HealthFocus
PRODUCTS AUSTRALIA

An Australian native plant: A novel broad-spectrum antibiotic for the treatment of biofilms and common-wound colonising bacteria

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INDIGENOUS MEDICINES GROUP

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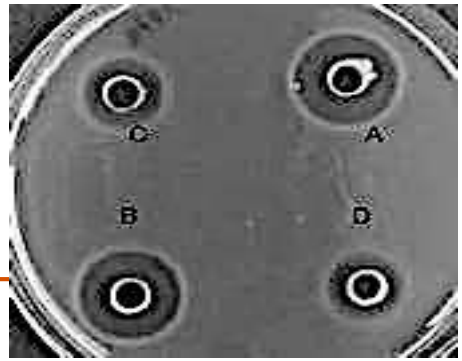
Antibiotic resistant pathogens (ARPs)

- **Antimicrobials are central to the global health system**
- **The recent spread of ARPs has significantly depleted the supply of efficacious antibiotics**
- **In the USA, MRSA kills more Americans every year (~20,000) than:**
  - emphysema, AIDS, Parkinson's disease and homicide combined
- **Hospital-acquired infections (HAIs) >2M/yr (at US$20B in direct costs and $35B in additional productivity costs), cause more than five times this number of deaths** (1 every three seconds)
- **For the EU, the WHO reports commensurate numbers of HAIs and costs**
  - while low-income countries experience 3 – 4 times this rate of infections per capita

Medicinal plants

- **The history of plant usage for medicinal purposes dates back millennia across a multitude of cultures**
  - medicinal plants continue to play a central role in the healthcare system of a large proportion (~80%) of the world's population
- **Globally, approximately 20,000 plant species are used as ethnomedicines**

