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Uncovering the connection between daptomycin resistance, lipid composition and membrane characteristics

Utilizing ion mobility and mass spectrometry, we've developed a method for identifying and quantifying the lipid composition of staphylococcus aureus. By using this method, we're able to fully compare differences in lipid composition between daptomycin susceptible and daptomycin resistant bacteria. Daptomycin resistance is often associated with lipid synthesis gene mutations, in which our method allows us to uncover the result of these alterations.

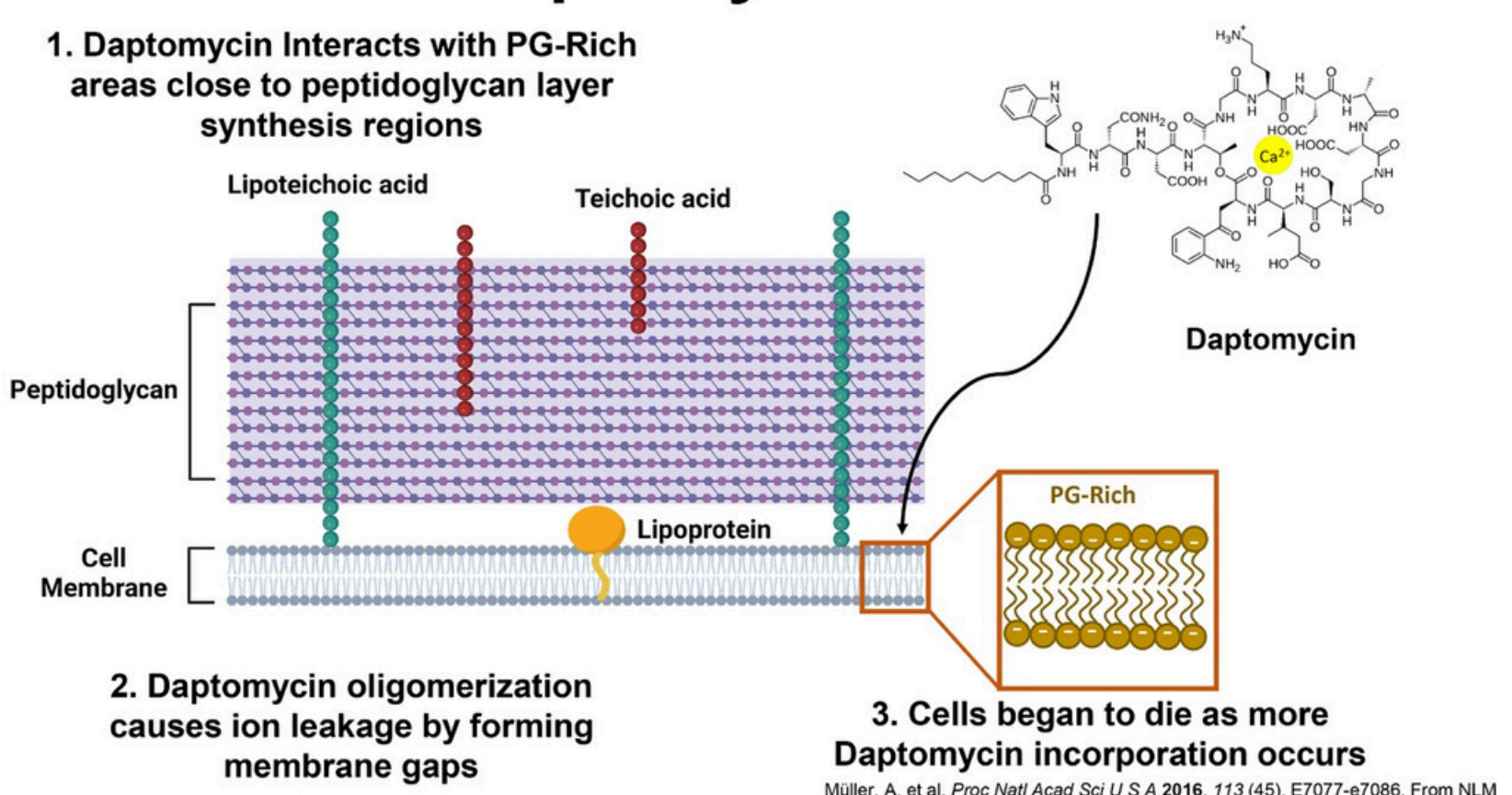
Why Study Resistant Staphylococcus aureus?



