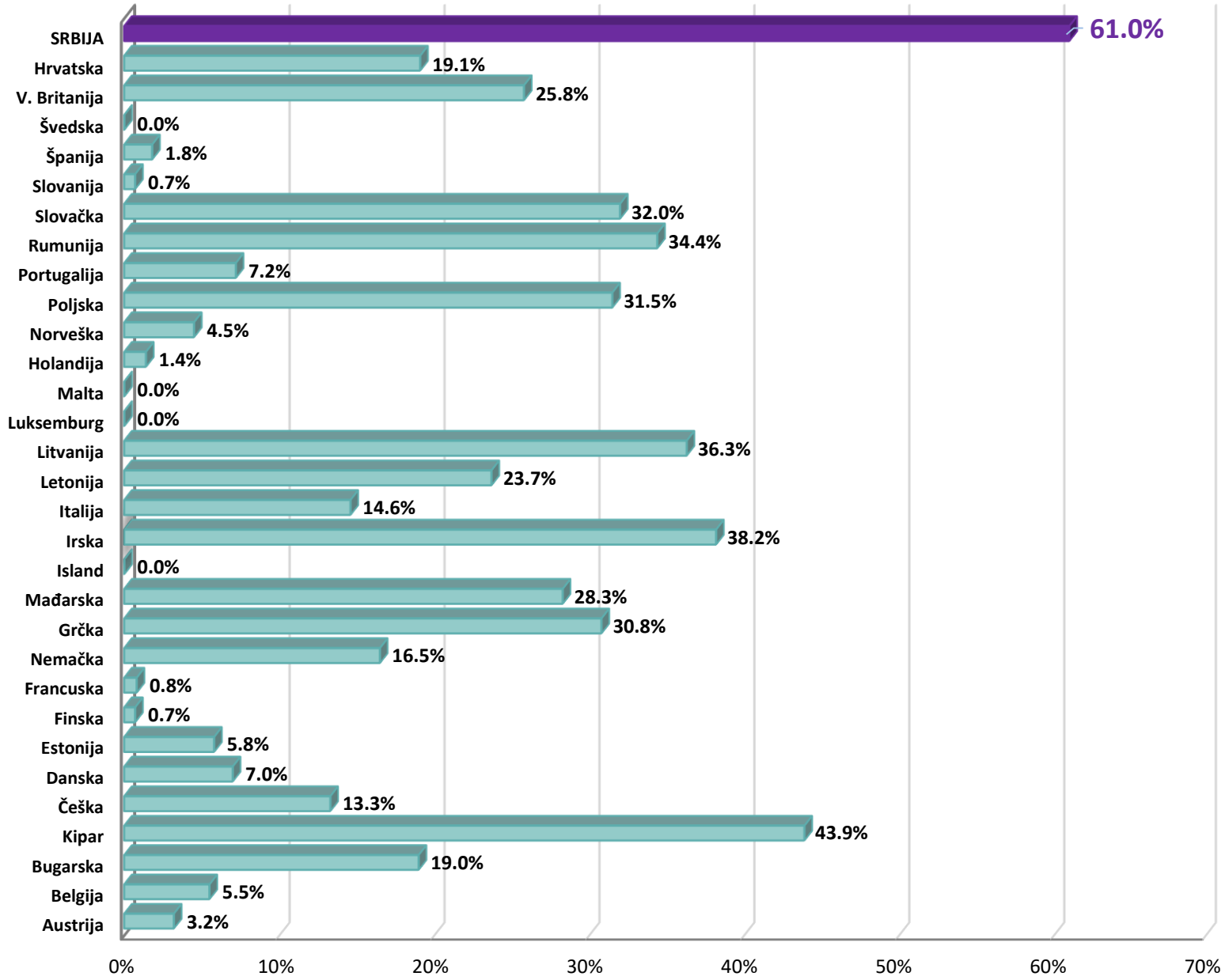
Proporcije izolata meticilin-rezistentnih *Staphylococcus aureus* **(MRSA)** u Evropi



***Enterococcus faecium*: rezistencija na antibiotike u Srbiji, 2013-2020.**



Proporcije vankomicin-rezistentnih izolata ***Enterococcus faecium*** u Evropi

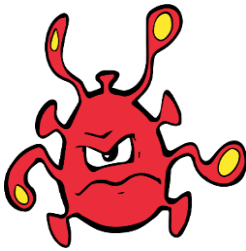


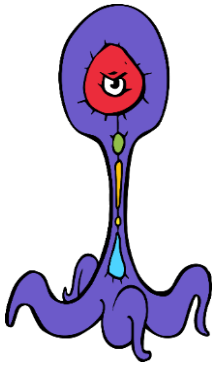
Brzi molekularni test
Respiratorni panel

nazofaringealni bris

23 patogena – 1 test – 45 minuta

19 virusa	4 bakterije
Adenovirus	*Bordetella parapertussis*
Coronavirus 229E (Koronavirus 229E)	*Bordetella pertussis*
Coronavirus HKU1 (Koronavirus HKU1)	*Chlamydia pneumoniae*
Coronavirus NL63 (Koronavirus NL63)	*Mycoplasma pneumoniae*
Coronavirus OC43 (Koronavirus OC43)	
Middle East Respiratory Syndrome Coronavirus (Bliskoistočni respiratorni sindrom koronavirus) (MERS-CoV)	
Severe Acute Respiratory Syndrome Coronavirus 2 (Teški akutni respiratorni sindrom – koronavirus 2) (SARS-CoV-2)	
Human Metapneumovirus (Humani metapneumovirus)	
Human Rhinovirus/Enterovirus (Humani rinovirus/enterovirus)	
Influenca A (Influenza A), sa podtipovima H1, H3 i H1-2009	
Influenca B (Influenca B)	
Parainfluenza Virus 1 (Virus parainfluence 1)	
Virus parainfluence tipa 2 (Virus parainfluence 2)	
Virus parainfluence tipa 3 (Virus parainfluence 3)	
Virus parainfluence tipa 4 (Virus parainfluence 4)	
Respiratorni sincicijalni virus (Respiratorni sincicijalni virus)	





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Clinical evaluation of the BioFire® Respiratory Panel 2.1 and detection of SARS-CoV-2

Hannah M. Creager[a], Barbara Cabrera[a], Andy Schnaubelt[a], Jesse L. Cox[a], Allison M. Cushman-Vokoun[a], Salika M. Shakir[b], Keith D. Tardif[b], Meei-Li Huang[c], Keith R. Jerome[c,d], Alexander L. Greninger[c], Daria Drobysheva[e], Usha Spaulding[e], Margarita Rogatcheva[e], Kevin M. Bourzac[e], S.H. Hinrichs[a], M.J. Broadhurst[a,1], P.D. Fey[a,*,1]

ABSTRACT

We evaluated the performance of the BioFire® Respiratory Panel 2.1 (RP2.1) in the detection of SARS CoV-2 in comparison against three other SARS CoV-2 EUA assays. In these studies, the RP2.1 panel had 98 % positive percent agreement (48/49) and 100 % negative percent agreement (49/49). Since 30 % of nasopharyngeal swab specimens have a SARS CoV-2 Ct > 30 and thus detection of virus in low titers is clinically relevant, a sample with a high titer was diluted and each 10 fold dilution was tested in triplicate and compared against 6 other EUA approved SARS CoV-2 assays. These data suggested that the BioFire® RP2.1 panel, along with four other SARS CoV-2 assays (Roche cobas, Cepheid Xpert Xpress, BioFire® Defense COVID19, and NECoV19), consistently detected viral RNA at the 10 − 7 dilution. Overall, these studies suggest that the BioFire® RP2.1 assay can be used to detect acute cases of SARS CoV2 in addition to patients with low viral titer later in disease presentation.

