

# Preživljavanje klinički značajne bakterije *Acinetobacter baumannii* u vodenim medijima različitih temperatura i vrijednosti pH

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# Acinetobacter

► 57 vrsta

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## Commonly found human pathogens

*A. baumannii* (genospecies 2)

*A. nosocomialis* (genospecies 13TU)

*A. pittii* (genospecies 3)

*A. calcoaceticus* (genospecies 1)

## Uncommon organisms in clinical infections

*A. baylyi*

*A. guillouiae*

*A. lwoffii*

*A. soli*

*A. beijerinckii*

*A. gyllenbergii*

*A. nectaris*

*A. tandoii*

*A. bereziniae*

*A. haemolyticus*

*A. parvus*

*A. tjernbergiae*

*A. boissieri*

*A. harbinensis*

*A. puyangensis*

*A. towneri*

*A. bouvetii*

*A. indicus*

*A. qingfengensis*

*A. ursingii*

*A. brisouii*

*A. johnsonii*

*A. radioresistens*

*A. venetianus*

*A. gernerii*

*A. junii*

*A. rudis*

*A. grimontii*<sup>a</sup>

*A. kookii*

*A. schindleri*

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Review

# Clinical relevance of the ESKAPE pathogens

Jack N Pendleton, Sean P Gorman & Brendan F Gilmore

Pages 297-308 | Published online: 10 Jan 2014

Download citation <http://dx.doi.org/10.1586/eri.13.12>

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## Abstract

In recent years, the Infectious Diseases Society of America has highlighted a faction of antibiotic-resistant bacteria (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Enterobacter* spp.) – acronymically dubbed ‘the ESKAPE pathogens’ – capable of ‘escaping’ the biocidal action of antibiotics and mutually representing new paradigms in pathogenesis, transmission and resistance. This review aims to consolidate clinically relevant background information on the ESKAPE pathogens and provide a contemporary summary of bacterial resistance, alongside pertinent microbiological considerations necessary to face the mounting threat of antimicrobial resistance.

Keywords:: *Acinetobacter*, antibiotics, antimicrobial resistance, *Enterobacter*, ESKAPE pathogens, hospital-acquired infection, *Klebsiella*, MRSA, multidrug resistance, *Pseudomonas*, VRE

## Bad Bugs, No Drugs: No ESKAPE! An Update from the Infectious Diseases Society of America <sup>FREE</sup>

Helen W. Boucher ✉, George H. Talbot, John S. Bradley, John E. Edwards, David Gilbert, Louis B. Rice, Michael Scheld, Brad Spellberg, John Bartlett

Clin Infect Dis (2009) 48 (1): 1-12. DOI: <https://doi.org/10.1086/595011>

Published: 01 January 2009 Article history ▼

## The WHO priority list

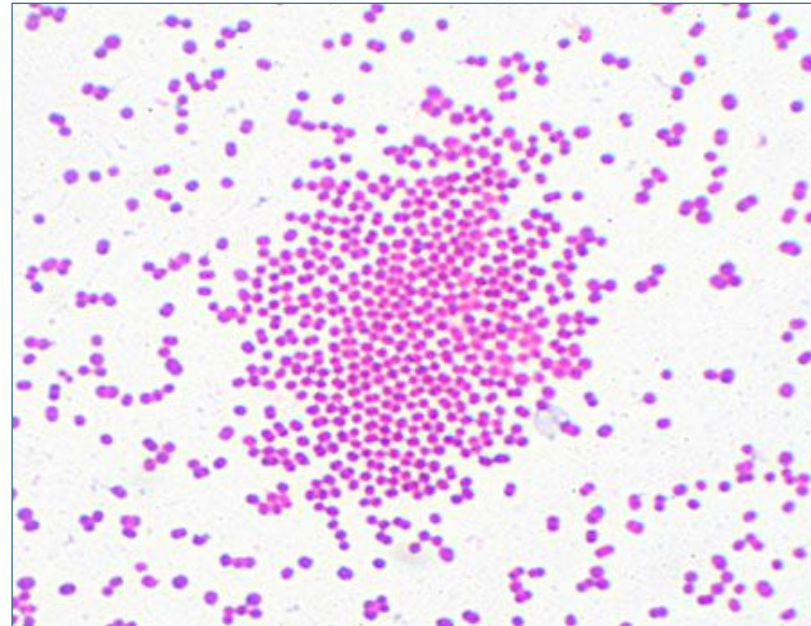
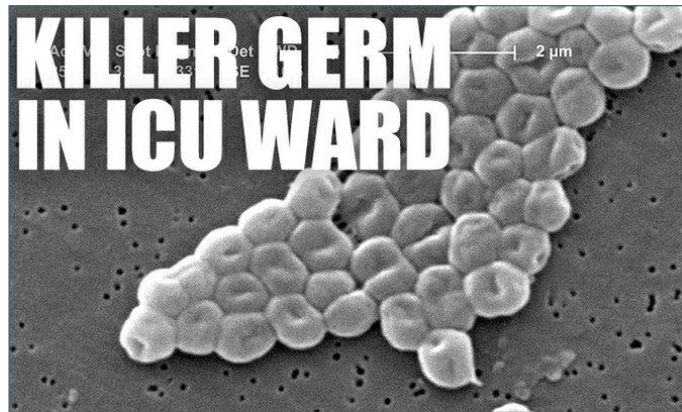
PRIORITY: CRITICAL	PRIORITY 2: HIGH	PRIORITY 3: MEDIUM
<ul style="list-style-type: none"><li>◆ <b>Acinetobacter baumannii</b> carbapenem-resistant</li><li>◆ <b>Pseudomonas aeruginosa</b> carbapenem-resistant</li><li>◆ <b>Enterobacteriaceae</b> carbapenem-resistant, ESBL-producing</li></ul>	<ul style="list-style-type: none"><li>◆ <b>Enterococcus faecium</b> vancomycin-resistant</li><li>◆ <b>Staphylococcus aureus</b> methicillin-resistant vancomycin-intermediate and resistant</li><li>◆ <b>Helicobacter pylori</b> clarithromycin-resistant</li><li>◆ <b>Campylobacter spp.</b> fluoroquinolone-resistant</li><li>◆ <b>Salmonellae</b> fluoroquinolone-resistant</li><li>◆ <b>Neisseria gonorrhoeae</b> cephalosporin-resistant fluoroquinolone-resistant</li></ul>	<ul style="list-style-type: none"><li>◆ <b>Streptococcus pneumoniae</b> penicillin-non-susceptible</li><li>◆ <b>Haemophilus influenzae</b> ampicillin-resistant</li><li>◆ <b>Shigella spp.</b> fluoroquinolone-resistant</li></ul>

Source: WHO

- ▶ Rezistencija na karbapenemske antibiotike u Hrvatskoj povećala se sa 10% u 2008. do 86% u 2016. godini (Croatian Academy of Medical Sciences. Antibiotic resistance in Croatia, 2016. Zagreb: CAMS; 2017.)