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

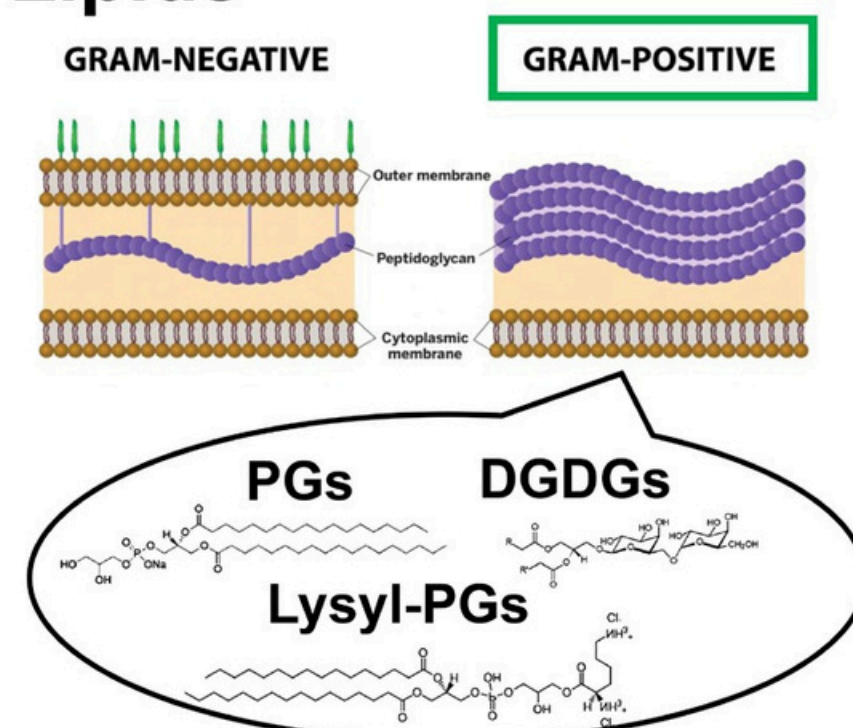
Centers for Disease Control and Prevention, 2019 Antibiotic Resistance Threats Report
<https://www.cdc.gov/drugresistance/biggest-threats.html#mrsa>