Brzi molekularni test
Respiratorni panel

23 patogena – 1 test – 45 minuta

19 virusa	4 bakterije
Adenovirus	*Bordetella parapertussis*
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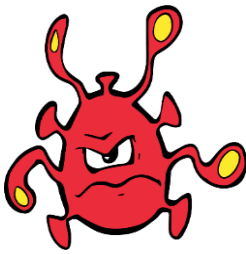
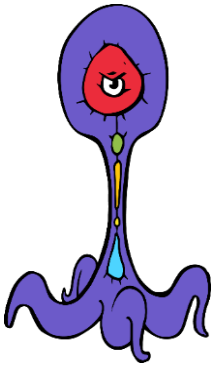
Influenca B (Influenca B)	
Parainfluenza Virus 1 (Virus parainfluence 1)	
Virus parainfluence tipa 2 (Virus parainfluence 2)	
Virus parainfluence tipa 3 (Virus parainfluence 3)	
Virus parainfluence tipa 4 (Virus parainfluence 4)	
Respiratorni sincicijalni virus (Respiratorni sincicijalni virus)	

koinfekcije



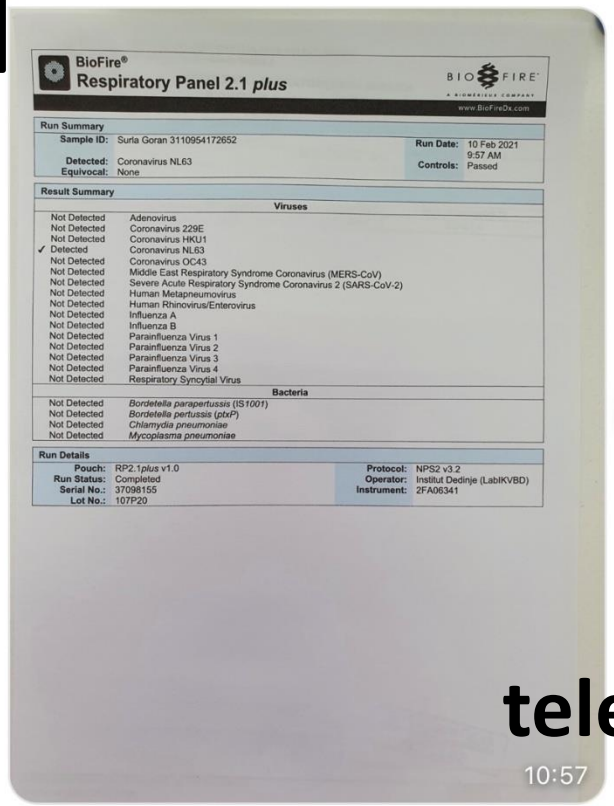


Respiratorni panel 2.1 plus (RP2.1plus) – naše iskustvo

[redacted]

10 February 2021

[redacted]



BioFire®
Respiratory Panel 2.1 *plus*

BIOFIRE

www.BioFireDx.com

Run Summary

Sample ID:	Surla Goran 3110954172652	**Run Date:**	10 Feb 2021 9:57 AM
Detected:	Coronavirus NL63	**Controls:**	Passed
Equivocal:	None		

Result Summary

	Viruses
Not Detected	Adenovirus
Not Detected	Coronavirus 229E
Not Detected	Coronavirus HKU1
✓ Detected	Coronavirus NL63
Not Detected	Coronavirus OC43
Not Detected	Middle East Respiratory Syndrome Coronavirus (MERS-CoV)
Not Detected	Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)
Not Detected	Human Metapneumovirus
Not Detected	Human Rhinovirus/Enterovirus
Not Detected	Influenza A
Not Detected	Influenza B
Not Detected	Parainfluenza Virus 1
Not Detected	Parainfluenza Virus 2
Not Detected	Parainfluenza Virus 3
Not Detected	Parainfluenza Virus 4
Not Detected	Respiratory Syncytial Virus
	Bacteria
Not Detected	*Bordetella parapertussis* (IS*1001*)
Not Detected	*Bordetella pertussis* (*ptxP*)
Not Detected	*Chlamydia pneumoniae*
Not Detected	*Mycoplasma pneumoniae*

Run Details

Pouch:	RP2.1*plus* v1.0	**Protocol:**	NPS2 v3.2
Run Status:	Completed	**Operator:**	Institut Dedinje (LabIKVBD)
Serial No.:	37098155	**Instrument:**	2FA06341
Lot No.:	107P20		

10:57

Mozete li nam pomoći 10:57

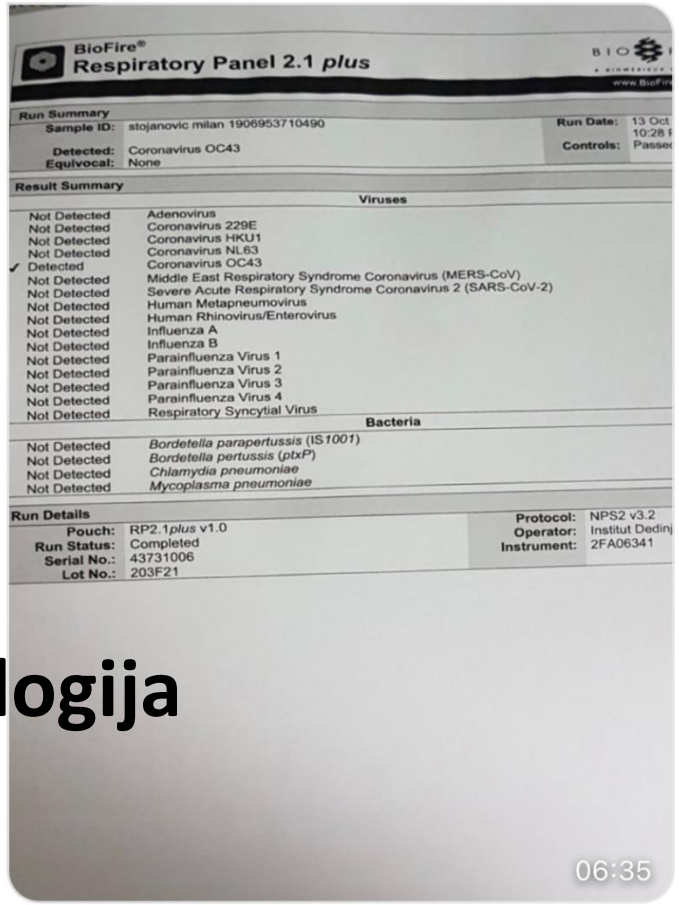
Hvala 10:57

telemikrobiologija

[redacted]

14 October 2021

[redacted]



BioFire®
Respiratory Panel 2.1 *plus*

Run Summary

Sample ID:	stojanovic milan 1906953710490	**Run Date:**	13 Oct 10:28
Detected:	Coronavirus OC43	**Controls:**	Passed
Equivocal:	None		