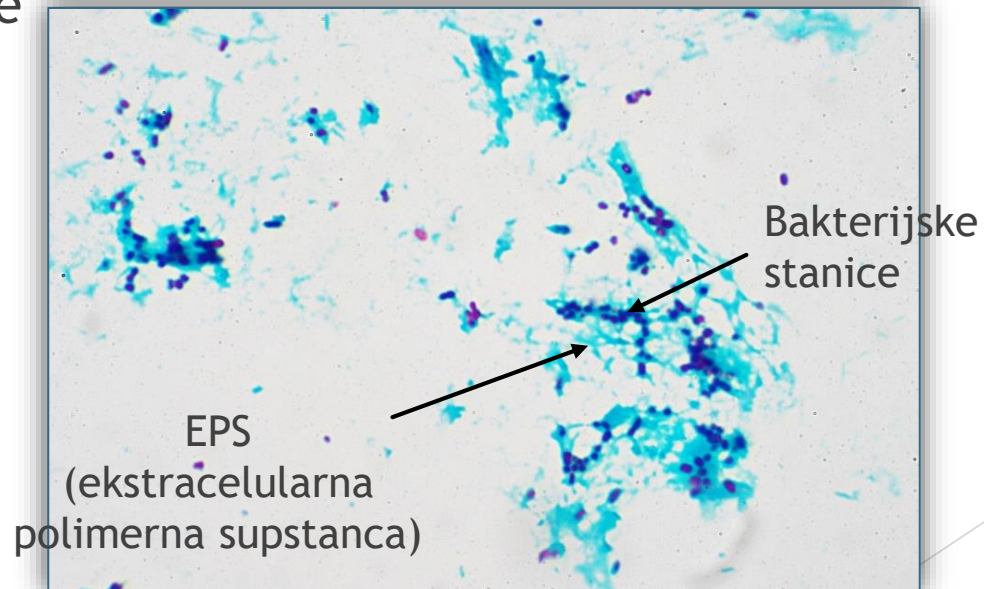
# *Acinetobacter baumannii*

- ▶ Gram negativni nesporogeni kokobacilus
- ▶ Emergentni humani oportunistički patogen
- ▶ Infekcije većinom vezane uz bolnički okoliš



# Razlozi uspješnosti

- ▶ Rezistencija na antibiotike-  
multiplo-rezistentni sojevi
- ▶ Stvaranje biofilma na biotskim  
i abiotskim površinama
- ▶ Površinska pokretljivost  
trzanjem i rojenjem
- ▶ Otpornost na komercijalne  
dezinficijense koji se  
uobičajeno koriste



# Klinički značajni *A. baumannii* u okolišu

- ▶ Bolničke otpadne vode
- ▶ Uređaji za pročišćavanje otpadnih voda
- ▶ Prirodne vode (rijeka Sena i Sava)



# Cilj

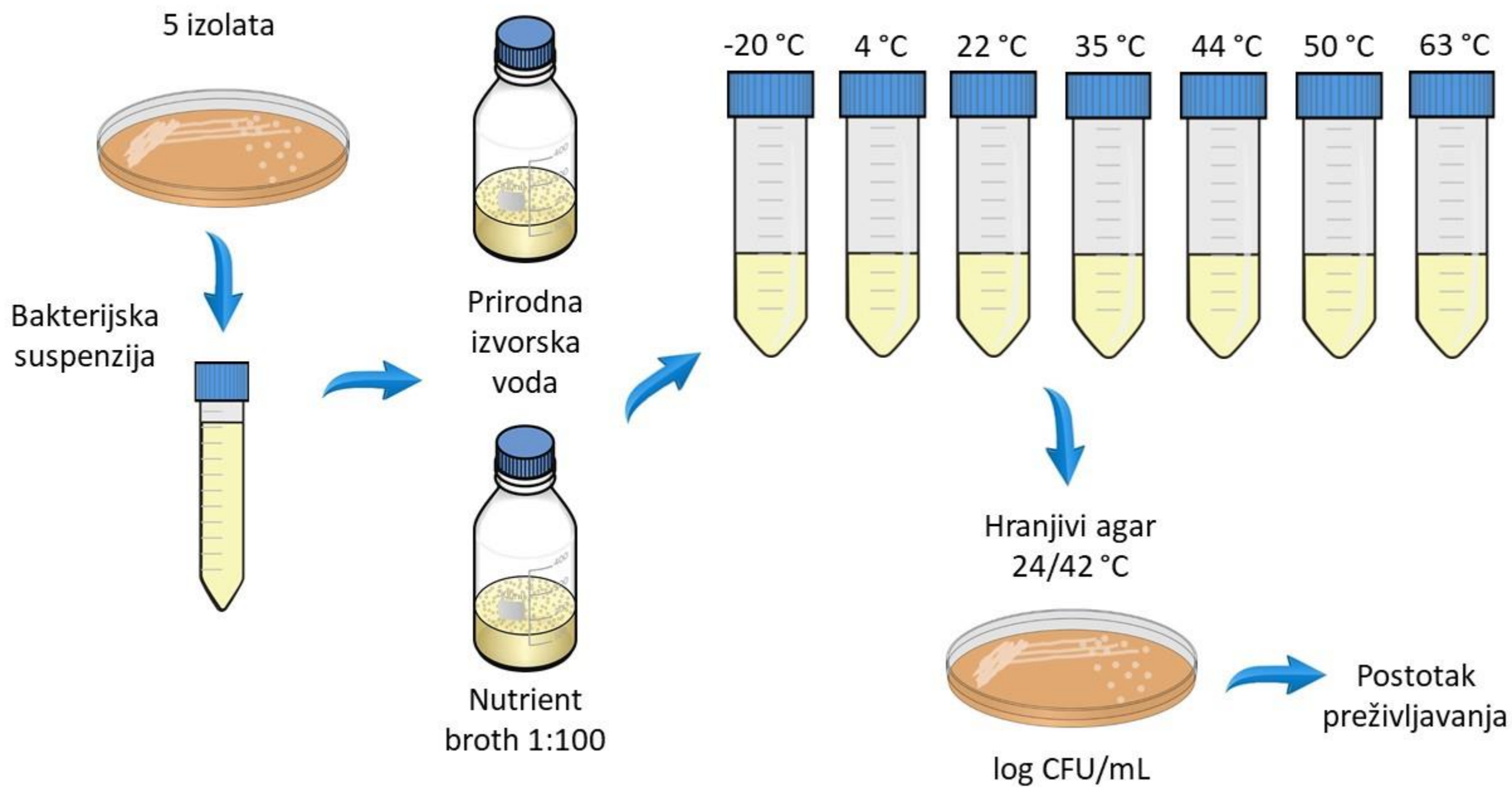
- ▶ Do danas nepoznato koji ekološki čimbenici i u kojoj mjeri utječu na preživljavanje *A. baumannii* u prirodi
- ▶ Istražiti učinak temperature i pH na preživljavanje *A. baumannii* u prirodnoj izvorskoj vodi i u vodi obogaćenoj nutrijentima