How Daptomycin Works

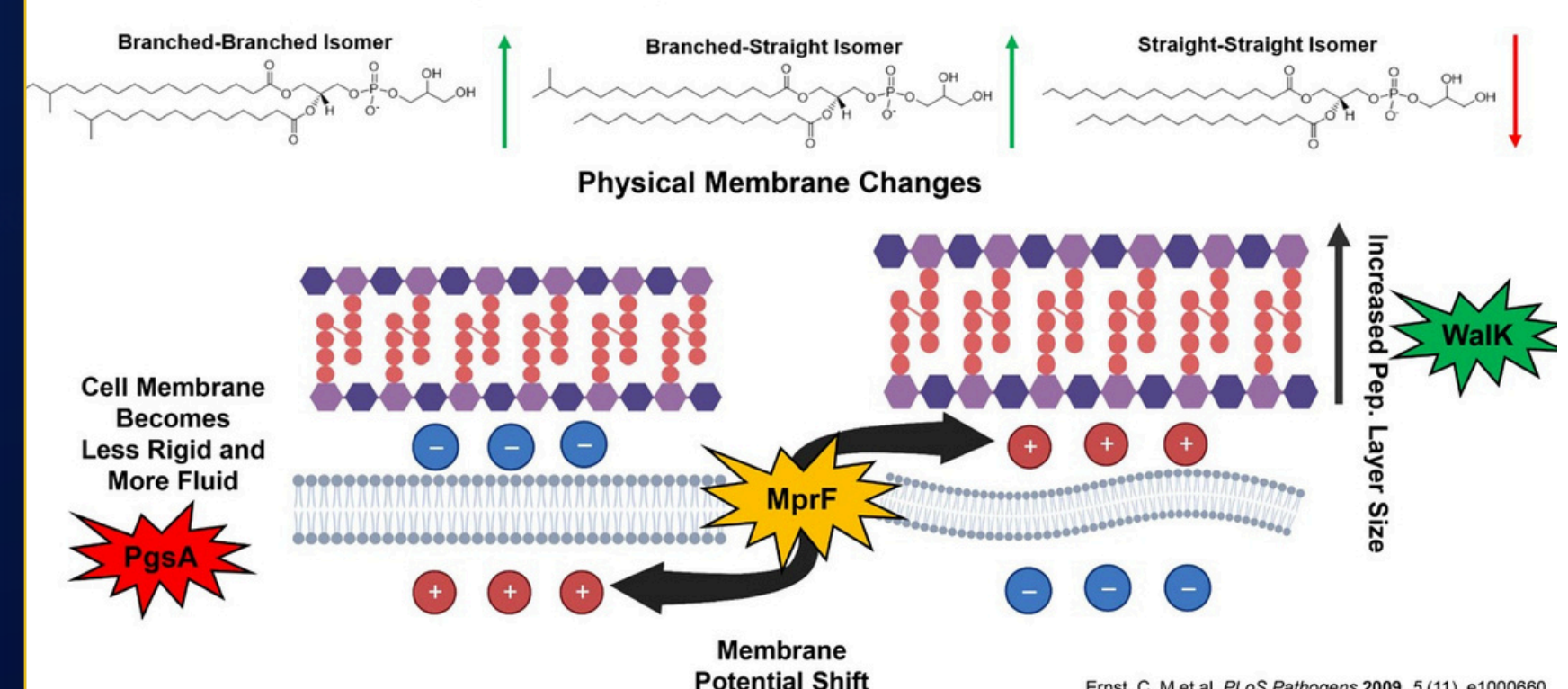


S. Aureus Cell Membrane's Important Lipids

- 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)

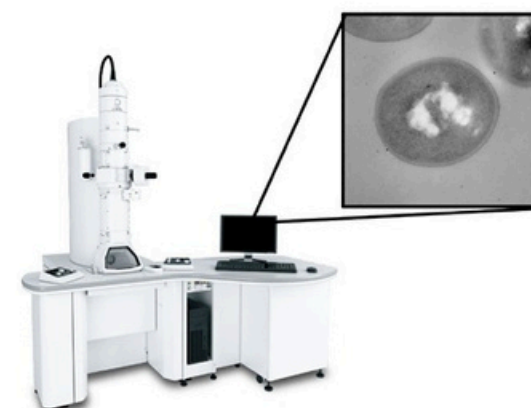


The Role of the Cell Membrane in Daptomycin Resistance



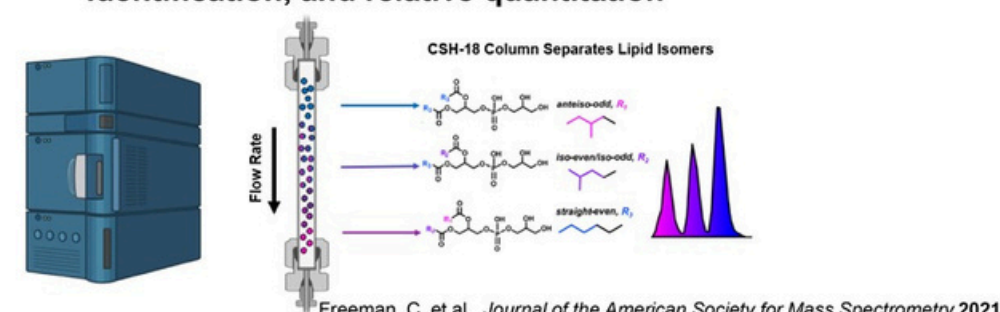
How We Can Analyze Lipids and Cell Membrane Characteristics

