MODE OF *ACINETOBACTER BAUMANNII* IMMOBILIZATION ONTO NATURAL ZEOLITE IN NUTRIENT-POOR AND NUTRIENT–RICH WATER

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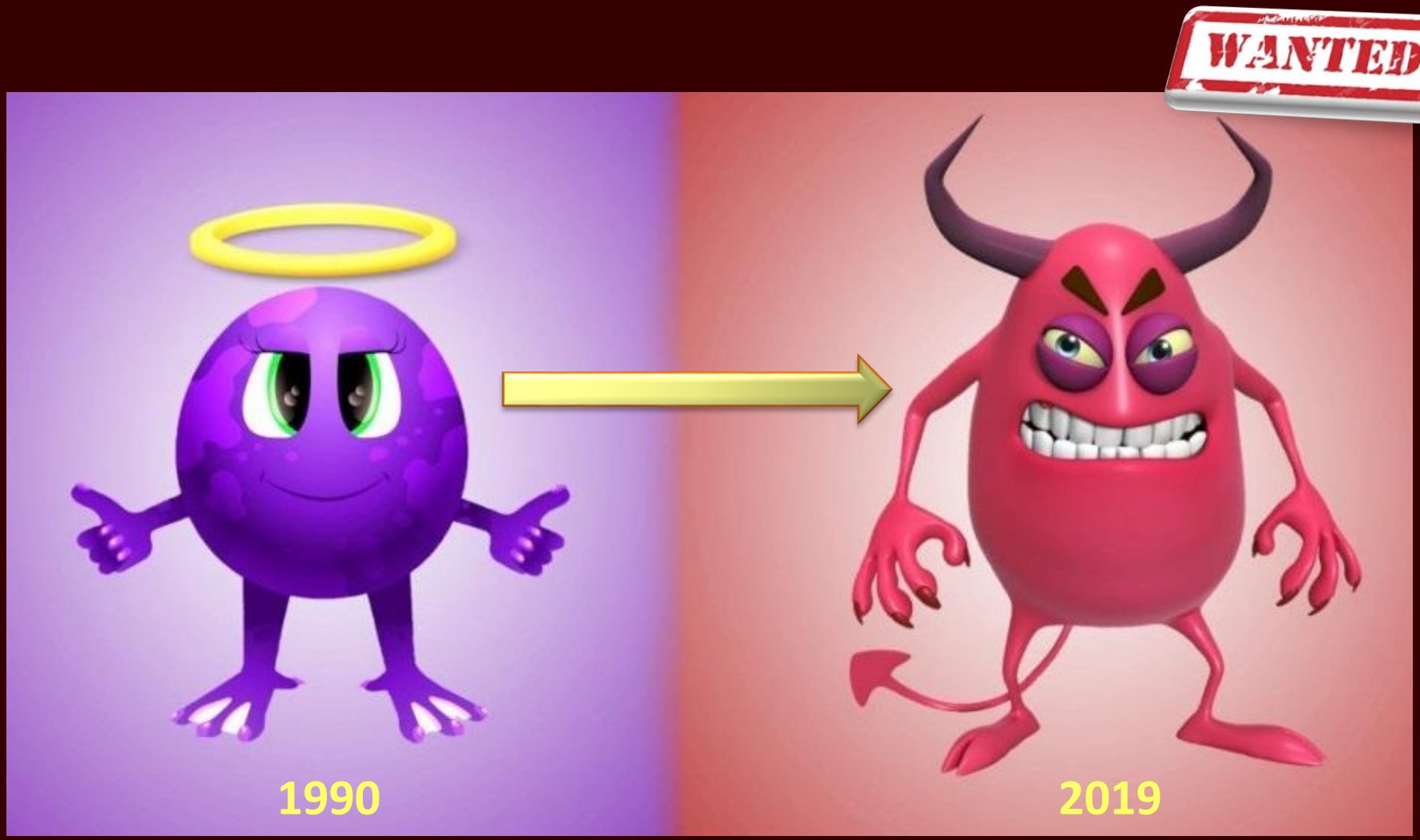
Acinetobacter baumannii is a Gram-negative bacterium with cells of coccobacillus shape (1181 x 996 nm).

Although not an obligate pathogen, during the last 30 years *A. baumannii* developed the resistance to commonly used antimicrobial agents.



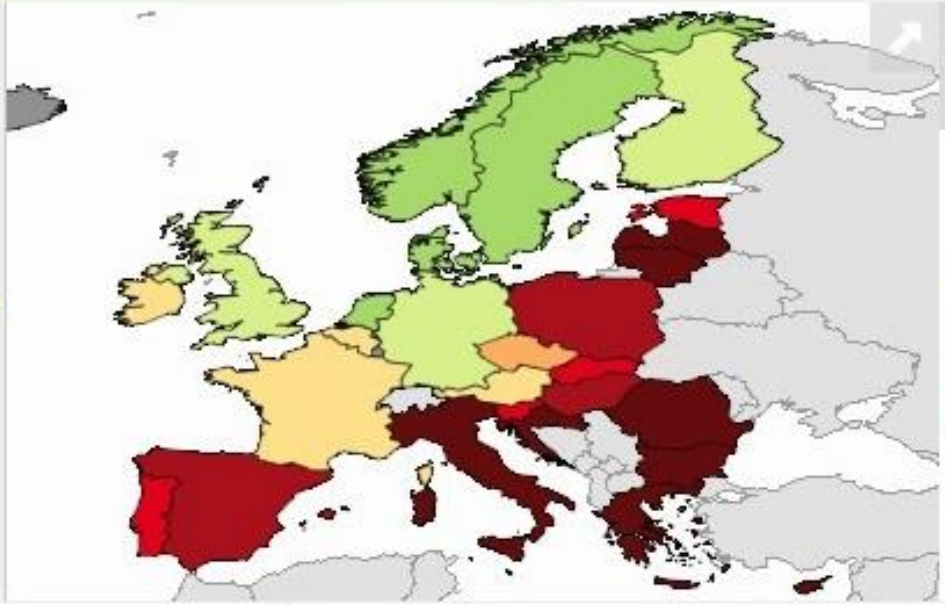
A. baumannii resistant to last-resort antibiotics is nowadays a leading cause of nosocomial infections worldwide.