Result Summary

	Viruses
Not Detected	Adenovirus
Not Detected	Coronavirus 229E
Not Detected	Coronavirus HKU1
Not Detected	Coronavirus NL63
✓ Detected	Coronavirus OC43
Not Detected	Middle East Respiratory Syndrome Coronavirus (MERS-CoV)
Not Detected	Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)
Not Detected	Human Metapneumovirus
Not Detected	Human Rhinovirus/Enterovirus
Not Detected	Influenza A
Not Detected	Influenza B
Not Detected	Parainfluenza Virus 1
Not Detected	Parainfluenza Virus 2
Not Detected	Parainfluenza Virus 3
Not Detected	Parainfluenza Virus 4
Not Detected	Respiratory Syncytial Virus
	Bacteria
Not Detected	*Bordetella parapertussis* (IS*1001*)
Not Detected	*Bordetella pertussis* (*ptxP*)
Not Detected	*Chlamydia pneumoniae*
Not Detected	*Mycoplasma pneumoniae*

Run Details

Pouch:	RP2.1*plus* v1.0	**Protocol:**	NPS2 v3.2
Run Status:	Completed	**Operator:**	Institut Dedinj
Serial No.:	43731006	**Instrument:**	2FA06341
Lot No.:	203F21		

06:35

Kako biste Vi protumacili Hvala 06:35

Brzi molekularni test
Pneumonija panel

Sputum, endotrahealni aspirat, BAL,…

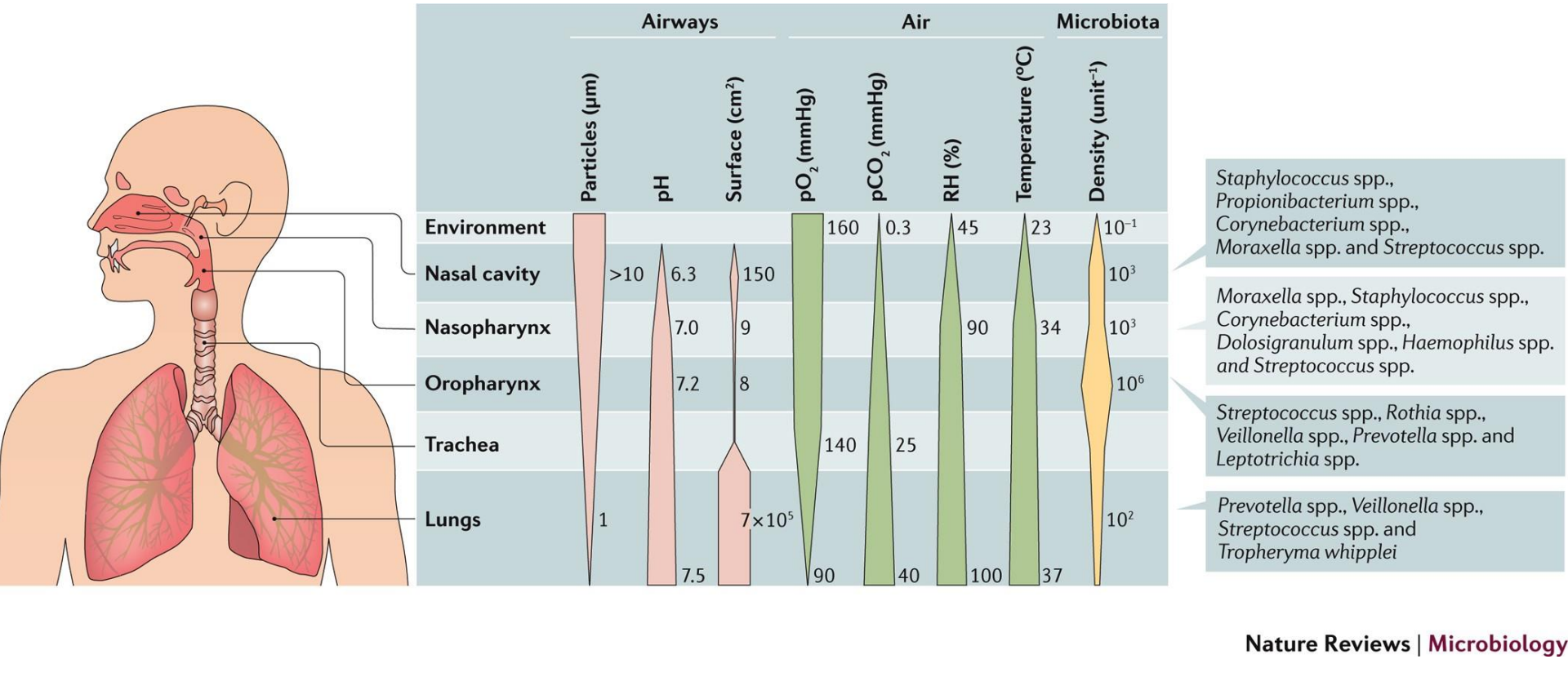
27 patogena + 7 gena rezistencije – 1 test – 60 minuta

18 bakterija + 9 virusa + 7 gena rezistencije

Bakterije prijavljene sa binovima od 10^4, 10^5, 10^6, ili ≥ 10^7 kopija/mL		
Acinetobacter calcoaceticus-baumannii kompleks	*Klebsiella oxytoca*	*Serratia marcescens*
Enterobacter cloacae kompleks	*Klebsiella pneumoniae grupa*	*Staphylococcus aureus*
Escherichia coli	*Moraxella catarrhalis*	*Streptococcus agalactiae*
Haemophilus influenzae	*Proteus* vrste	*Streptococcus pneumoniae*
Klebsiella aerogenes	*Pseudomonas aeruginosa*	*Streptococcus pyogenes*

Atipične bakterije		
Chlamydia pneumoniae	*Legionella pneumophila*	*Mycoplasma pneumoniae*
Virusi		
Adenovirus	Humani rinovirus/enterovirus	Bliskoistočni respiratorni sindrom – koronavirus (MERS-CoV)
Koronavirus	Influenca A	Virus parainfluence
Humani metapneumovirus	Influenca B	Respiratorni sincicijalni virus
Geni antimikrobne rezistencije		
CTX-M	NDM	*mecA/C* i MREJ
IMP	OXA-48-like	
KPC	VIM	

Mikrobiota respiratornog trakta



Nature Reviews | Microbiology

Brzi molekularni test
Pneumonija panel

27 patogena + 7 gena rezistencije – 1 test – 60 minuta

18 bakterija + 9 virusa + 7 gena rezistencije

Bakterije prijavljene sa binovima od 10^4, 10^5, 10^6, ili ≥ 10^7 kopija/mL		
Acinetobacter calcoaceticus-baumannii kompleks	*Klebsiella oxytoca*	*Serratia marcescens*
Enterobacter cloacae kompleks	*Klebsiella pneumoniae grupa*	*Staphylococcus aureus*
Escherichia coli	*Moraxella catarrhalis*	*Streptococcus agalactiae*
Haemophilus influenzae	*Proteus* vrste	*Streptococcus pneumoniae*
Klebsiella aerogenes	*Pseudomonas aeruginosa*	*Streptococcus pyogenes*