# Materijal i metode

- ▶ Eksperimenti provedeni na 4 okolišna i 1 kliničkom izolatu odabranim prema profilu antibiotske osjetljivosti kroz 7 tjedana

Izolat	Klonsko porijeklo	Stečena karbapenemaza	Profil antibiotske osjetljivosti
OB4138	IC2	OXA-23	XDR (SXT, CST)
IN39	IC2	OXA-23	MDR (MIN, CST, aminoglikozidi)
EF7	IC2	OXA-23	PDR
EF8	IC2	OXA-23	XDR (SXT, CST)
EF11	neklonski	nema	S



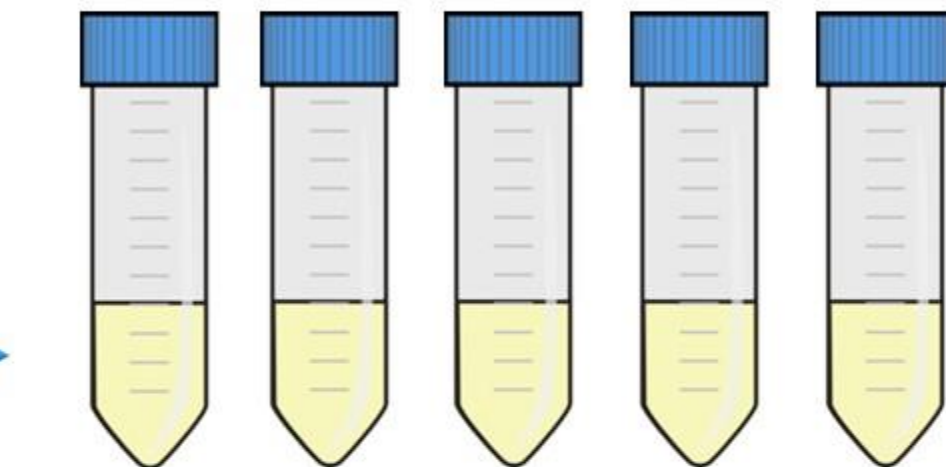
Prirodna izvorska voda



pH 2 5 7 10 12



Nutrient broth 1:100



pH 2 5 7 10 12

Bakterijska  
suspenzija



22 °C

Hranjivi agar  
24/42 °C

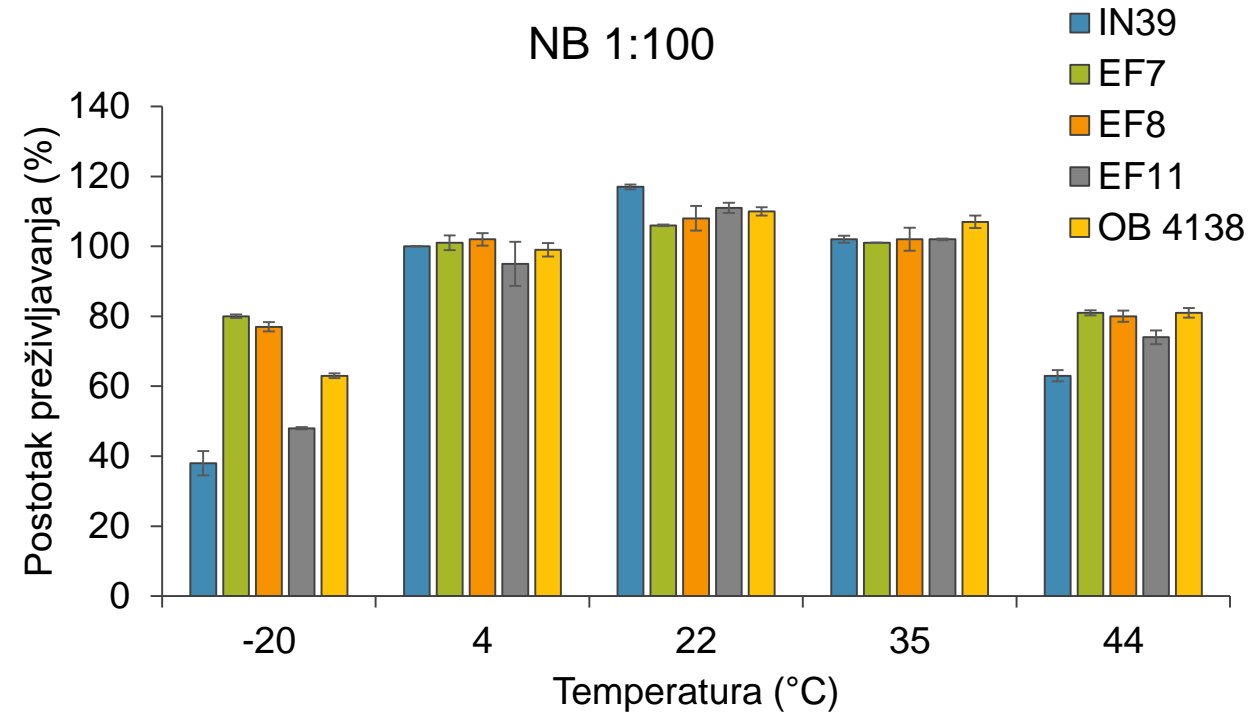
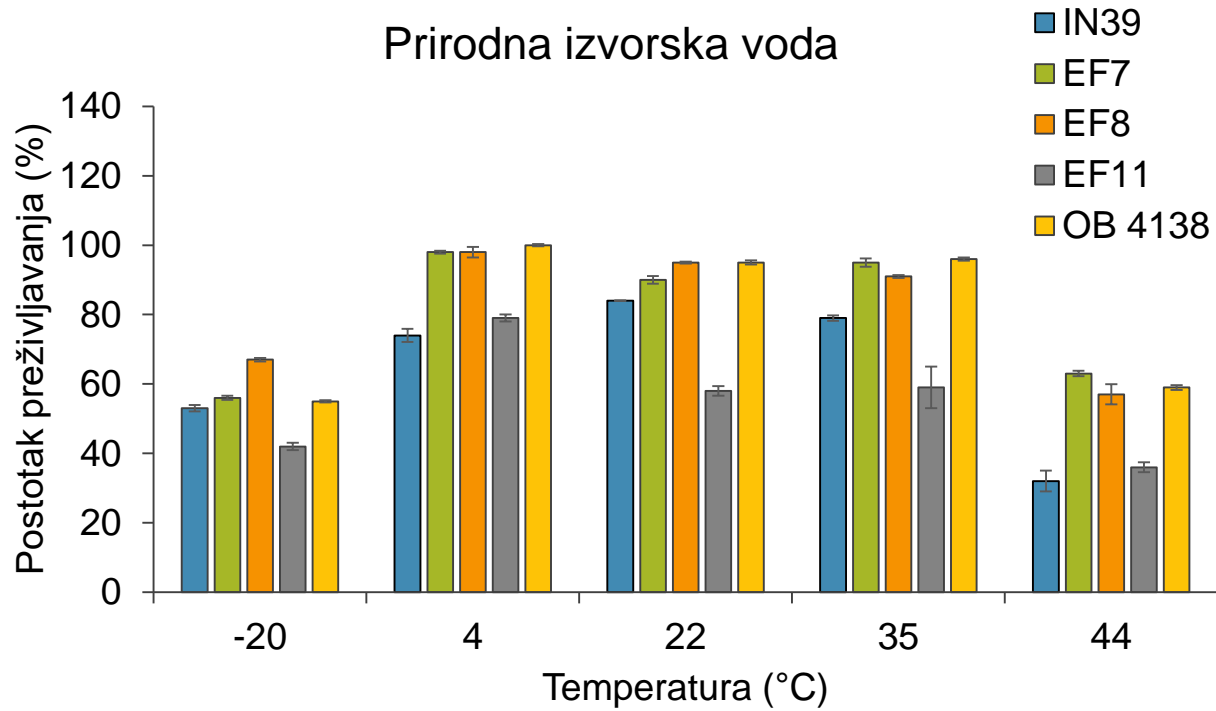