Transmission Electron Microscopy Imaging of Peptidoglycan Layers

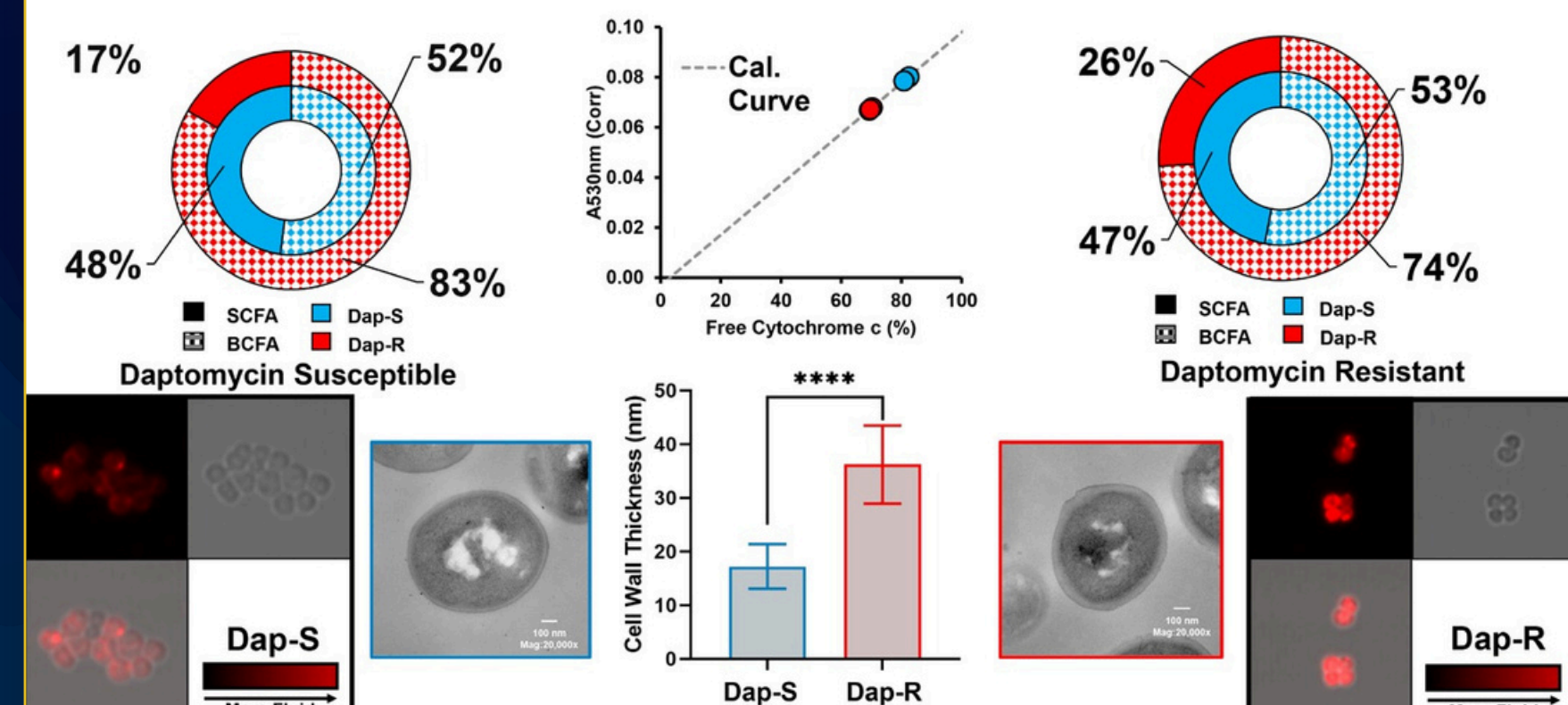


Fluorescence microscopy and Uv-Vis Spectroscopy for cell imaging and charge determination

Ion-Mobility Mass Spectrometry for Lipid separation, identification, and relative quantitation



Difference in Lipid Composition and Membrane Characteristics Between Strains



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Igniting
Innovation
in Georgia