Acinetobacter baumannii—The New MRSA?

Surveillance Atlas of Infectious Diseases

Antimicrobial resistance
Acinetobacter spp. | Carbapenems
Resistant (R) isolates proportion | 2017

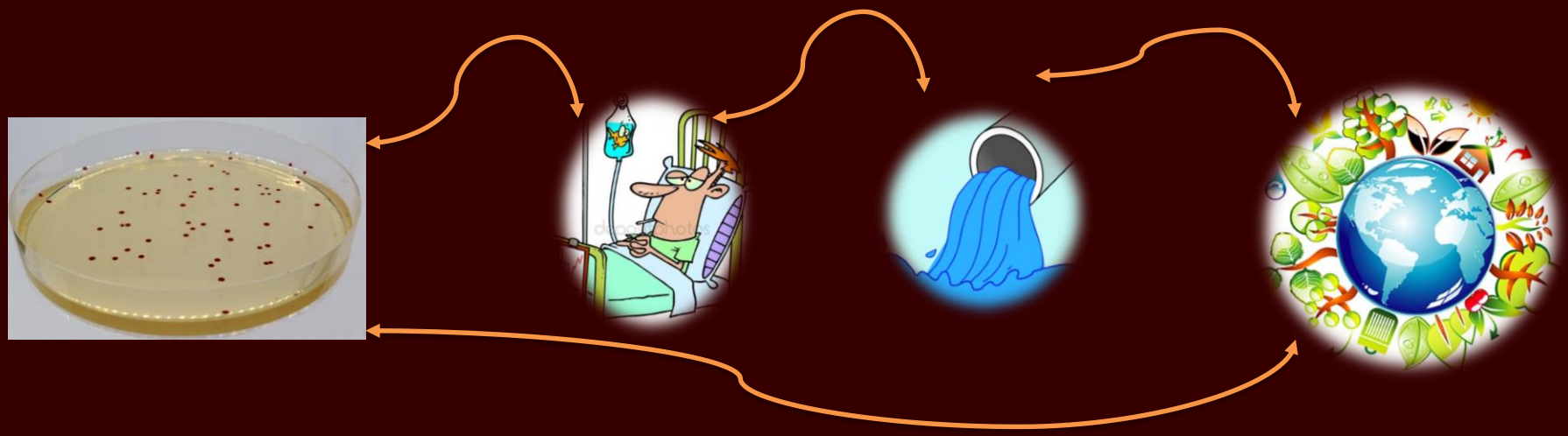
Region	Resistant (R) isolates proportion (%)
Austria	6.7
Belgium	6.9
Bulgaria	80.4
Croatia	96.2
Cyprus	76.0
Czech Republic	12.7
Denmark	0.0
Estonia	33.3



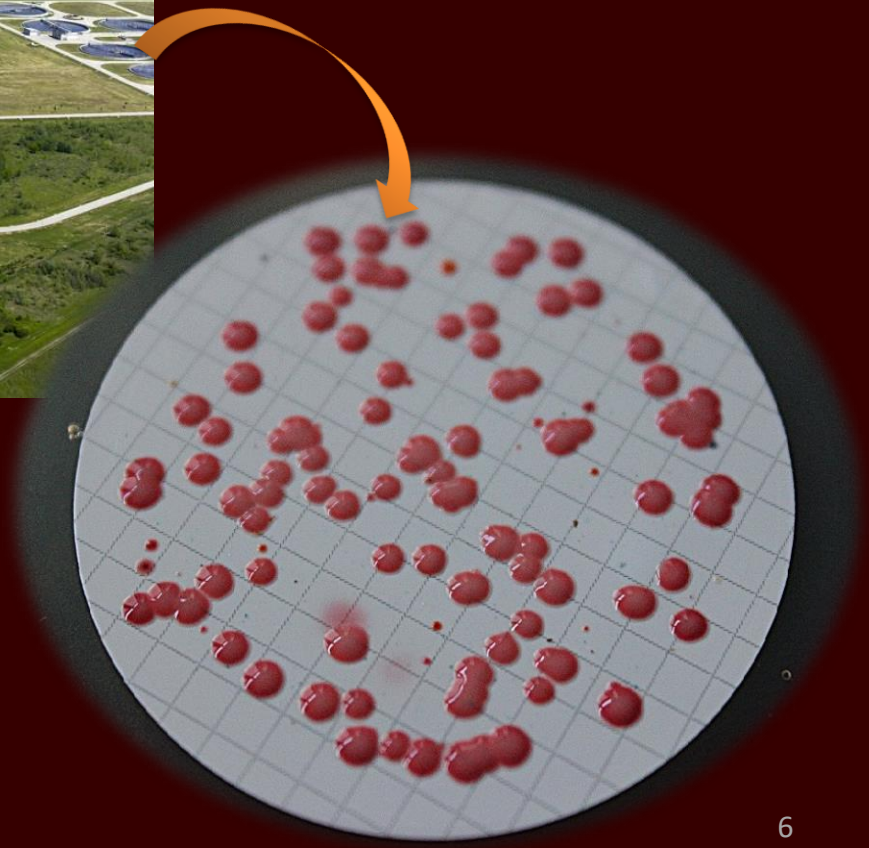
https://ecdc.europa.eu/en/antimicrobial-resistance/surveillance-and-disease-data/data-ecdc