log CFU/mL

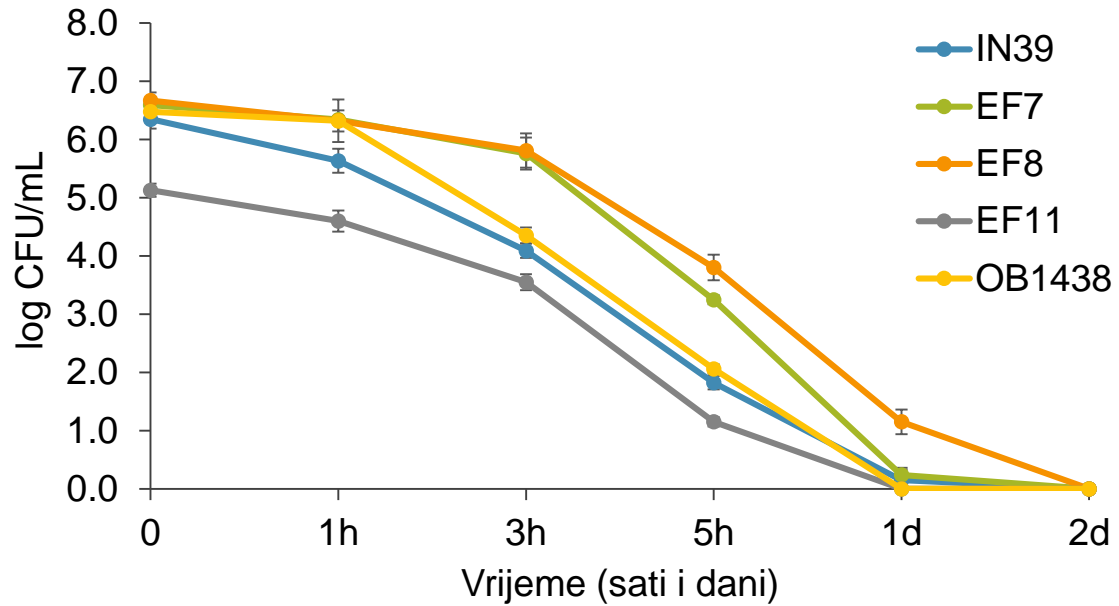


Postotak  
preživljavanja

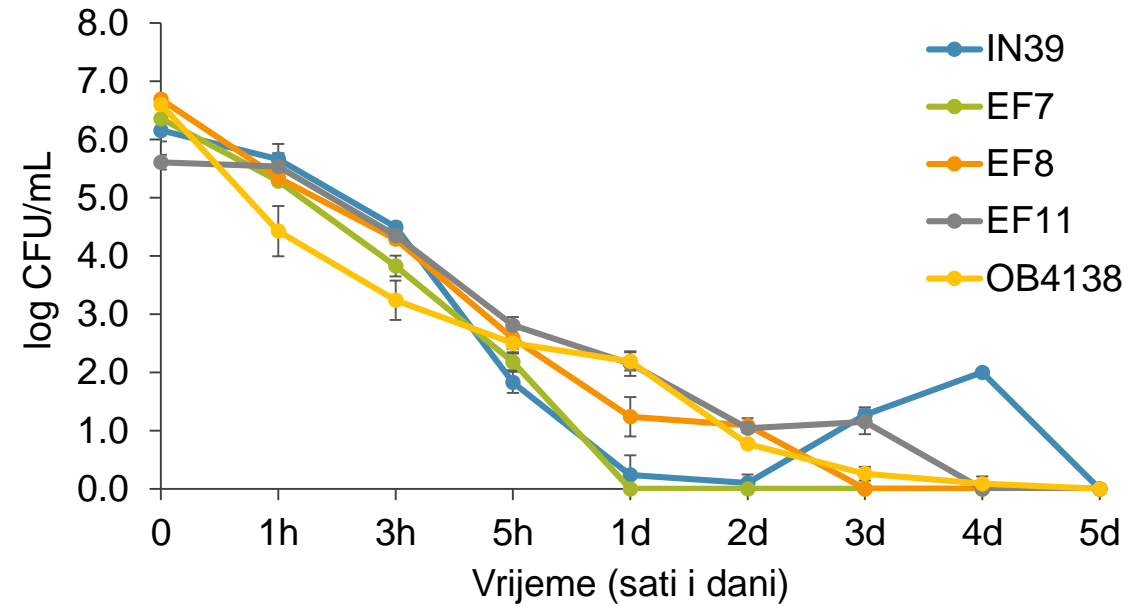
# Rezultati Temperatura



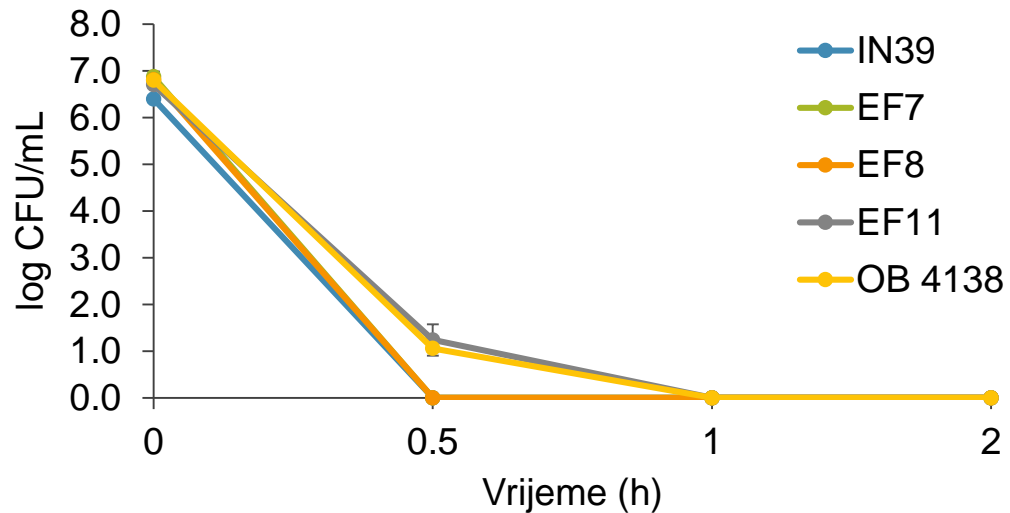
Prirodna izvorska voda 50 °C



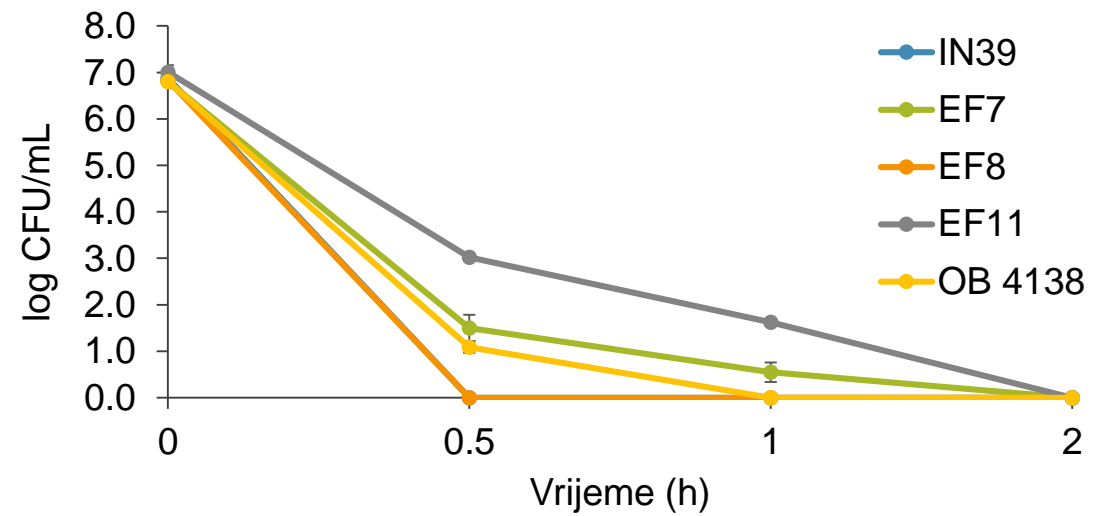
NB 1:100 50 °C



Prirodna izvorska voda 63 °C