Results

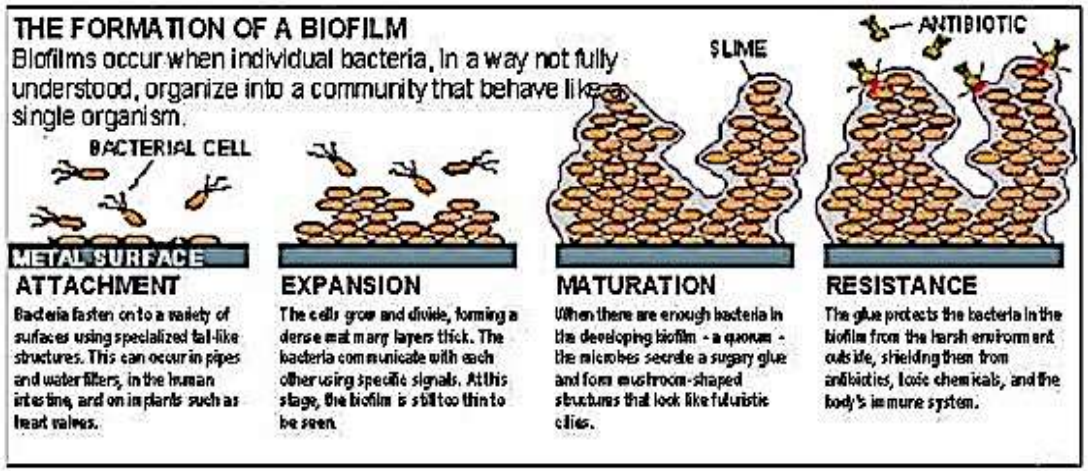


	Bacteria	Controls		Species 8472
		+ve	-ve	
Gram positive	MRSA 1113	7.2±0.8	—	9.0±0.8
	MRSA 1092	9.1±0.7	—	9.0±0.1
	MSSA	17.6±2.1	—	5.0±0.5
	Bacillus cereus	7.3±1.6	—	6.5±0.5
	Streptococcus pyogenes	8.0±0.0	—	9.0±0.3
	Staphylococcus epidermidis	9.0±0.2	—	9.0±0.0
Gram negative	*Escherichia coli*	4.0±0.0	—	2.0±0.4
	Klebsiella pneumoniae	4.5±0.0	—	0.0±0.0
	Proteus vulgaris	9.0±0.0	—	3.0±0.2
	Proteus mirabilis	9.0±0.2	—	3.0±0.1
	Pseudomonas aeruginosa	5.0±0.0	—	1.0±0.1
VRE	*Enterococcus gallinarum*	3.0±0.1	—	5.0±0.1
	Enterococcus faecalis	7.0±0.0	—	6.0±0.2
	Enterococcus faecium	6.0±0.0	—	7.0±0.6
	Enterococcus casseliflavus	1.0±0.0	—	6.0±0.4
MDR	*Acinetobacter baumannii*	6.0±0.3	—	2.0±0.0

Values represent the radius of zone of inhibition (mm). All results are presented as mean ±SEM of triplicate data sets. (VRE = vancomyocin-resistant enterococci – Gram +ve; MDR = multi-drug-resistant – Gram –ve; — = zero zone of inhibition).

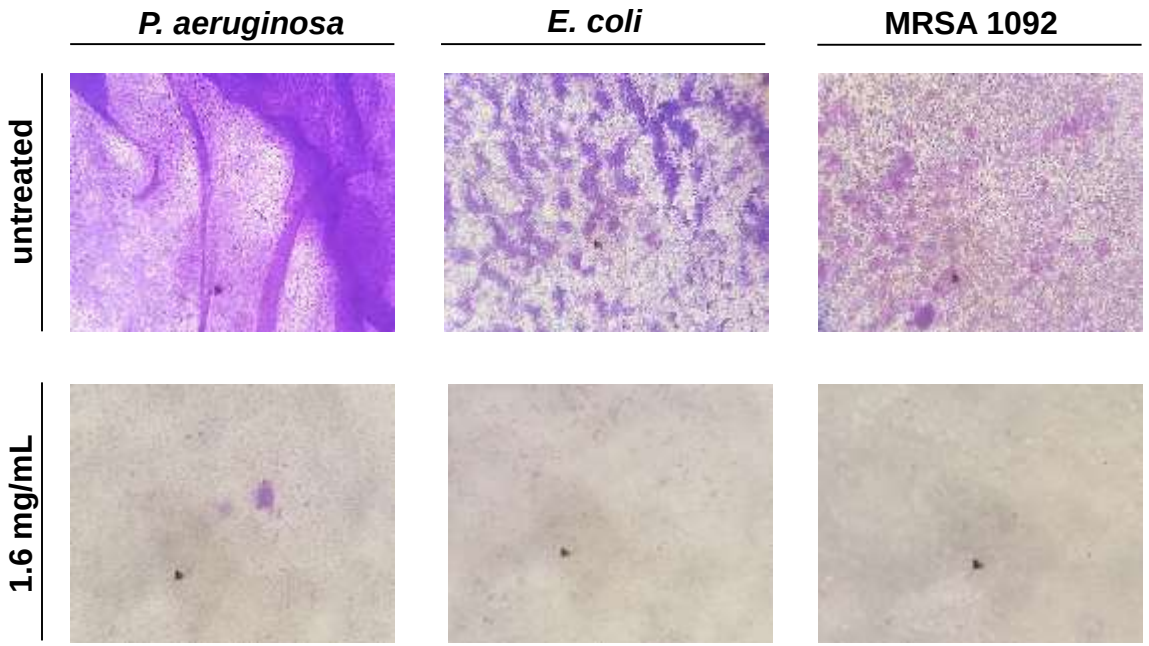
Biofilms

- **Form when bacteria adhere to surfaces in aqueous environments**
  - excrete a slimy glue-like substance that co-anchors them to various materials
- **60% of chronic wounds contain biofilms compared to 6% of acute wounds**