Recently the occurrence of *A. baumannii* in urban wastewaters and rivers influenced by the untreated hospital sewage have been reported.
This suggest the water as a potential source of clinically relevant *A. baumannii* isolates that poses a threat to people that come into contact with water.

The **goal** of this study was to examine the natural zeolitizied tuff (NZ) as a material for the capture of *A. baumannii* from nutrient-poor and nutrient-rich water.



A. baumannii isolate (named EF7) was recovered from effluent of the Zagreb wastewater treatment plant.



Antibiotic resistance profile of pandrug-resistant isolate of *A. baumannii*.

carbapenems (MEM-meropenem, IMI-imipenem); fluoroquinolones (CIP-ciprofloxacin, LVX-levofloxacin); aminoglycosides (TOB-tobramycin, GEN-gentamicin, AMK-amikacin); tetracyclines (MIN - minocycline); penicillins/β-lactamase inhibitors (SAM-ampicillin/sulbactam, TIM - ticarcillin/clavulanate); folate pathway inhibitors (SXT-trimethoprim/sulfamethoxazole); polymyxins (CST-colistin).

[R] - resistant, [I] - intermediate according to EUCAST or CLSI criteria.

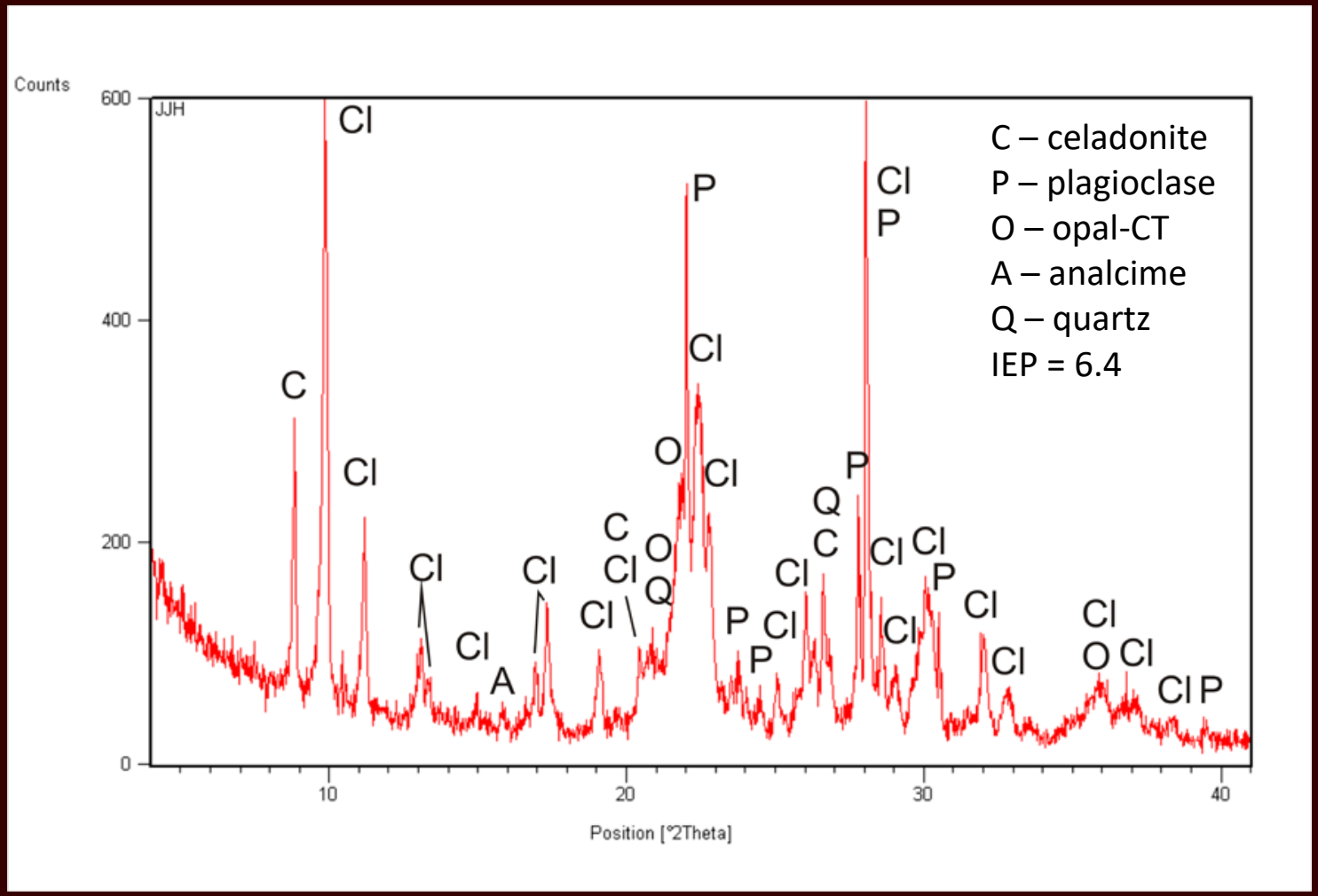
Isolate	MEM	IMI	CIP	LVX	TOB	GEN	AMK	MIN	SAM	TIM	SXT	CST
EF7	R	R	R	R	R	R	R	I	R	R	R	R