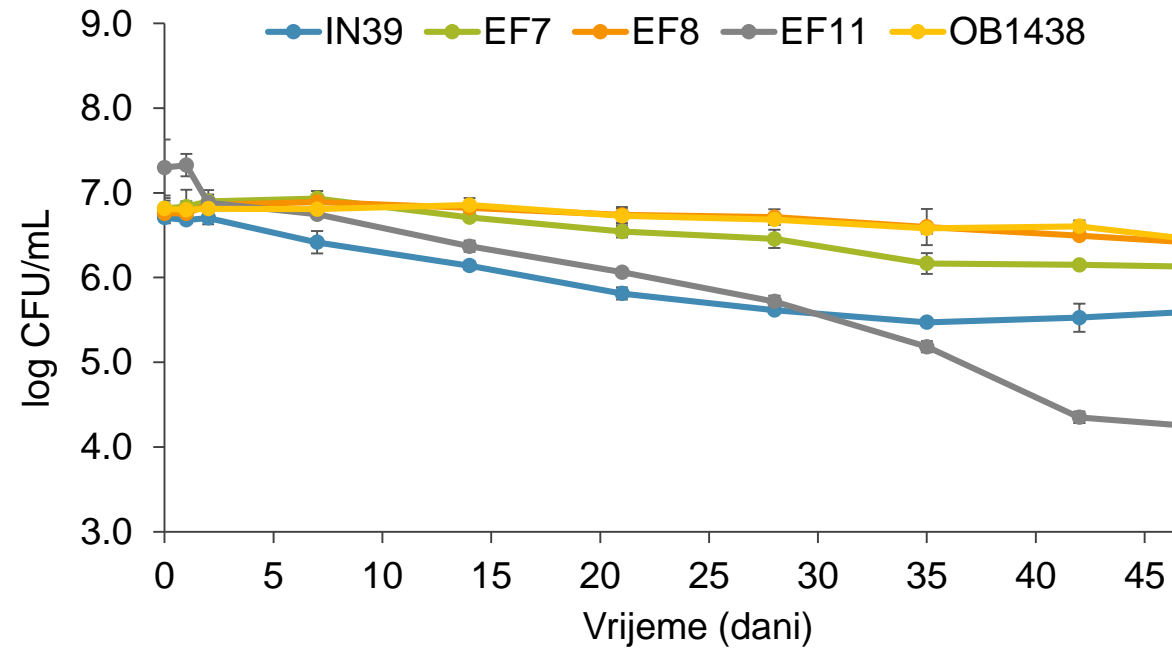


NB 1:100 63 °C

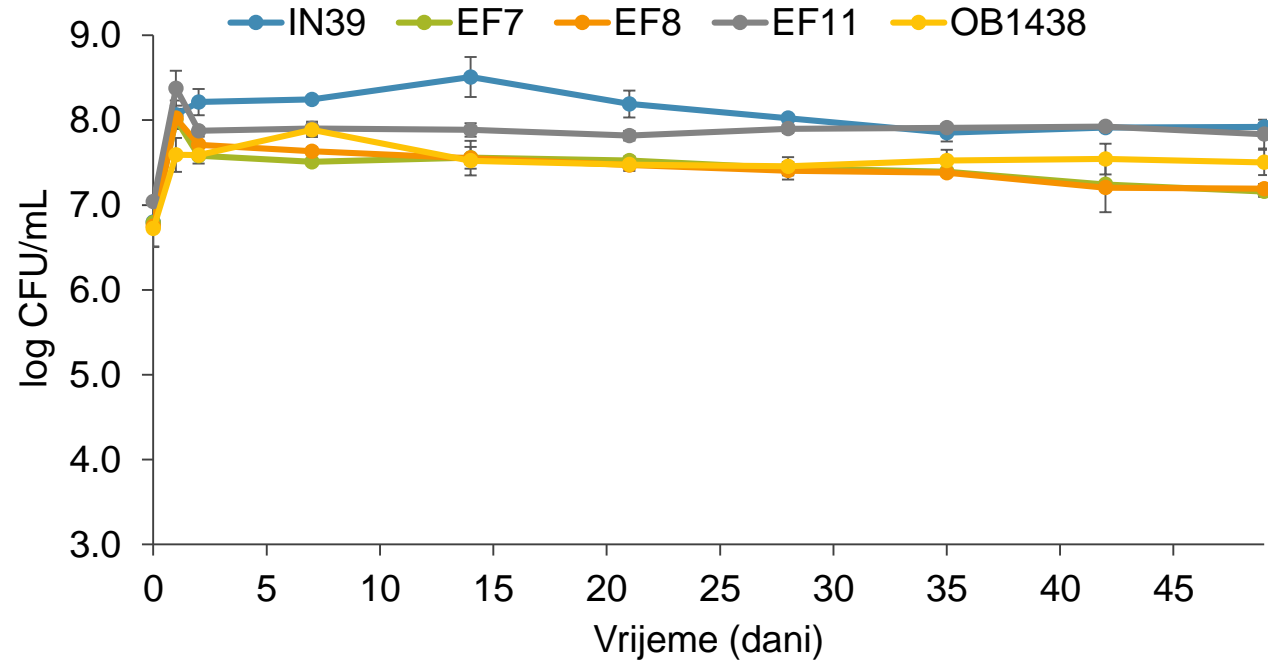


# Rezultati pH

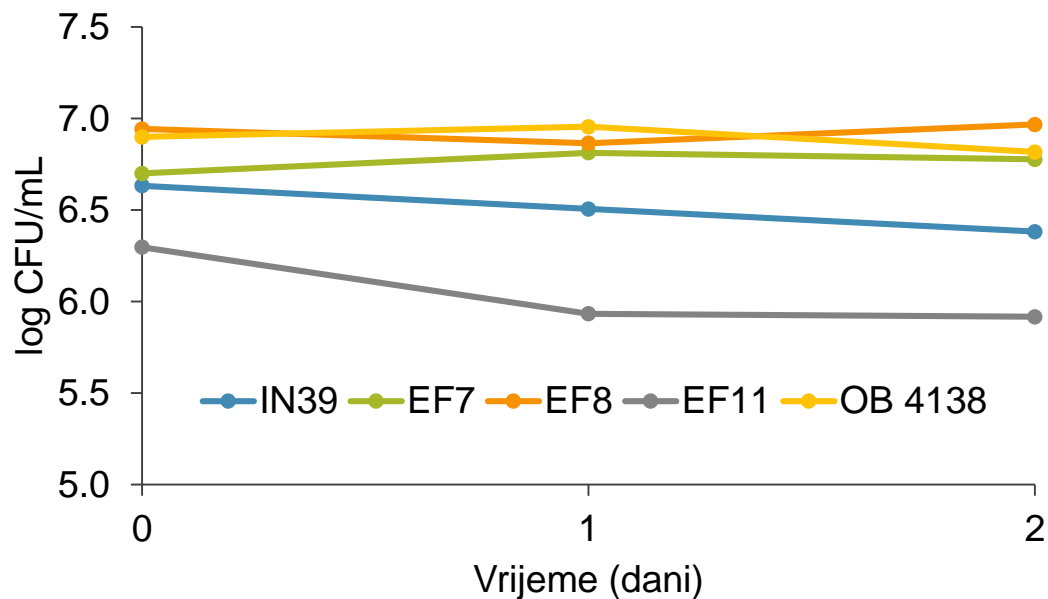
Prirodna izvorska voda 22 °C pH 7



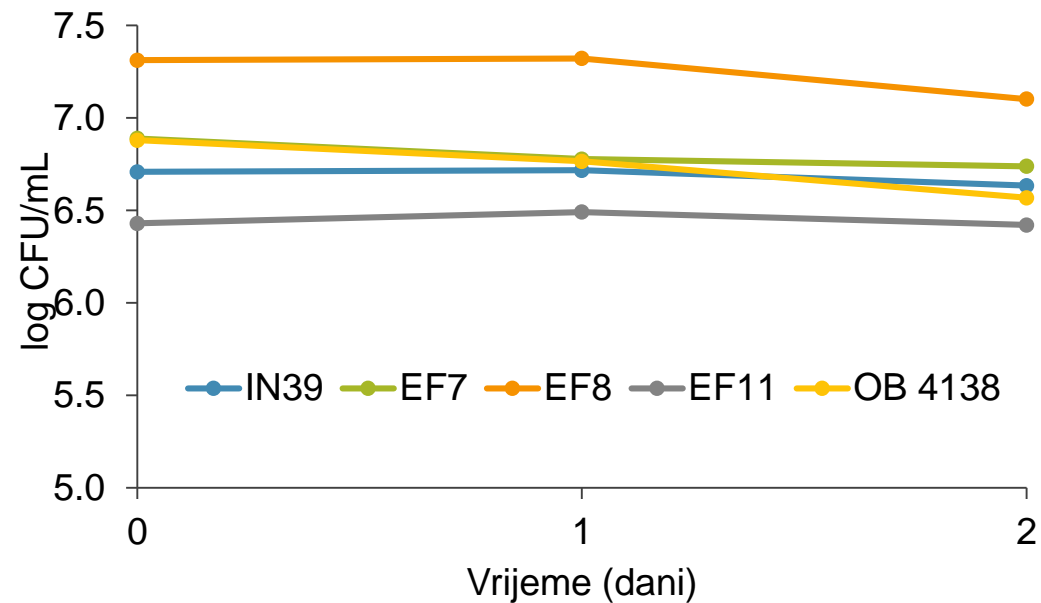
NB 1:100 22 °C pH 7



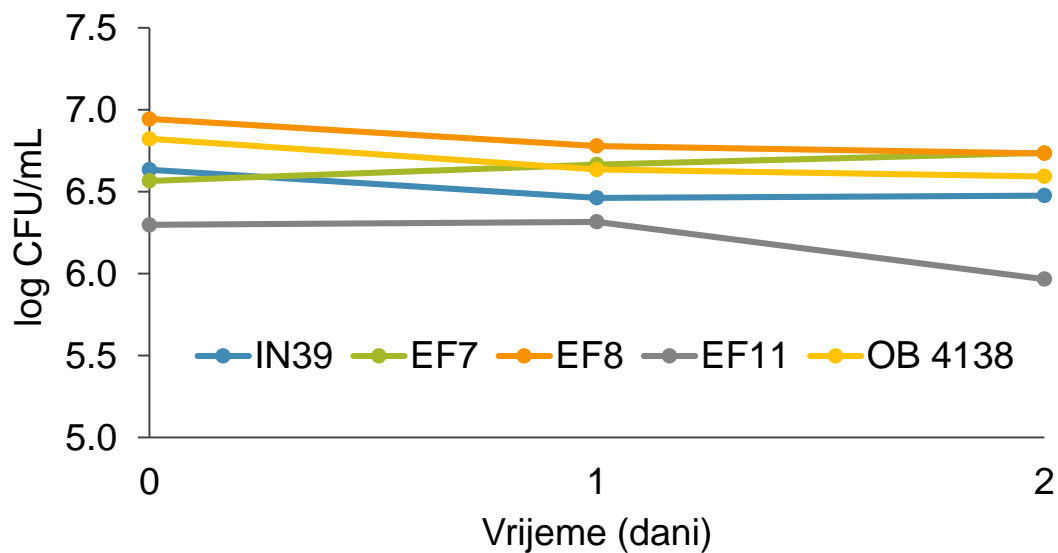