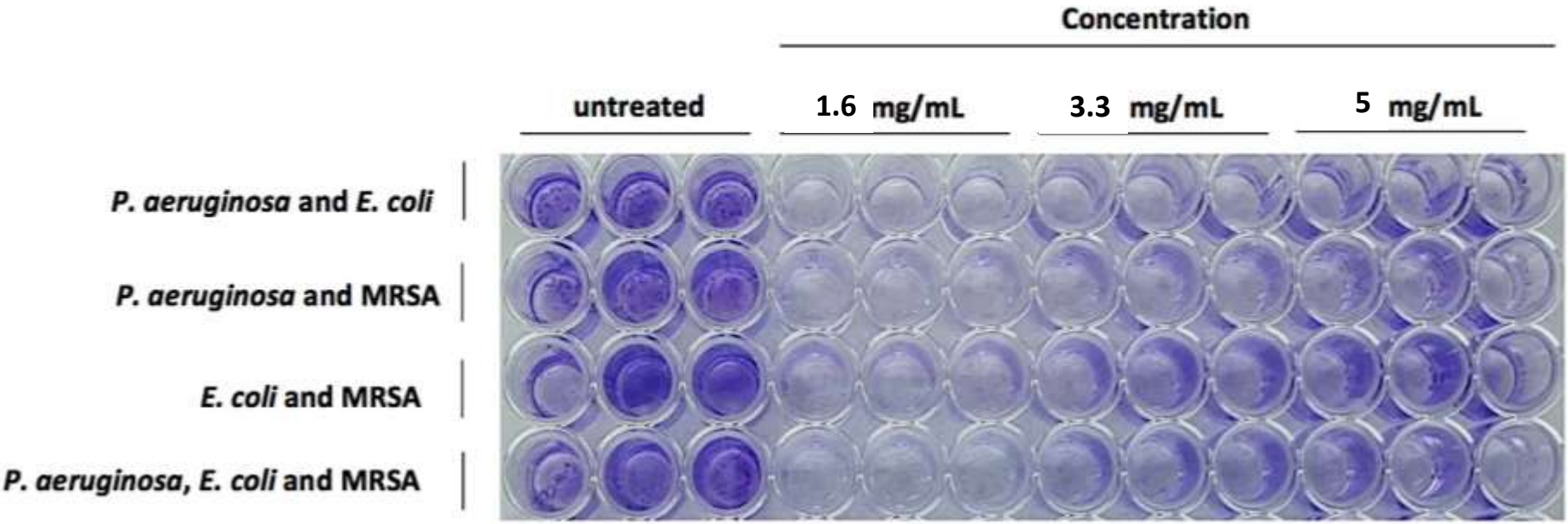
Results

Bacteria	Concentration		
	1.6 (mg/mL)	3.3 (mg/mL)	5 (mg/mL)
P. aeruginosa	87%	78%	69%
E. coli	77%	73%	67%
MRSA 1092	100%	100%	92%



Results

Bacterial combination	Degradation of biofilm (%) mg/mL		
	1.6	3.3	5
P. aeruginosa and *E. coli*	83	55	41
P. aeruginosa and MRSA	94	86	76
E. coli and MRSA	87	78	68
P. aeruginosa, E. coli and MRSA	93	68	72



Significance

- **The rate at which resistant organisms are being uncovered exceeds that at which new effective therapeutics are being discovered**

- **Bactericidal against WHOs top 5 priority pathogens**
  - **ESKAPE bacteria**

- **Broad spectrum therapy**
  - also highly effective at degrading bacterial biofilms
    - post-surgical *i.e*. applied directly to the incision to prevent post-op infection
    - treatment of burns and wounds

Where are we right now and future directions?

- **We have identified the bioactive compounds in question**
  - two new novel class of antibiotics
  - <500 Da
  - synthesisable in the lab
- **ADME testing**
- ***In vivo* testing**
  - animal models
- **Clinical trials**

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Extraction of Plant Material

plant leaves

dried and ground by electric grinder

extracted separately with different solvents

filtered

evaporated in vacuum concentrator

resuspended


SPRING WATER