Microb Drug Resist. 2016 Oct 28. [Epub ahead of print]

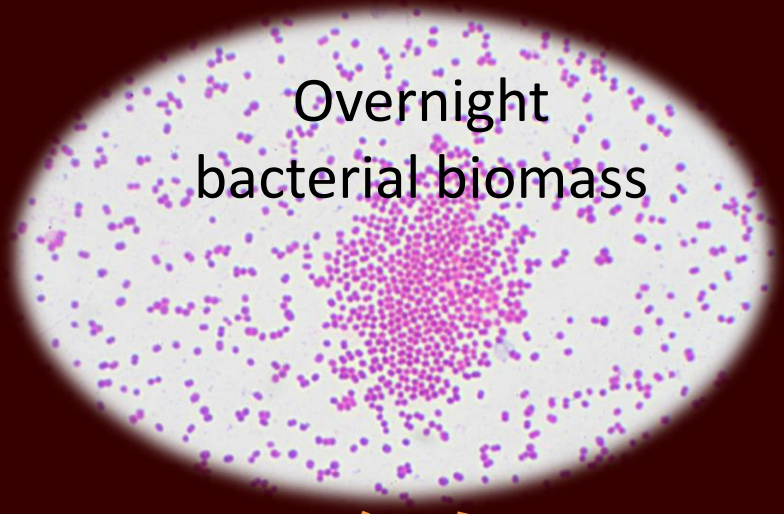
Pan Drug-Resistant Environmental Isolate of Acinetobacter baumannii from Croatia.

Goic-Barisic I[1,2], Seruga Music M[3], Kovacic A[4], Tonkic M[1,2], Hrenovic J[3].

The NZ was obtained from quarry located at Donje Jesenje, Croatia. Dry-autoclaved particles ≤ 0.122 mm were used.



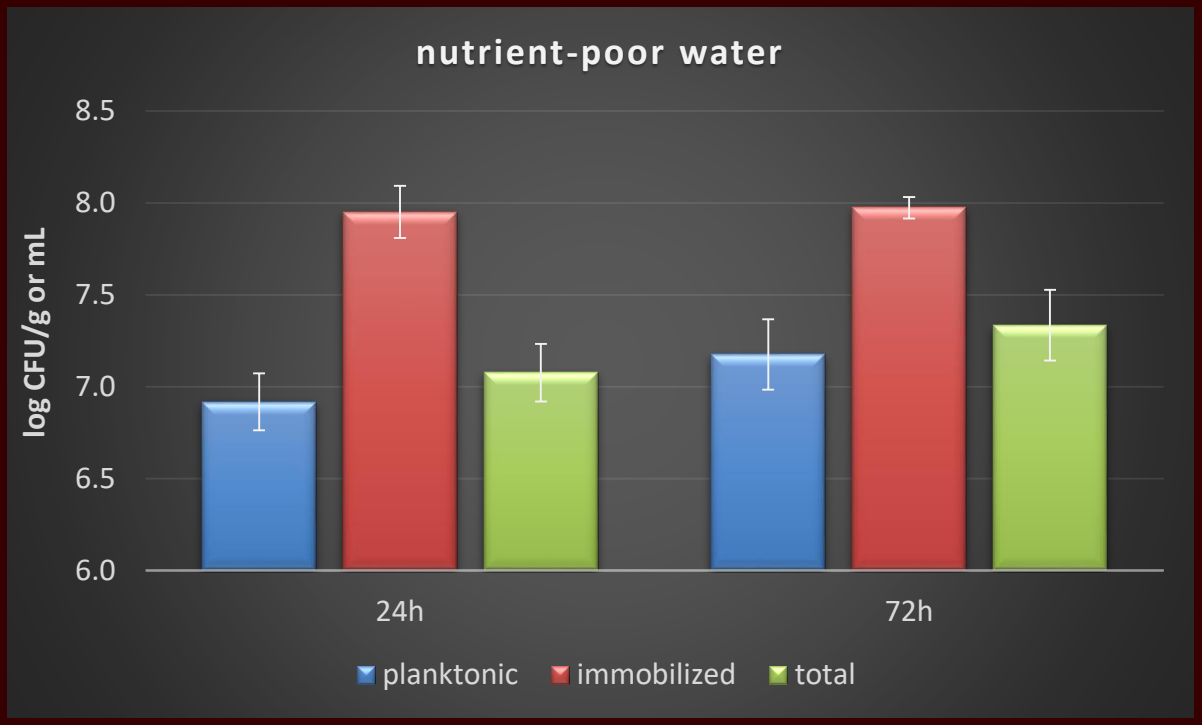
X-ray powder pattern of NZ. NZ sample consisted mostly of clinoptilolite (50-55%) with major constituents being celadonite, plagioclase feldspars and opal-CT (10-15% each). Analcime and quartz were present in traces.

