

# 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 Negative Bacteria

Commonly Encountered Gram Negative Bacteria*	Common Sites of Infection*	Usual Drug of Choice	Comments *common but not all inclusive
<i>Escherichia coli</i>	respiratory, intra-abdominal, wound, surgical site, urinary system, blood	cefazolin, ceftriaxone, ciprofloxacin, ertapenem, meropenem,	ESBL first choice: ertapenem, meropenem
<i>Klebsiella pneumoniae</i>	respiratory system, urinary system, blood, wound, surgical sites	ceftriaxone, ciprofloxacin, ceftazidime, cefepime, levofloxacin, moxifloxacin, piperacillin/tazobactam, meropenem, ertapenem	ESBL first choice: ertapenem, meropenem
<i>Salmonella species</i>	gastro-intestinal system, blood, bone	ceftriaxone, amoxicillin, ampicillin, azithromycin, ciprofloxacin	
<i>Haemophilus Influenzae</i>	respiratory system, blood	azithromycin, amoxicillin-clavulanate, levofloxacin, moxifloxacin	
<i>Moraxella catarrhalis</i>	respiratory tract, ears, eyes	azithromycin, amoxicillin-clavulanate, levofloxacin, moxifloxacin	
<i>Neisseria meningitidis</i>	meningitis, genitourinary system, joint	ceftriaxone, ceftazidime	
<i>Stenotrophomonas maltophilia</i>	respiratory system, urinary system, wound and surgical site	TMP-SMX, levofloxacin, moxifloxacin, tigecycline, colistin	Colistin and tigecycline: only if resistant to moxifloxacin and TMP-SMX
<i>Burkholderia cepacia</i>	respiratory system, blood	Treatment is based on microbiology results.	Cystic fibrosis patients Multidrug resistance (MRD) is common.
<i>Legionella spp.</i>	respiratory system, gastro-intestinal	levofloxacin, moxifloxacin, azithromycin	
<i>Bacteroides fragilis</i>	abdomen, blood, wound, surgical sites	metronidazole, piperacillin-tazobactam, meropenem,	Mixed infections only: piperacillin-tazobactam, meropenem

**Note:** This is only an introduction to the gram negative bacteria. If you have any questions or suggestions please email: [Linda.Jorgoni@uhn.ca](mailto:Linda.Jorgoni@uhn.ca) , or [Linda.Dresser@uhn.ca](mailto:Linda.Dresser@uhn.ca) .

### **References**

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