

Gram Positive versus Gram Negative bacteria



In 1884 Christian Gram, a Danish bacteriologist, performed a test that introduced dye to the bacteria, to identify if bacteria had a peptidoglycan wall or a mesh-like layer of amino acids and sugars. This method is called "**Gram staining**" and it is used to distinguish between **Gram positive** and **Gram negative** bacteria. Gram positive bacteria contain a thick peptidoglycan layer (with teichoic acids), that stain **purple** while Gram negative bacteria lack the teichoic acids in their cell wall and therefore, stain **pink /red**.

Commonly encountered Gram Positive Cocci Bacteria

Commonly Encountered Gram Positive Cocci Bacteria*	Common Sites of Infection*	Common Treatment	Comments <i>*common but not all inclusive</i>
Staphylococcus species			
<ul style="list-style-type: none"> Methicillin-sensitive <i>Staphylococcus aureus</i> (MSSA) 	skin, soft tissue, lungs, heart, blood	cefazolin, cloxacillin, vancomycin	<i>vancomycin used for empiric or penicillin allergy</i>
<ul style="list-style-type: none"> Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) 	skin, soft tissue, lungs, heart, blood	vancomycin, linezolid, daptomycin	<i>daptomycin cannot be used for lung infection</i>
<ul style="list-style-type: none"> Coagulase negative staphylococcus (CoNS) 	blood, heart, prosthetics material	vancomycin, daptomycin, linezolid	<i>CoNS is a frequent contaminant of blood cultures</i>
Streptococcus species*			<i>*e.g. group A, B,C, G</i>
<ul style="list-style-type: none"> Streptococcus-Group A 	throat, skin, soft tissue, lung	penicillin, amoxicillin	
<ul style="list-style-type: none"> Streptococcus-Group B 	blood, lung, CNS, skin, soft tissues, bone, joint	penicillin, amoxicillin, cefazolin	
Enterococcus species			
<ul style="list-style-type: none"> <i>Enterococcus faecalis</i> 	blood, heart, wound, intra-abdominal, urinary tract	ampicillin, nitrofurantoin, vancomycin, daptomycin, linezolid	<i>1-nitrofurantoin used for cystitis 2-vancomycin, daptomycin, linezolid used for empiric use, penicillin allergy, or resistance</i>
<ul style="list-style-type: none"> <i>Enterococcus faecium</i> 	blood, heart, wound, intra-abdominal, urinary tract	ampicillin, nitrofurantoin, vancomycin, daptomycin, linezolid	<i>ampicillin resistance is common.</i>
<ul style="list-style-type: none"> Vancomycin-Resistant Enterococci (VRE) 	urinary tract, heart, blood, wound, intra-abdominal, pelvic	daptomycin, linezolid	<i>VRE usually E. faecium</i>

Note: This is only an introduction to the gram positive cocci. If you have any questions or suggestions please email: Linda.Jorgoni@uhn.ca , or Linda.Dresser@uhn.ca.

References

Bennett, J., Dolin, R., Blaser, M., Mandell, G., Douglas, R.(2015). Douglas, and Bennett's principles and practice of infectious diseases. Philadelphia: Saunders.

Chambers, H. F., Eliopoulos, G. M., Gilbert, D. N., Saag, M., S. (2015). The Sanford Guide to Antimicrobial Therapy, Sperryville, VA: Antimicrobial Therapy.