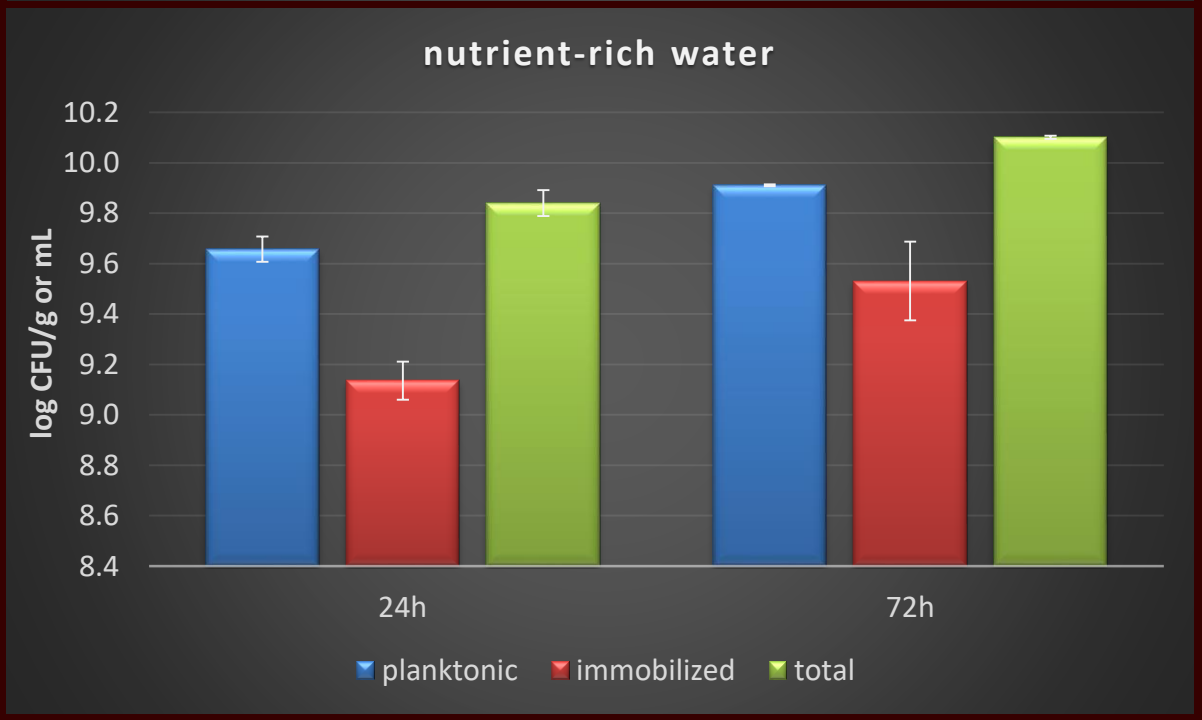


Parameter	**nutrient-poor water** (commercial spring water)
pH	8.1
COD (mg/L)	3
TOC (mg/L)	<1
TN (mg/L)	0.7
TP (mg/L)	0.1

Parameter	**nutrient-rich water** (commercial spring water + 1% nutrient broth)
pH	6.9
COD (mg/L)	99
TOC (mg/L)	44
TN (mg/L)	13.2
TP (mg/L)	1.1

Incubation at 35°C , aeration with sterile air (4.6 mg O_2/L).