Atipične bakterije		
Chlamydia pneumoniae	*Legionella pneumophila*	*Mycoplasma pneumoniae*
Virusi		
Adenovirus	Humani rinovirus/enterovirus	Bliskoistočni respiratorni sindrom – koronavirus (MERS-CoV)
Koronavirus	Influenca A	Virus parainfluence
Humani metapneumovirus	Influenca B	Respiratorni sincicijalni virus
Geni antimikrobne rezistencije		
CTX-M	NDM	*mecA/C* i MREJ
IMP	OXA-48-like	
KPC	VIM	

RESEARCH ARTICLE

PLOS ONE

Prevalence and outcomes of co-infection and superinfection with SARS-CoV-2 and other pathogens: A systematic review and meta-analysis

Published: May 6, 2021

Results

Of 6639 articles screened, 118 were included in the random effects meta-analysis. The pooled prevalence of co-infection was 19% (95% confidence interval [CI]: 14%-25%, I^2 = 98%) and that of superinfection was 24% (95% CI: 19%-30%). Pooled prevalence of pathogen type stratified by co- or superinfection were: viral co-infections, 10% (95% CI: 6%-14%); viral superinfections, 4% (95% CI: 0%-10%); bacterial co-infections, 8% (95% CI: 5%-11%); bacterial superinfections, 20% (95% CI: 13%-28%); fungal co-infections, 4% (95% CI: 2%-7%); and fungal superinfections, 8% (95% CI: 4%-13%). Patients with a co-infection or superinfection had higher odds of dying than those who only had SARS-CoV-2 infection (odds ratio = 3.31, 95% CI: 1.82–5.99). Compared to those with co-infections, patients with

Table 2. All identified organisms as a proportion of total number of organisms per pathogen.

Pathogen type	Co-infection (N = 1910) No. (%)	Superinfection (N = 480) No. (%)
Bacteria		
Staphylococcus aureus	148 (7.7)	13 (2.7)
Haemophilus influenza	127 (6.6)	6 (1.3)
Mycoplasma pneumoniae	82 (4.3)	6 (1.3)
Acinetobacter spps	78 (4.1)	107 (22.3)
Escherichia coli	73 (3.8)	33 (6.9)
Stenotrophomonas maltophilia	10 (0.5)	18 (3.8)
Klebsiella pneumoniae	189 (9.9)	28 (5.8)
Streptococcus pneumoniae	156 (8.2)	4 (0.8)
Chlamydia pneumoniae	29 (1.5)	
Bordetella	3 (0.2)	
Moraxella catarrhalis	32 (1.7)	
Pseudomonas	67 (3.5)	
Enterococcus faecium	14 (0.7)	22 (4.
Viruses		
Non-SARS-CoV-2[a] coronavirus strains	38 (2.0)	9 (1.9)
Human influenza A	426 (22.3)	0 (0)
Human influenza *B*	73 (3.8)	0 (0)
Respiratory syncytial virus	72 (3.8)	2 (0.4)
Parainfluenza	17 (0.9)	0 (0)
Human metapneumovirus	20 (1.0)	9 (1.9)
Rhinovirus	68 (3.6)	11 (2.3)
Adenovirus	35 (1.8)	2 (0.4)
Fungi		
Mucor	6 (0.3)	1 (0.2)
Candida spp.	19 (1.0)	90 (18.8)
Aspergillus	128 (6.7)	65 (13.5)

respiratorne koinfekcije

FilmArray® Pneumonia Panel plus – naše iskustvo

FilmArray®
Pneumonia Panel *plus* - IVD

BIOFIRE A BIOMÉRIEUX COMPANY
www.BioFireDx.com

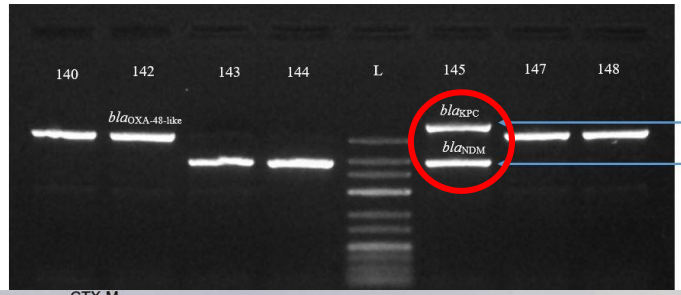
Run Information

Sample ID	[redacted]	Run Date	05 Feb 2021 11:03 AM
Protocol	SPUTUM v3.3	Serial No.	30889230
Pouch Type	Pneumo*plus* v2.0	Lot No.	376220
Controls	Passed	Operator	Institut Dedinje (LabIKVBD)
Run Status	Completed	Instrument	2FA06341

Result Summary

Bacteria

	Bin (copies/mL)		10^4	10^5	10^6	≥10^7
Not Detected		*Acinetobacter calcoaceticus-baumannii* complex				
Not Detected		*Enterobacter cloacae* complex				
Not Detected		*Escherichia coli*				
Not Detected		*Haemophilus influenzae*				
Not De						
Not De						
Not De						
Not De						
Not De						
Not De						
Not De						
✓ Detec						
Not De						
Not D						



Note: D
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consist
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correla

Antimicro

⦸ N/A	CTX-M
⦸ N/A	IMP
⦸ N/A	KPC
✓ Detected	*mecA/C* and MREJ
⦸ N/A	NDM
⦸ N/A	OXA-48-like
⦸ N/A	VIM

Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for a genetic marker of antimicrobial resistance does not indicate susceptibility to associated antimicrobial drugs or drug classes. A Detected result for a genetic marker of antimicrobial resistance cannot be definitively linked to the microorganism(s) detected. Culture is required to obtain isolates for antimicrobial susceptibility testing and FilmArray Pneumonia Panel *plus* results should be used in conjunction with culture results for the determination of susceptibility or resistance.

Atypical Bacteria

Not Detected	*Chlamydia pneumoniae*
Not Detected	*Legionella pneumophila*
Not Detected	*Mycoplasma pneumoniae*

Viruses

Not Detected	Adenovirus
Not Detected	Coronavirus
Not Detected	Human Metapneumovirus
Not Detected	Human Rhinovirus/Enterovirus
Not Detected	Influenza A
Not Detected	Influenza B
Not Detected	Middle East Respiratory Syndrome Coronavirus (MERS-CoV)
Not Detected	Parainfluenza Virus
Not Detected	Respiratory Syncytial Virus

FilmArray®
Pneumonia Panel *plus* - IVD

BIOFIRE A BIOMÉRIEUX COMPANY
www.BioFireDx.com

Run Information

Sample ID	113355 BORZANOVIC MILORAD	Run Date	13 Dec 2020 7:11 PM
Protocol	BAL v3.3	Serial No.	30889242
Pouch Type	Pneumo*plus* v2.0	Lot No.	376220
Controls	Passed	Operator	lab lab (Lab IKVBD)
Run Status	Completed	Instrument	2FA06341

Result Summary

Bacteria

	Bin (copies/mL)		10^4	10^5	10^6	≥10^7
✓ Detected	≥10^7	*Acinetobacter calcoaceticus-baumannii* complex				
Not Detected		*Enterobacter cloacae* complex				
Not Detected		*Escherichia coli*				
Not Detected		*Haemophilus influenzae*				
Not Detected		*Klebsiella aerogenes*				
Not Detected		*Klebsiella oxytoca*				
✓ Detected	10^5	*Klebsiella pneumoniae* group				
Not Detected		*Moraxella catarrhalis*				
Not Detected		*Proteus* spp.				
Not Detected		*Pseudomonas aeruginosa*				
Not Detected		*Serratia marcescens*				
Not Detected		*Staphylococcus aureus*				
Not Detected		*Streptococcus agalactiae*				
Not Detected		*Streptococcus pneumoniae*				
Not Detected		*Streptococcus pyogenes*				

Note: Detection of bacterial nucleic acid may be indicative of colonizing or normal respiratory flora and may not indicate the causative agent of pneumonia. Semi-quantitative Bin (copies/mL) results generated by the FilmArray Pneumonia Panel *plus* are not equivalent to CFU/mL and do not consistently correlate with the quantity of bacterial analytes compared to CFU/mL. For specimens with multiple bacteria detected, the relative abundance of nucleic acids (copies/mL) may not correlate with the relative abundance of bacteria as determined by culture (CFU/mL). Clinical correlation is advised to determine significance of semi-quantitative Bin (copies/mL) for clinical management.

