#### Strategies in Stewardship and Why Some Antimicrobials Should Be Protected

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#### **Disclosures**

- Acted as a consultant
  - Nabriva Therapeutics AG
  - Theravance Biopharma





- Define antimicrobial stewardship
- Discuss current and future strategies for antimicrobial stewardship to promote judicious use of antimicrobials
- Describe the reasons for "protecting" antimicrobials



## **Outline**

- The Problem
- Antimicrobial stewardship
  - Concept
  - Strategies
    - Passive
    - Active
    - Other (...prevention would be nice)
- Reasons antimicrobials are protected
- Collaboration





#### Misuse adversely impacts patients – Resistance

".... the microbes are educated to resist penicillin and a host of penicillin-fast organisms is bred out... In such cases the thoughtless person playing with penicillin is morally responsible for the death of the man who finally succumbs to infection with the penicillin-resistant organism. I hope this evil can be averted."

- Sir Alexander Fleming, June 1945

#### Timeline | Race against time: the introduction of new antibiotic classes and the emergence of resistance



#### Antibiotics are misused in hospitals

- An estimated 30-50% of antimicrobial use in hospitals is inappropriate
- Misused in a variety of ways
  - Given when not needed
  - Continued when no longer necessary
  - Wrong dose/drug for infection
  - Broad spectrum for susceptible organisms

IDSA Statement on 'Antibiotic Resistance: Promoting Critically Needed Antibiotic Research and Development and Appropriate Use ("Stewardship") of these Precious Drugs' -Before the House Committee on Energy and Commerce Subcommittee on Health; June 9, 2010

#### **Antibiotics are misused in hospitals**

FIGURE 1. Percentage of hospital discharges with at least one antibiotic day, by antibiotic group — 323 hospitals, United States, 2010\*



Antibiotic group

CDC, MMWR. 2014; 63.

#### Misuse adversely impacts patients – Adverse Effects

- Perception that there is (almost) no risk and (almost) all benefit to giving an antibiotic
- Antibiotics account for nearly 1 in 5 (19.3%) of drug-related adverse events
  - >140,000 ED visits/year
  - Admission required for 6.1% of adverse events
- Side effects...



Shehab, et al. Clin Infect Dis. 2008; 47:735.

## Misuse adversely impacts patients - C. difficile

- Antibiotic exposure is single most important risk factor for *Clostridium difficile* associated disease (CDAD)
  - Up to 85% of patients with CDAD have antibiotic exposure in the 28 days before infection



Chang HT, et al. Infect Control Hosp Epidemiol. 2007; 28:926-31.

Bagdasarian N, et al. JAMA. 2015; 313:398-408.

# Misuse adversely impacts patients – *C. difficile*



Campbell, et al. Infect Control Hosp Epidemiol. 2009; 30:523-33. Dubberke, et al. Clin Infect Dis. 2008; 46:497-504.

Dubberke, et al. Emerg Infect Dis. 2008; 14:1031-8. Antibiotic Resistance Threats in the U.S. 2013. Misuse adversely impacts patients – Resistance

- Methicillin resistant vs. susceptible
   *Staphylococcus aureus* (MRSA vs. MSSA)
  - Mortality is nearly double
  - Mortality risk with MRSA bacteremia: OR: 1.93; p <0.001
  - Mortality of MRSA infections: RR: 1.7; 85% CI (1.3-2.4)



Shurland, et al. Infect Control Hosp Epidemiol. 2007; 28:273-9.



#### CRE – Regional Epidemiology NCHSN (2011 – 2014)



Antibiotic Resistance Threats in the U.S. 2013.

### Other Threats...







## MICROORGANISMS WITH A THREAT LEVEL OF SERIOUS

Multidrug-resistant Acinetobacter Drug-resistant Campylobacter Fluconazole-resistant Candida (a fungus) Extended spectrum β-lactamase producing Enterobacteriaceae (ESBLs) Vancomycin-resistant Enterococcus (VRE) Multidrug-resistant Pseudomonas aeruginosa Drug-resistant non-typhoidal Salmonella Drug-resistant Salmonella Typhi Drug-resistant Shigella Methicillin-resistant Staphylococcus aureus (MRSA) Drug-resistant Streptococcus pneumoniae Drug-resistant tuberculosis

Antibiotic Resistance Threats in the U.S. 2013.

# Improving antibiotic use reduces resistance



#### Misuse adversely impacts society



## Improving antibiotic use improves infection cure rates



#### Clinical Outcomes with Antimicrobial Management Program



Fishman N. Am J Med. 2006;119:S53.

# Improving antibiotic use reduces *C. difficile* infections



# Targeted antibiotic consumption and nosocomial *C. difficile* disease



Valiquette, et al. Clin Infect Dis 2007;45:S112.

## **Antimicrobial Stewardship**

- A rational, systematic approach to the use of antimicrobial agents in order to achieve optimal outcomes
  - Most appropriate agent
  - Optimal dosing
  - Appropriate route and <u>duration</u>



IDSA/SHEA Guidelines for Antimicrobial Stewardship Programs. Barlam TF, et al. Clin Infect Dis. 2016; 62: e51-77.





Core Elements of Hospital Antibiotic Stewardship Programs

CDC



- Accountability: Appointing a single leader responsible for program outcomes. Experience with successful programs show that a physician leader is effective.
- **Drug Expertise:** Appointing a single pharmacist leader responsible for working to improve antibiotic use.
- Action: Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (i.e. "antibiotic time out" after 48 hours).
- Tracking: Monitoring antibiotic prescribing and resistance patterns.
- **Reporting:** Regular reporting information on antibiotic use and resistance to doctors, nurses and relevant staff.
- Education: Educating clinicians about resistance and optimal prescribing.