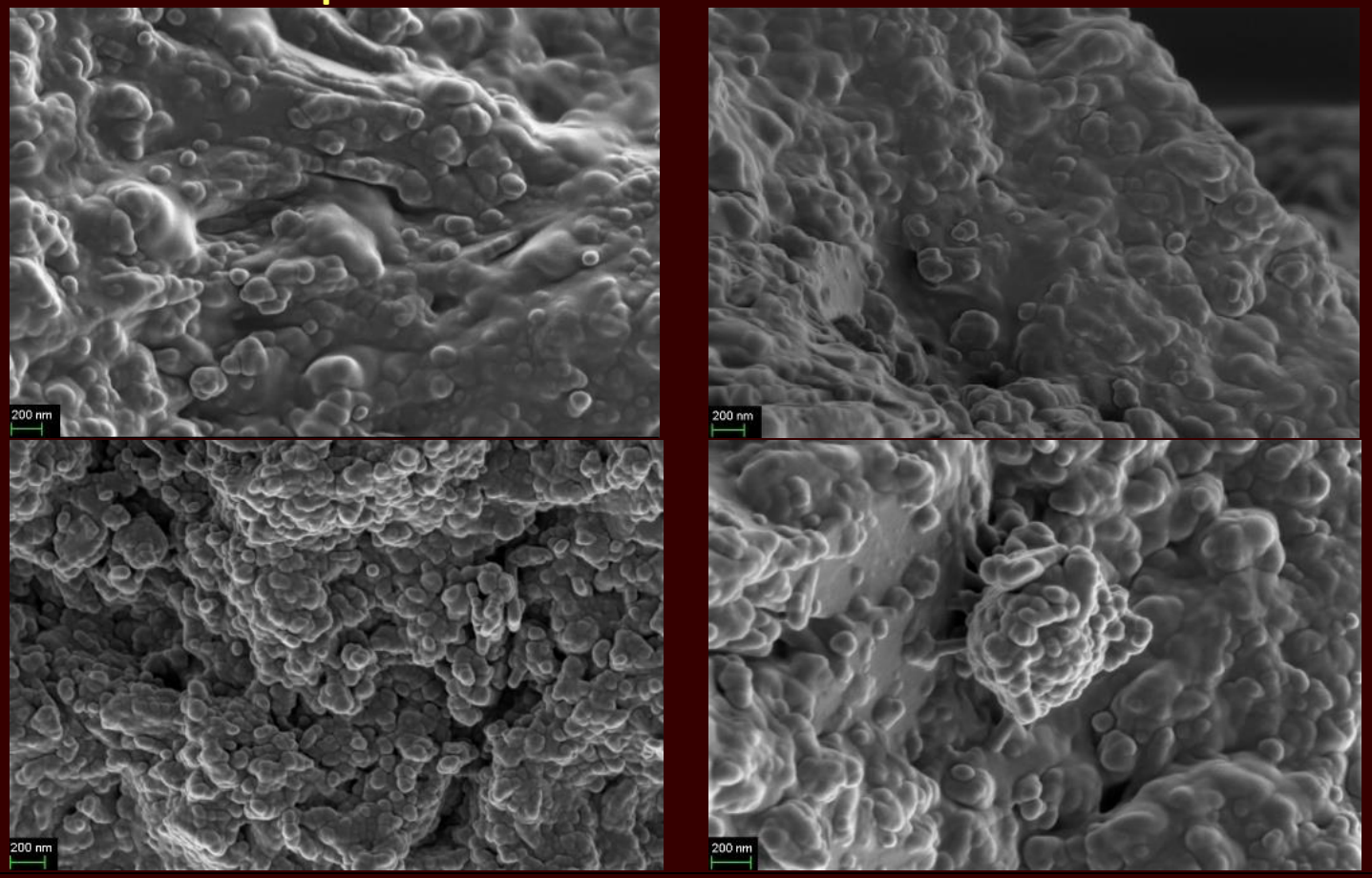




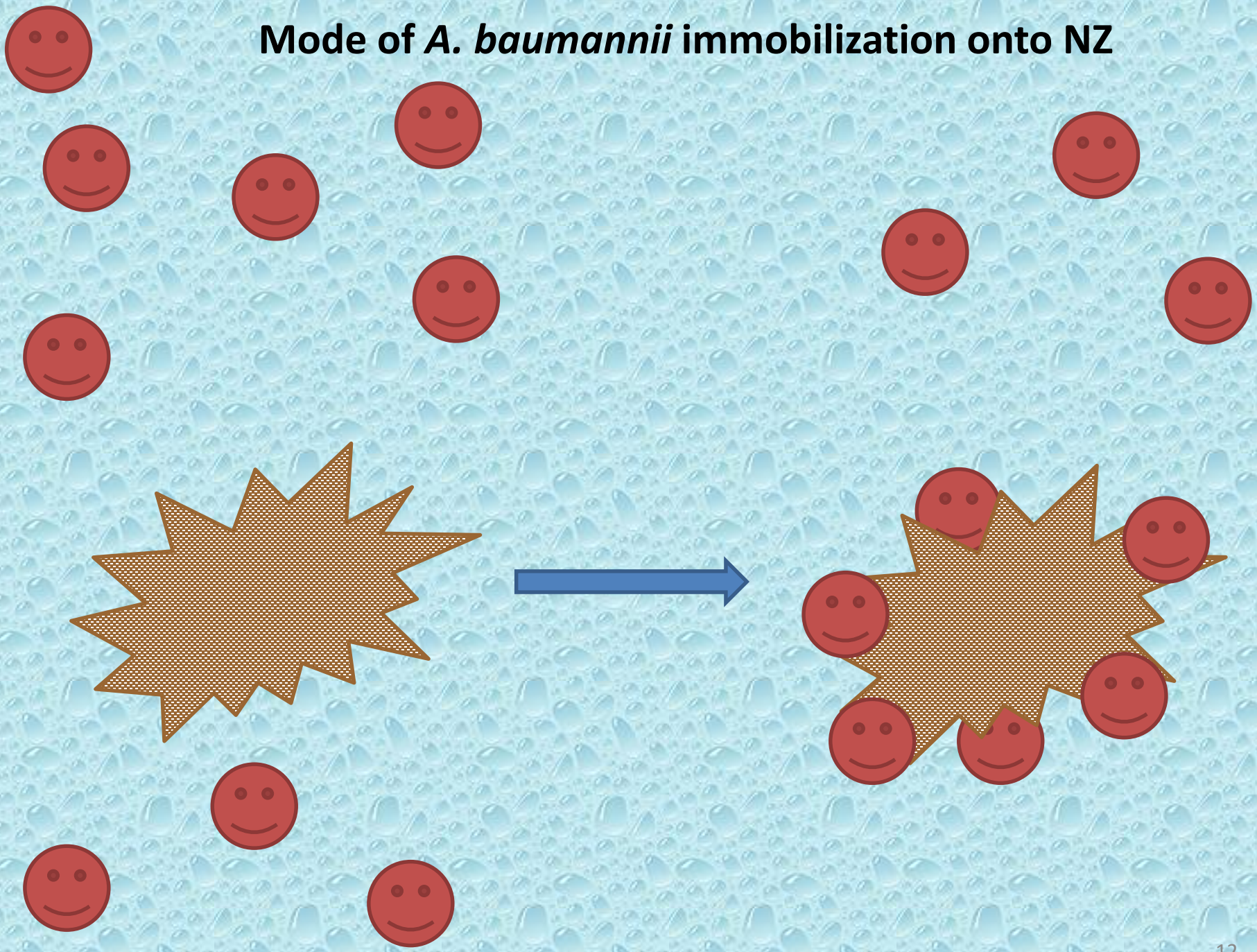
Numbers of *A. baumannii* after 24h and 72h of contact with NZ.
c_0 (log CFU/mL)=7.3±0.0.

