Elise Bezold

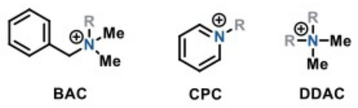
Roche Award
Ph.D. Candidate, Chemistry
First Year ARCS Scholar

EMORY UNIVERSITY

Leveraging Novel Chemical Space to Understand and Disrupt Bacterial Virulence Mechanisms

Using a multi-disciplinary approach, we are probing how disinfectants affect virulence processes of opportunistic pathogen, Pseudomonas aeruginosa. Through this work, we hope to expand our fundamental knowledge surrounding antivirulence approaches to combat the antimicrobial resistance crisis.

QACs are found in our everyday life



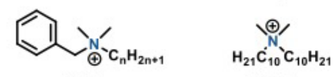
Resistance to QAC disinfectants first reported in the **1980s**

QAC usage increased following the COVID-19 pandemic

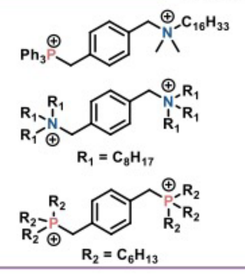
Addressing the need for novel disinfectants

Pseudomonas aeruginosa shows low susceptibility to our current arsenal of disinfectants.

Our novel scaffolds show 3 to 6-fold better activity than BAC and DDAC.



Promising bioactivity



Biscationic QHCs
P. aeruginosa, 8 μM

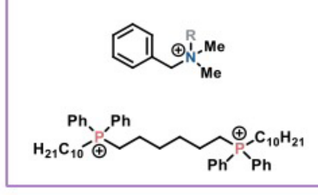
Bushy Tailed QACs
P. aeruginosa, 2 μM

Bushy Tailed QPCs
P. aeruginosa, 8 μM

P. aeruginosa and cationic biocides

Panel of 100 highly resistant clinical isolates from Department of Defense
- **Serious** threat classified by CDC and WHO
- Over 1.5 million deaths worldwide
- Defense strategies protect from host immune system and antibiotics

Cationic Biocides (CB)



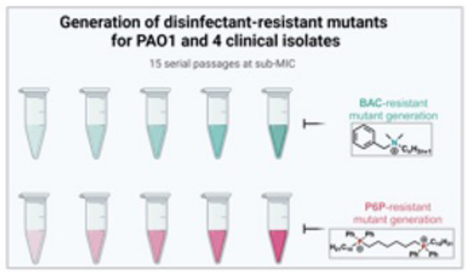
Benzalkonium chloride (BAC)
Commercially available QAC

P6P-10,10
Broad-spectrum activity
100x more potent than commercial disinfectants

Murray *et al. Lancet.* **2022**, *399* (10325), 629-655. Malhotra *et al. Clin. Microbiol. Rev.* **2019**, *32* (3). Michaud *et al. ACS Infect. Dis.* **2022**, *8* (11), 2307-2314.

Understanding disinfectants and virulence

Major Research Hypothesis
Prolonged exposure of *Pseudomonas aeruginosa* to disinfectants would result in increased bacterial virulence based on previous literature.



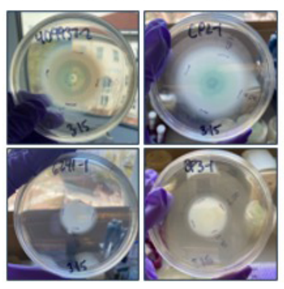
Key Findings
Increased resistance does not correlate to increased virulence.

There are significant consequences that disinfectant resistance exerts on virulence-associated phenotypes of *P. aeruginosa*.

Vargas-Cuebas, G.G.; Sanchez, C.A.; **Bezold, E.L.** *et al. Virulence.* **2024**, *15* (1).
Sommers *et al. ACS Infec. Dis.* **2022**, *8* (2), 387-397.

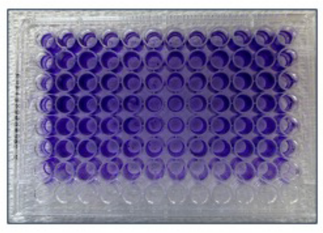
Characterizing changes in virulence phenotypes

Motility
How bacteria move on surfaces



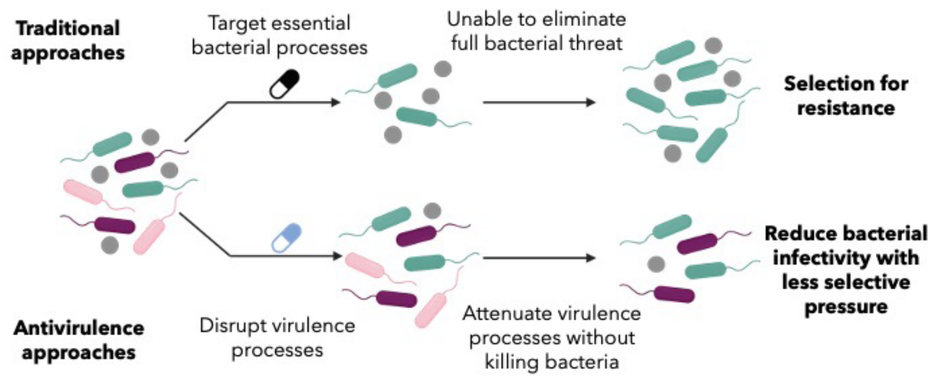
BAC-resistant strains exhibited a reduction in swimming behavior.

Biofilm
A community of bacteria that stick together on a surface



No increase in biofilm formation across cationic biocide resistant strains.

A new approach to antimicrobial resistance



Lau *et al. eBioMedicine*, **2023**, 88 (104429).

Scholar Awards Celebration
November 13, 2024

SCHOLAR AWARDS CELEBRATION ARCS FOUNDATION ATLANTA

Igniting Innovation in Georgia