Antimicrobial Resistance Genes

Not Detected	CTX-M
Not Detected	IMP
✓ Detected	KPC
⦸ N/A	*mecA/C* and MREJ
✓ Detected	NDM
Not Detected	OXA-48-like
Not Detected	VIM

Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for a genetic marker of antimicrobial resistance does not indicate susceptibility to associated antimicrobial drugs or drug classes. A Detected result for a genetic marker of antimicrobial resistance cannot be definitively linked to the microorganism(s) detected. Culture is required to obtain isolates for antimicrobial susceptibility testing and FilmArray Pneumonia Panel *plus* results should be used in conjunction with culture results for the determination of susceptibility or resistance.

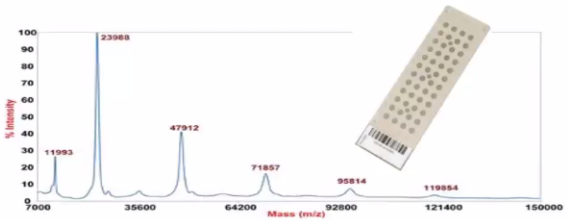
Atypical Bacteria

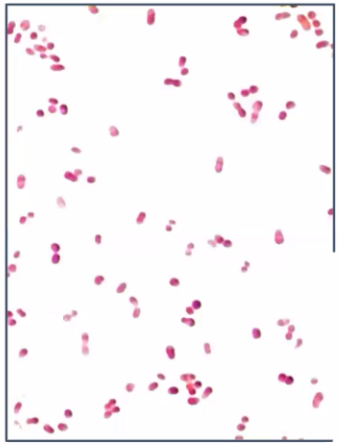
Not Detected	*Chlamydia pneumoniae*
Not Detected	*Legionella pneumophila*
Not Detected	*Mycoplasma pneumoniae*

Viruses

Not Detected	Adenovirus
Not Detected	Coronavirus
Not Detected	Human Metapneumovirus
Not Detected	Human Rhinovirus/Enterovirus
Not Detected	Influenza A
Not Detected	Influenza B
Not Detected	Middle East Respiratory Syndrome Coronavirus (MERS-CoV)
Not Detected	Parainfluenza Virus
Not Detected	Respiratory Syncytial Virus

Infekcije krvi: direktna detekcija iz hemokulture





hands-on time = 2-3 min

RESULT: after 1,5-h

K. pneumoniae

Bitte die Packungseinlage für Details beachten.

Probe	bk2056		
Test	BC-GN	?	Prozeß Abgeschlossen 01-31-16, 01:16 p.m.
Kartusche	02148436		Analyse Abgeschlossen 01-31-16, 02:08 p.m.

Übersicht

Detail

Acinetobacter	Nicht detektiert	Citrobacter	Nicht detektiert
Enterobacter	Nicht detektiert	Proteus	Nicht detektiert
E. coli	Nicht detektiert	P. aeruginosa	Nicht detektiert
K. oxytoca	Nicht detektiert	K. pneumoniae	Detektiert
VIM	Nicht detektiert	OXA	Nicht detektiert
CTX-M	Detektiert	KPC	Nicht detektiert
NDM	Nicht detektiert	IMP	Nicht detektiert
S. marcescens	Nicht detektiert		

Information Verbrauchsmaterial

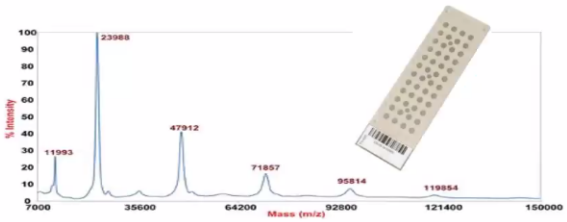
Kartusche	REF 20-006-021	2016-05-09	LOT 111115021A
Extraktionsplatte	REF 20-009-021	2016-05-09	LOT 111115021B
Reagenzienplatte	REF 20-011-021	2016-05-09	LOT 111115021C

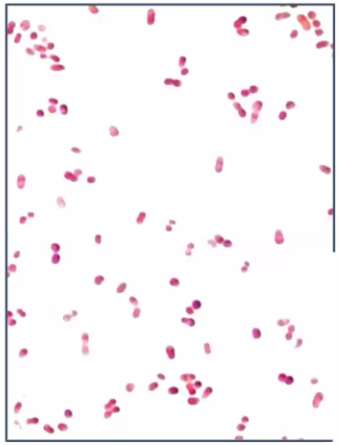
Prozessor-Qualitätskontrollstatus	
Prozessor Modul	A:1
Prozessierungszeit	113 Minuten
Prozessierungstemperatur	38,5 °C
Interne Kontrollen	Bestanden

- **Patient: Mr. J.-C. H. (78)**
  - Patient with COPD + diabetes mellitus, already hospitalized for 3 weeks because of COVID-19.
  - **LAST NIGHT around 21:30 patient was transferred from intermediate-care to ICU because of high BT, CRP, and leukocytes.**
  - **The patient was without AB *Th.* and the BC were collected**

CEFTAZIDIME + MOXIFLOXACIN were administrated

Infekcije krvi: direktna detekcija iz hemokulture/direktna detekcija iz krvi





hands-on time = 2-3 min

RESULT: after 1,5-h

K. pneumoniae

Bitte die Packungseinlage für Details beachten.

Probe	bk2056		
Test	BC-GN	?	Prozeß Abgeschlossen 01-31-16, 01:16 p.m.
Kartusche	02148436		Analyse Abgeschlossen 01-31-16, 02:08 p.m.

