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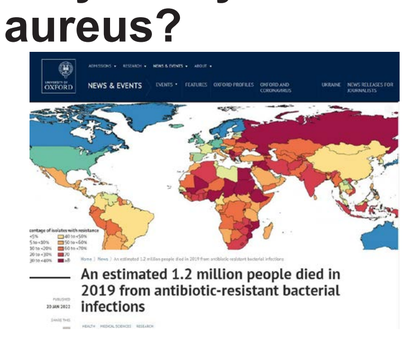
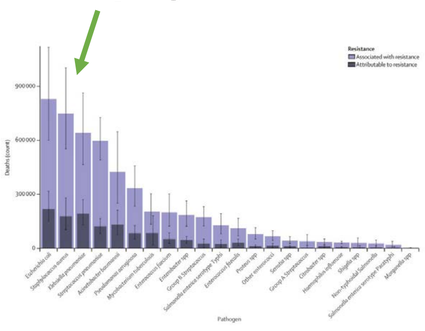
Unveiling Lipid Composition Changes in Different Straight Chain Fatty Acid Growing Conditions for Daptomycin Resistant *Staphylococcus aureususing* RPLC-IM-MS

Why Study Resistant Staphylococcus aureus?



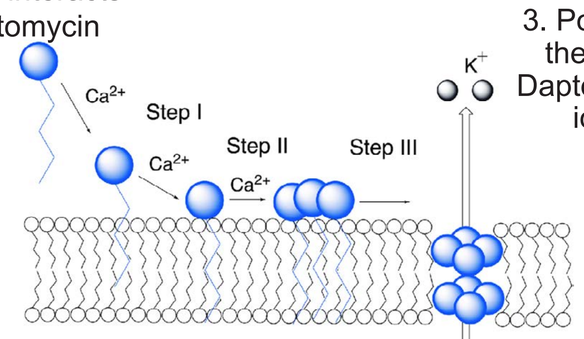


Methicillin Resistant S. aureus (MRSA) can develop resistance to Daptomycin over time, making the threat for antibiotic resistance even worse

C. J. Murray et al. *The Lancet* (2022)

How Daptomycin Works

1. Calcium interacts with Daptomycin



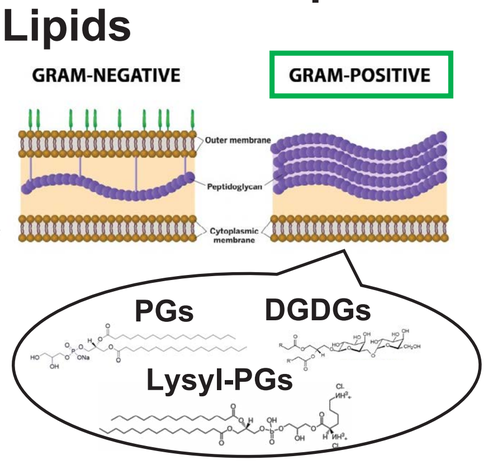
3. Pore space from the collection of Daptomycin creates ion leakage

2. Daptomycin collects inside membrane

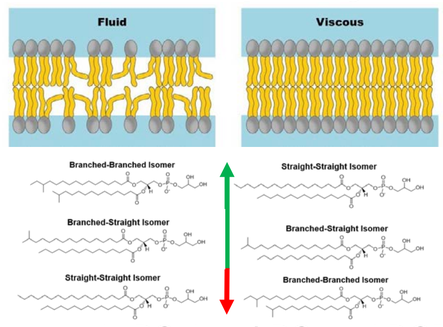
A. Zhivich. *Microbiology Independent Research Journal* (2020)

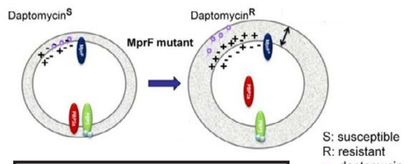
S. Aureus Cell Membrane's Important Lipids

- *S. Aureus* is a gram-positive bacteria, meaning it has one membrane layer
- The cell membrane is mainly composed of a combination of phospholipids (phosphatidylglycerol and lysyl-phosphatidylglycerol) and glycolipids (diglucosyl diacylglycerols)



The Role of the Cell Membrane in Daptomycin Resistance



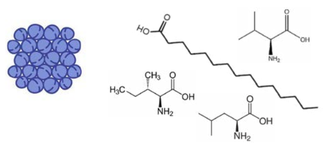


More positive charge inhibits Daptomycin interaction

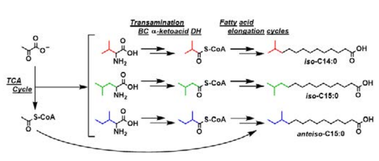
Changes in PG, Lysyl-PG, and DGDG isomer compositions can affect membrane fluidity and polarity. Resistant S. aureus have more branched isomers while the susceptible has all three isomers present

Viewing Differences in Lipid Isomer Composition in Each Class Using Mass Spec.

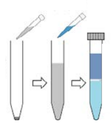
1.Feed Fatty acids or amino acids



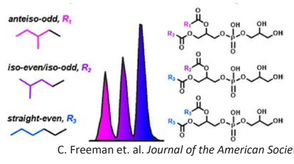
2.Staph uses external FAs Or amino acids to make lipids



3.Extract Lipids from bacteria



4. Separate isomers using RPLC-IM-MS



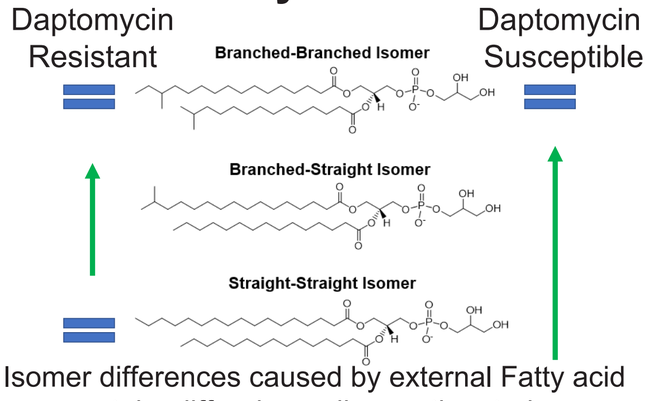
B/B
B/S
S/S

C. Freeman et. al. *Journal of the American Society of Mass Spectrometry* (2021)

Effect of using external Straight Chain Fatty Acids

Daptomycin Resistant

Daptomycin Susceptible



Isomer differences caused by external Fatty acid uptake differ depending on the strain

ARCS FOCUS ON THE FUTURE 2022

Scholar Awards Celebration
November 17, 2022