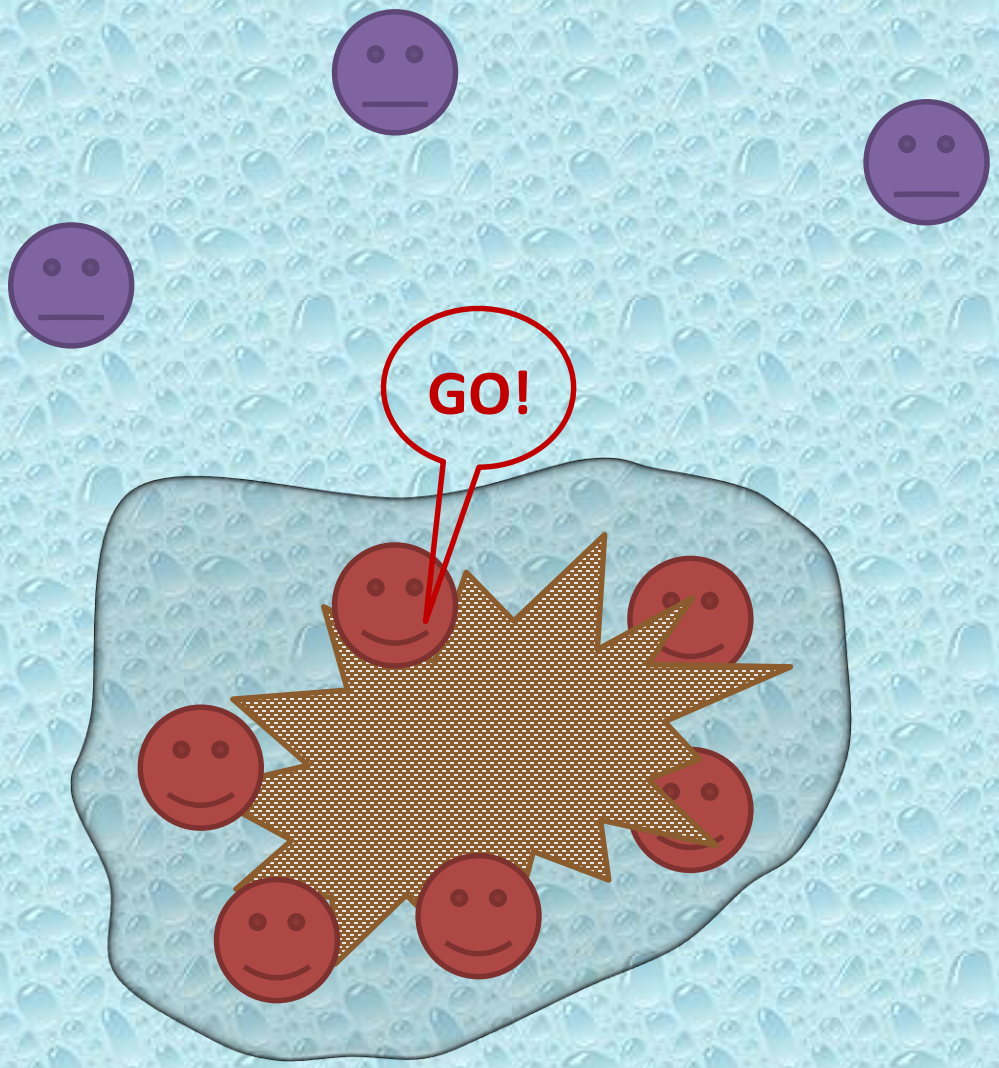
SEM analysis revealed the formation of biofilm on the rough surface of NZ particles within 24h of contact in both nutrient-poor and nutrient-rich water.

Bacteria stayed tightly attached onto NZ and covered by extracellular polymeric substances up to 72h of monitoring.