Übersicht

Detail

Acinetobacter	Nicht detektiert	Citrobacter	Nicht detektiert
Enterobacter	Nicht detektiert	Proteus	Nicht detektiert
E. coli	Nicht detektiert	P. aeruginosa	Nicht detektiert
K. oxytoca	Nicht detektiert	K. pneumoniae	Detektiert
VIM	Nicht detektiert	OXA	Nicht detektiert
CTX-M	Detektiert	KPC	Nicht detektiert
NDM	Nicht detektiert	IMP	Nicht detektiert
S. marcescens	Nicht detektiert		

Information Verbrauchsmaterial

Kartusche	REF 20-006-021	2016-05-09	LOT 111115021A
Extraktionsplatte	REF 20-009-021	2016-05-09	LOT 111115021B
Reagenzienplatte	REF 20-011-021	2016-05-09	LOT 111115021C

Prozessor-Qualitätskontrollstatus	
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Prozessierungstemperatur	38,5 °C
Interne Kontrollen	Bestanden

- **Patient: Mr. J.-C. H. (78)**
  - Patient with COPD + diabetes mellitus, already hospitalized for 3 weeks because of COVID-19.
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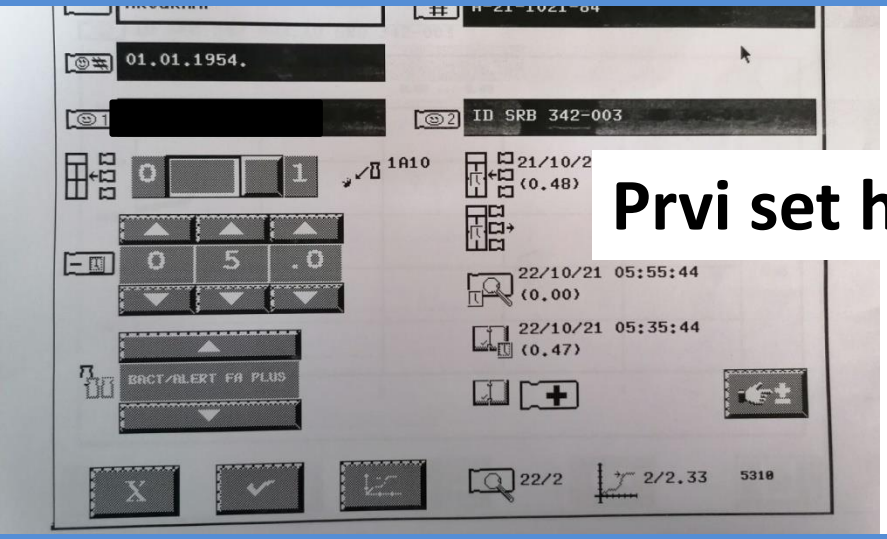
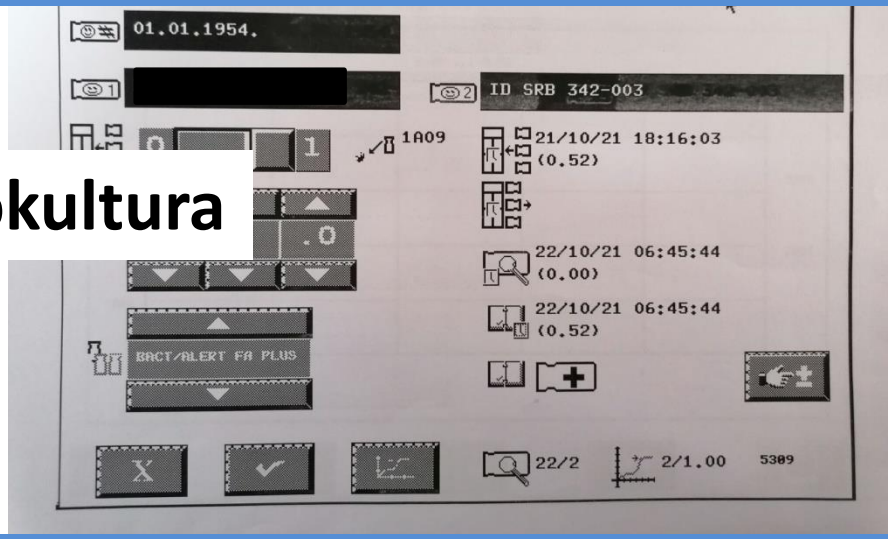
  - **The patient was without AB *Th.* and the BC were collected**

CEFTAZIDIME + MOXIFLOXACIN were administrated

Therapy was escalated to *MEROPENEM*

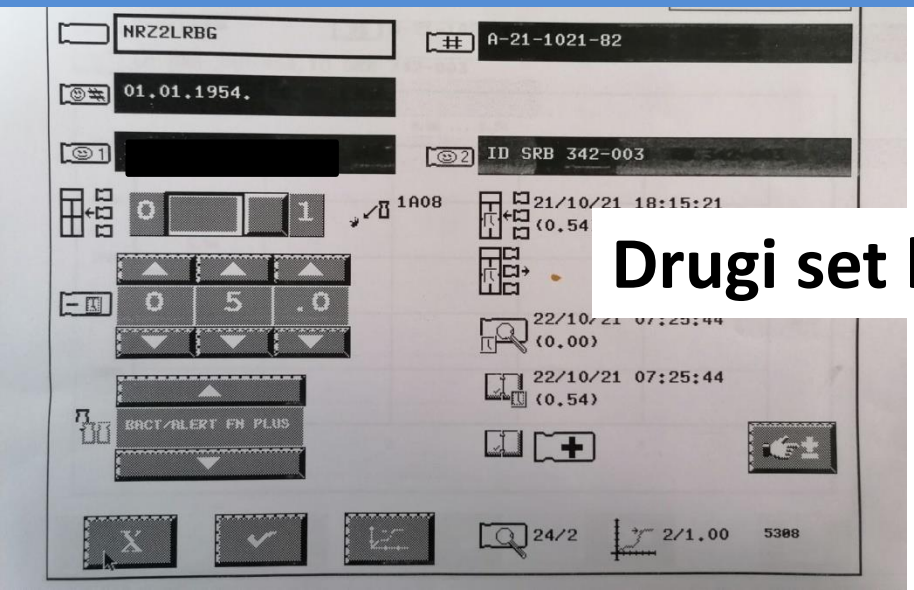
Naše iskustvo

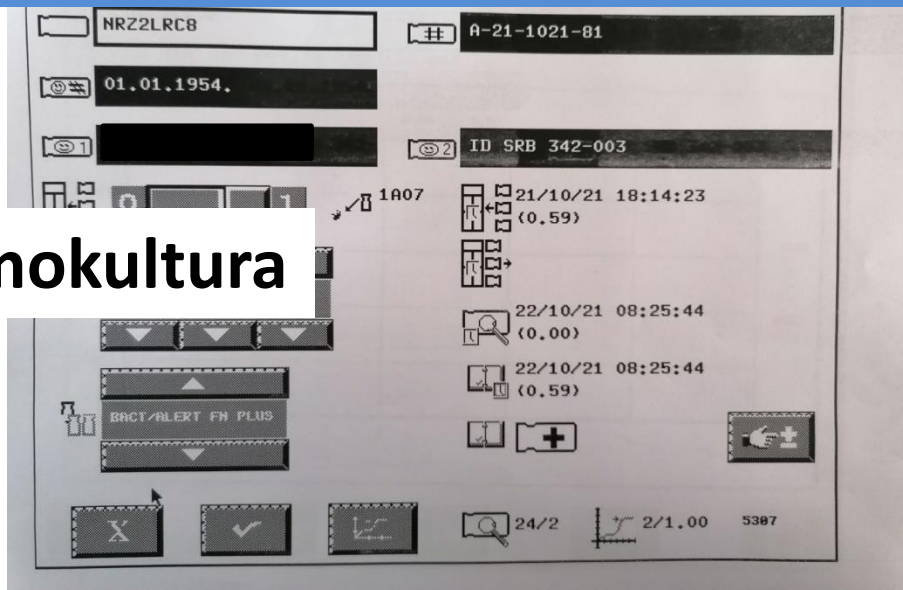




Prvi set hemokultura

U dva seta hemokultura (4 bočice) – detektovan *Staphylococcus epidermidis*, meticilin osetljiv (MSSE)