Prirodna izvorska voda pH 5



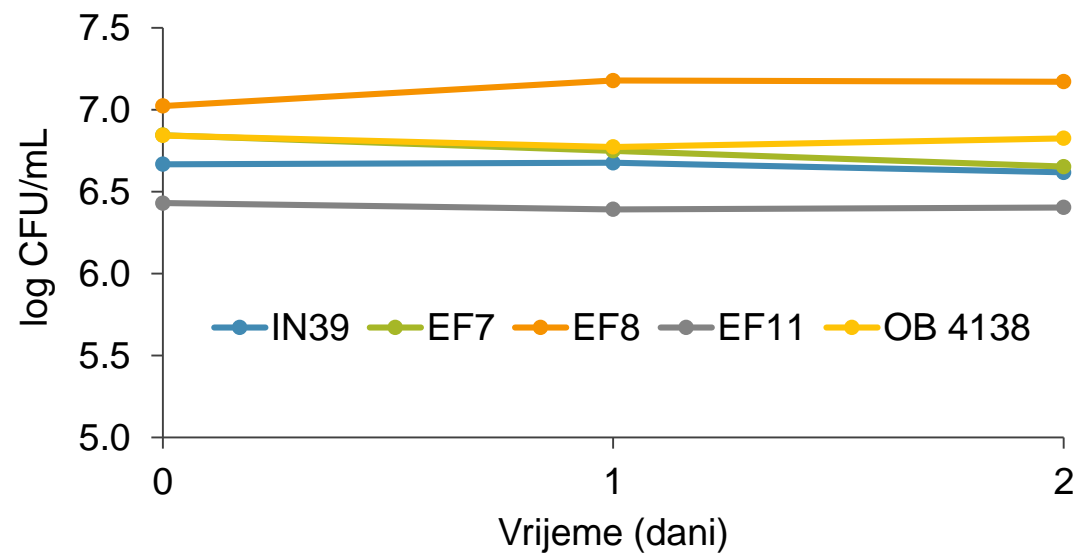
NB 1:100 pH 5



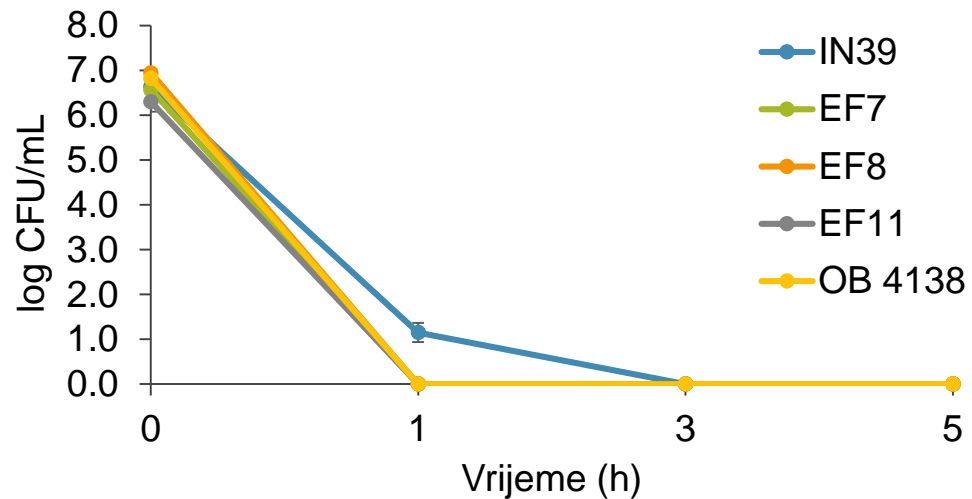
Prirodna izvorska voda pH 10



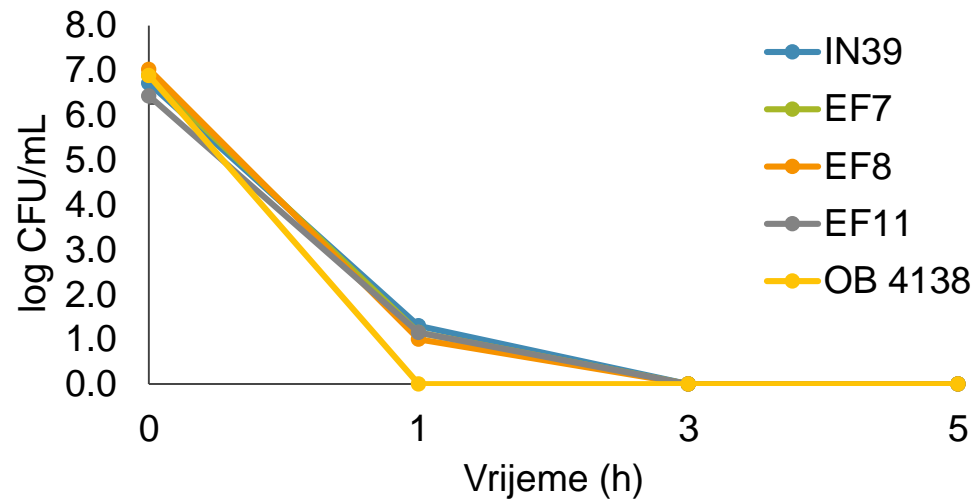
NB 1:100 pH 10



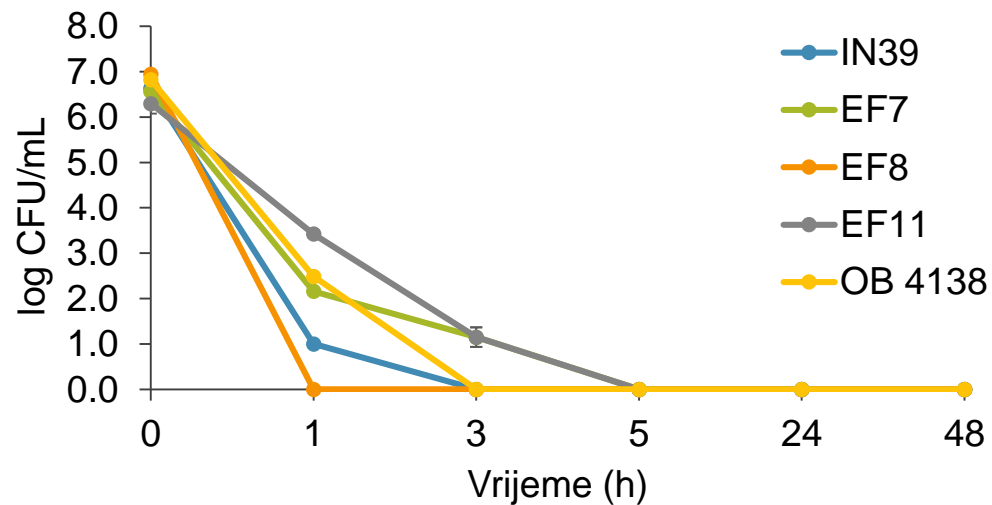
Prirodna izvorska voda pH 2



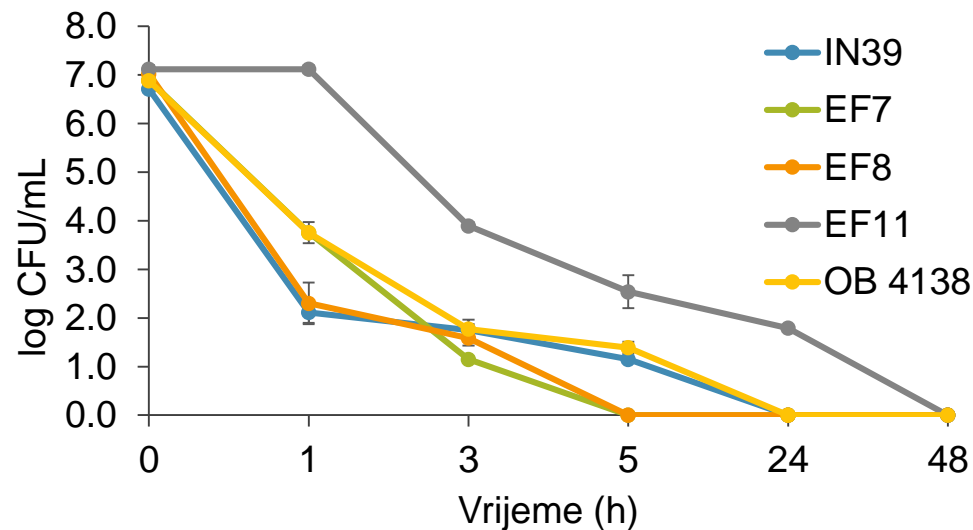
NB 1:100 pH 2



Prirodna izvorska voda pH 12



NB 1:100 pH 12





# Zaključak

- ▶ *A. baumannii* preferira sredinu bogatu nutrijentima
- ▶ Optimalni uvjeti za preživljavanje *A. baumannii* su sobna temperatura (22 °C) i neutralni pH
- ▶ *A. baumannii* je vrlo otporna bakterija na različite uvjete temperature i pH koji su nepovoljni za većinu drugih mezofilnih nesporogenih bakterija
- ▶ Multiplo-rezistentni izolati *A. baumannii* potencijalno bolje preživljavaju nepovoljne okolišne uvjete

# Hvala na pažnji!



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<https://www.pmf.unizg.hr/naturaci>