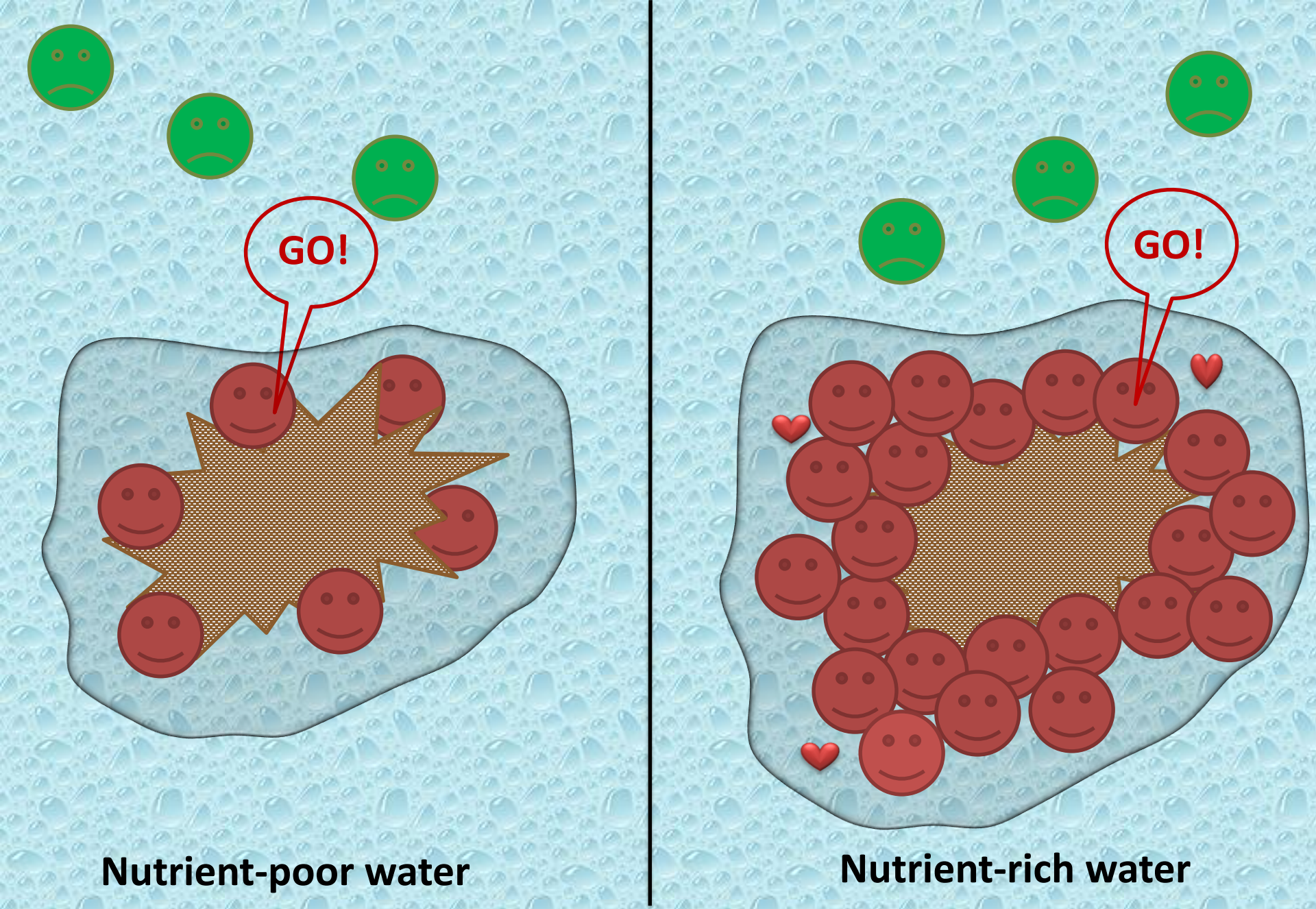


Mode of *A. baumannii* immobilization onto NZ





….24h later


GO!
GO!
Nutrient-poor water
Nutrient-rich water
….72h later

Conclusion:

- NZ is a promising material for the immobilization of super-bacterium *A. baumannii* in both nutrient-poor and nutrient-rich water.

- Capacity of the examined NZ for the immobilization of *A. baumannii* could be set at 8 log CFU per one gram of dry weight.

- Higher number of immobilized bacteria could be obtained as a result of bacterial multiplication inside the formed biofilm.

- This feature could find application in the removal of *A. baumannii* from contaminated water, in order to mitigate the propagation of this emerging human pathogen in nature and to avoid the consequent public health risk.

Thank you for attention!

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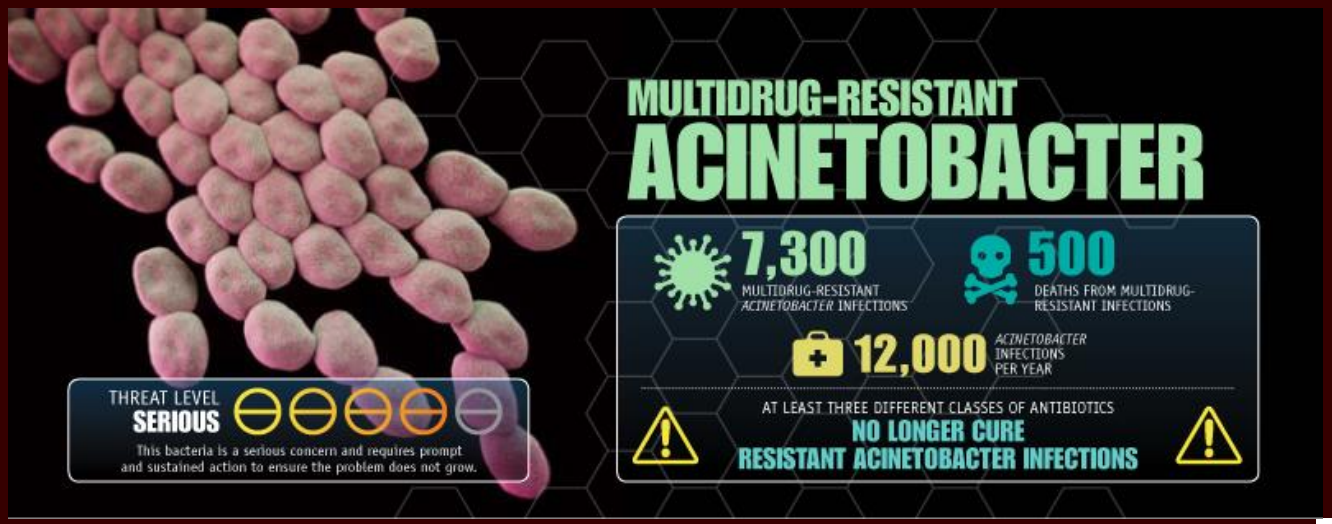
https://www.pmf.unizg.hr/naturaci



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Croatian Science Foundation