Drugi set hemokultura

Brzi molekularni test
Blood culture (hemokultura) panel

Pozitivne hemokultura

43 targeta– 1 test – 60 minuta

GRAM-NEGATIVE BACTERIA
- *Acinetobacter calcoaceticus-baumannii* complex
- ***Bacteroides fragilis***
- ***Enterobacterales***
  - *Enterobacter cloacae cp.*
  - *Escherichia coli*
  - ***Klebsiella aerogenes***
  - *Klebsiella oxytoca*
  - *Klebsiella pneumoniae* group
  - *Proteus*
  - ***Salmonella***
  - *Serratia marcescens*
- *Haemophilus influenzae*
- *Neisseria meningitidis*
- *Pseudomonas aeruginosa*
- ***Stenotrophomonas maltophilia***

GRAM-POSITIVE BACTERIA
- ***Enterococcus faecalis***
- ***Enterococcus faecium***
- *Listeria monocytogenes*
- ***Staphylococcus***
  - *Staphylococcus aureus*
  - ***Staphylococcus epidermidis***
  - ***Staphylococcus lugdunensis***
- ***Streptococcus***
  - *Streptococcus agalactiae*
  - *Streptococcus pneumoniae*
  - *Streptococcus pyogenes*

YEAST
- *Candida albicans*
- ***Candida auris***
- *Candida glabrata*
- *Candida krusei*
- *Candida parapsilosis*
- *Candida tropicalis*
- ***Cryptococcus neoformans/gattii***

ANTIMICROBIAL RESISTANCE GENES

Carbapenemases
- **IMP**
- KPC
- **NDM**
- **OXA-48-like**
- **VIM**

Colistin Resistance
- ***mcr-1***

ESBL
- **CTX-M**

Methicillin Resistance
- *mecA/C*
- ***mecA/C* and MREJ (MRSA)**

Vancomycin Resistance
- *vanA/B*

ZAVOD ZA LABORATORIJSKU DIJAGOSTIKU
KONZILIJUM

Svetog Save 28a
Bratstva i jedinstva 105
Kneginje Zorke 30

(011) 3861- 047, 2430-804, 2434-892
(011) 3322-723, 2673 830, 715 1921

http://www.konzilijum.rs
info@konzilijum.rs

ATC 03-011
МЕДИЦИНСКА ЛАБОРАТОРИЈА ENISO 15189

Ime pacijenta: [redacted]

Pol: Ž Datum rodjenja: 05.10.1943

Datum prijema:
Datum izdavanja: [redacted]

IZVEŠTAJ O ISPITIVANJU

Broj protokola [redacted]

Vrsta uzorka: **Brisevi kože i površinskih rana/bris rane**

Analiza: **Bakteriološka kultura-izolovanje, identifikacija i ispitivanje osetljivosti na antibiotike klinički značajnih bakterija**

REZULTAT	ANTIBIOGRAM Metoda: 3/1	
Pseudomonas aeruginosa - Veliki broj Metoda: 1/1, 2/1		
	Piperacilin	I
	Piperacilin + tazo baktam	I
	Ceftazidim	I
	Cefepim	I
	Imipenem	I
	Meropenem	S
	Amikacin	S
	Tobramicin	S
	Ciprofloksacin	I
	Levofloksacin	I

Napomena: Za terapiju sistemskih infekcija aminoglikozidne antibiotike primenjivati isključivo u kombinaciji sa drugim aktivnim antimikrobnim lekom.

ZAVOD ZA LABORATORIJSKU DIJAGOSTIKU
KONZILIJUM

Svetog Save 28a
Bratstva i jedinstva 105
Kneginje Zorke 30

(011) 3861- 047, 2430-804, 2434-892
(011) 3322-723, 2673 830, 715 1921

http://www.konzilijum.rs
info@konzilijum.rs

ATC 03-011
МЕДИЦИНСКА ЛАБОРАТОРИЈА ENISO 15189

Ime pacijenta: [redacted]
Pol: Ž Datum rodjenja: 05.10.1943

Datum prijema:
Datum izdavanja: [redacted]

IZVEŠTAJ O ISPITIVANJU

Broj protokola [redacted]

Vrsta uzorka: **Brisevi kože i površinskih rana/bris rane**

Analiza: **Bakteriološka kultura-izolovanje, identifikacija i ispitivanje osetljivosti na antibiotike klinički značajnih bakterija**

REZULTAT	ANTIBIOGRAM Metoda: 3/1	
Pseudomonas aeruginosa - Veliki broj Metoda: 1/1, 2/1		
	Piperacilin	I
	Piperacilin + tazo baktam	I
	Ceftazidim	I
	Cefepim	I
	Imipenem	I
	Meropenem	S
	Amikacin	S
	Tobramicin	S
	Ciprofloksacin	I
	Levofloksacin	I

Aminoglikozidi – samo kombinovana terapija

Napomena: Za terapiju sistemskih infekcija aminoglikozidne antibiotike primenjivati isključivo u kombinaciji sa drugim aktivnim antimikrobnim lekom.

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ATC 03-011
МЕДИЦИНСКА ЛАБОРАТОРИЈА ENISO 15189

Ime pacijenta: [redacted]
Pol: Ž Datum rodjenja: 05.10.1943

Datum prijema:
Datum izdavanja: [redacted]

IZVEŠTAJ O ISPITIVANJU

Broj protokola [redacted]

Vrsta uzorka: **Brisevi kože i površinskih rana/bris rane**

Analiza: **Bakteriološka kultura-izolovanje, identifikacija i ispitivanje osetljivosti na antibiotike klinički značajnih bakterija**

REZULTAT	ANTIBIOGRAM Metoda: 3/1	
Pseudomonas aeruginosa - Veliki broj Metoda: 1/1, 2/1		
	Piperacilin	I
	Piperacilin + tazo baktam	I
	Ceftazidim	I
	Cefepim	I
	Imipenem	I
	Meropenem	S
	Amikacin	S
	Tobramicin	S
	Ciprofloksacin	I
	Levofloksacin	I

Ceftazidim-avibaktam
Ceftolozan-tazobaktam
Meropenem-vaborbaktam
Imipenem-relebaktam
Kolistin

Aminoglikozidi – samo kombinovana terapija

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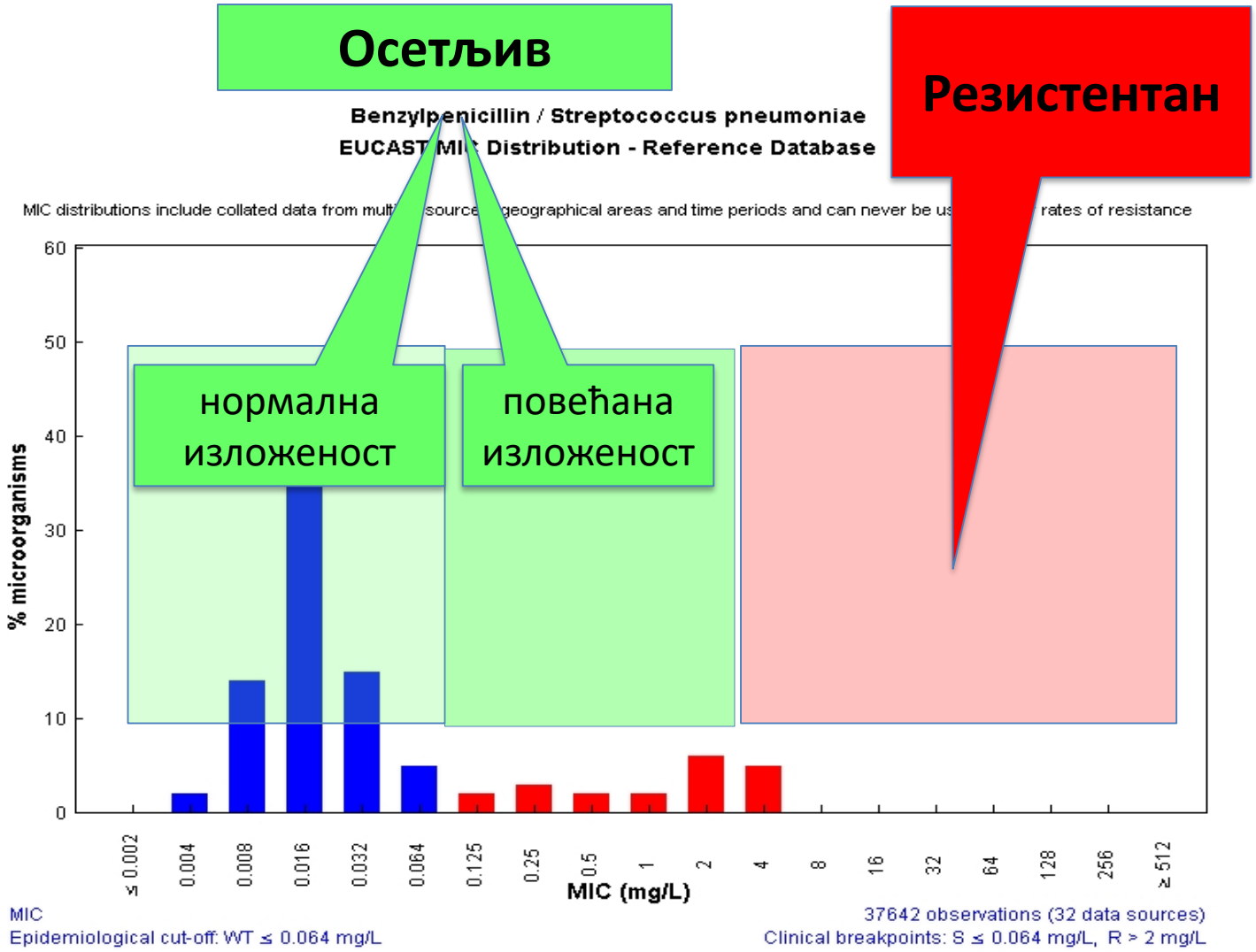
	Amikacin	S
	Tobramicin	S
	Ciprofloksacin	I
	Levofloksacin	I

Napomena: Za terapiju sistemskih infekcija aminoglikozidne antibiotike primenjivati isključivo u kombinaciji sa drugim aktivnim antimikrobnim lekom.

SIR - нове дефиниције 2019. год.



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IZVEŠTAJ O ISPITIVANJU

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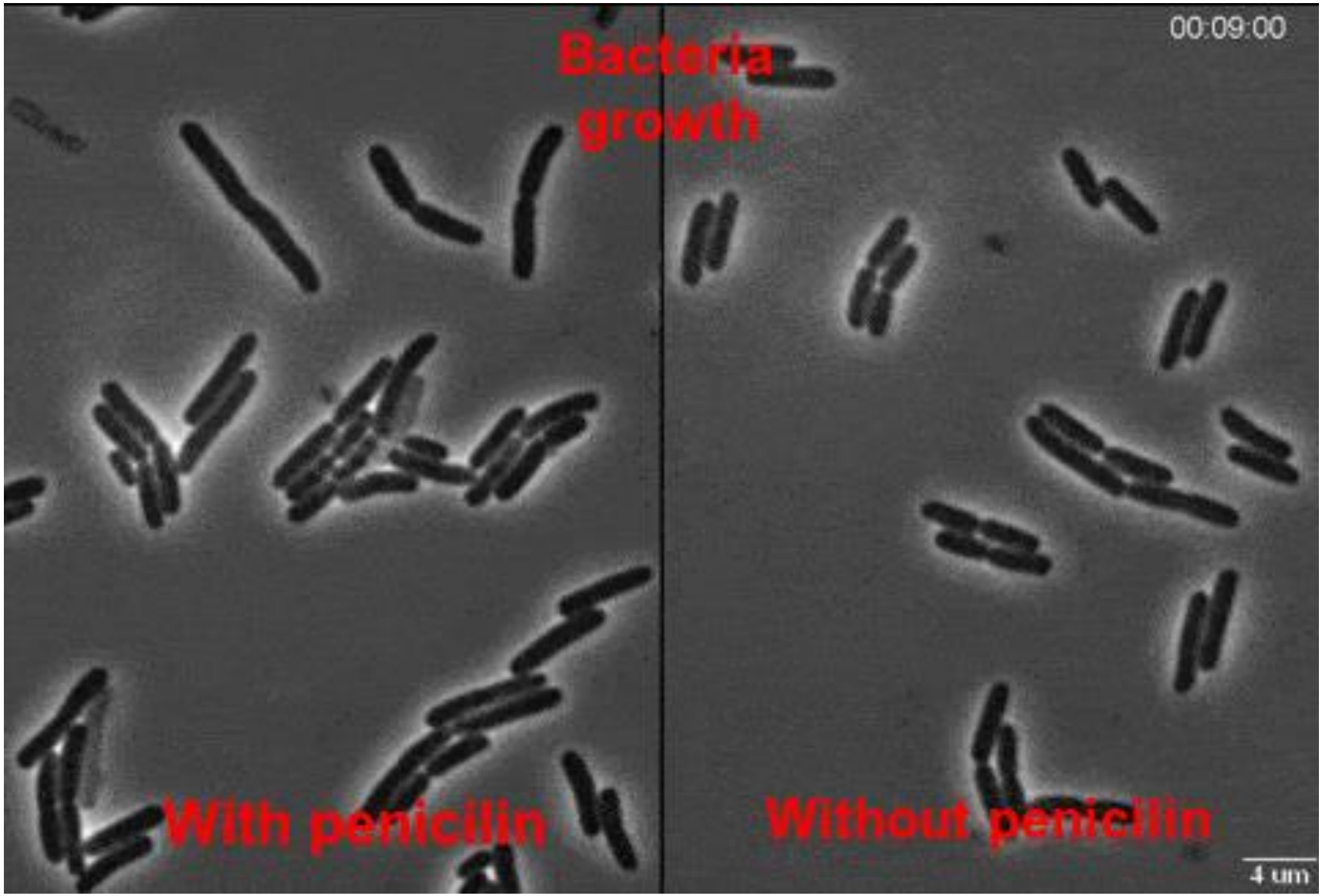
Bacteria growth
00:09:00
With penicillin
Without penicillin
4 um