Joint Commission

#### Official Publication of Joint Commission Requirements New Antimicrobial Stewardship Standard

Requirement

APPLICABLE TO HOSPITALS AND CRITICAL ACCESS HOSPITALS

#### Effective January 1, 2017

#### Standard MM.09.01.01

The [critical access] hospital has an antimicrobial stewardship program based on current scientific literature.

#### Elements of Performance for MM.09.01.01

 Leaders establish antimicrobial stewardship as an organizational priority. (See also LD.01.03.01, EP 5)

**Note:** Examples of leadership commitment to an antimicrobial stewardship program are as follows:

- Accountability documents
- Budget plans

- Infection prevention plans
- Performance improvement plans ategic plans
  - ing the electronic health record to collect antimibial stewardship data
- ...., critical access] hospital educates staff and licensed independent practitioners involved in antimicrobial ordering, dispensing, administration, and monitoring about antimicrobial resistance and antimicrobial stewardship practices. Education occurs upon hire or granting of initial privileges and periodically thereafter, based on organizational need.
- The [critical access] hospital educates patients, and their families as needed, regarding the appropriate use of antimicrobial medications, including antibiotics. (For more information on patient education, refer to Stan-

Continued on page 4





"We **[propose requiring] a hospital to develop and maintain an antibiotic stewardship program** ... to improve hospital antibiotic-prescribing practices and curb patient risk for possibly deadly *Clostridium difficile infections* (CDIs)...and potentially life-threatening, antibioticresistant infections."

"We promote **better alignment of a hospital's** infection control and **antibiotic stewardship efforts with nationally recognized guidelines** and heighten the role and accountability of a hospital's governing body in program implementation and oversight."

## Goals of Antimicrobial Stewardship

- Optimize clinical outcomes
- Minimize unintended consequences of antimicrobial use
  - Toxicity
  - Emergence of resistance
  - Selection of pathogenic organisms such as C. difficile



IDSA/SHEA Guidelines for Antimicrobial Stewardship Programs. Barlam TF, et al. Clin Infect Dis. 2016; 62: e51-77.

#### The Landscape of Antimicrobial Stewardship





# The hospital has an antimicrobial stewardship multidisciplinary team.



# The hospital has an antimicrobial stewardship multidisciplinary team.

Antimicrobial Stewardship Committee

Dr. Dominguez, Chair Me, Co-Chair Jon Albrecht Dr. Barrera Dr. Ebuh Marie Hale Dr. Hunter Dr. Jaynes Dr. Lorenzo **Tariro Matsikire** Dr. Momin Dr. Noori **Joslyn Pribble** Ilka Ratsaphangthong Dr. Saad **Dr. Schilling** Dr. Thomas **Beth Wallace** 



TJC Standards (Effective Jan. 1, 2017)

# Strategies for Antimicrobial<br/>Examples of When Antibiotics<br/>are Urgent and Necessary

- How can we improve?
  - Passive
  - Active
  - .... Prevent



#### CDC Getsmart for Healthcare. 2015.

## **Passive Strategies for Antimicrobial Stewardship (AS)**

- Education
  - Providers and staff
  - Patients!
- Guidelines, Pathways, or Protocols



IDSA/SHEA Guidelines for Antimicrobial Stewardship Programs. Barlam TF, et al. Clin Infect Dis. 2016; 62: e51-77.

# Hospitals educate patients and families regarding the appropriate use of antimicrobials. Viruses or Bacteria What's got you sick?

Antibiotics only treat bacterial infections. Viral illnesses cannot be treated with antibiotics. When an antibiotic is not prescribed, ask your healthcare professional for tips on how to relieve symptoms and feel better.

Illness		Usual Cause	
	Viruses	Bacteria	Needed
Cold/Runny Nose	$\checkmark$		NO
Bronchitis/Chest Cold (in otherwise healthy children and adults)	$\checkmark$		NO
Whooping Cough		$\checkmark$	Yes
Flu	$\checkmark$		NO
Strep Throat		$\checkmark$	Yes
Sore Throat (except strep)	$\checkmark$		NO
Fluid in the Middle Ear (otitis media with effusion)	$\checkmark$		NO
Urinary Tract Infection		$\checkmark$	Yes

#### piotic

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#### ntibiotic.

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n stop









Antibiotics Aren't Always the Answer

#### The hospital's ASP uses organizationalapproved multidisciplinary <u>protocols</u>.

- Antibiotic Formulary Restrictions: Implementation of antibiotic formulary restrictions have been shown to reduce antibiotic use.
  - We propose replacing the term 'restricted' antibiotics with 'protected.'
  - Specific antimicrobials can be protected in the absence of ID trained specialists with the establishment of <u>use criteria</u> and <u>guidelines</u>



TJC Standards (Effective Jan. 1, 2017). MM 09.01.01

## **Passive Strategies: Pathway**

Clostridium difficile Infection (CDI) Mar	nagement Guideline
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Increasing SCr (1.5x baseline)

Low albumin (≤ 2.5 g/dL)

Increasing lactate levels

Age  $\geq 65$  year

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٠

#### Diagnosis

- Should be based on combination of clinical and laboratory findings:
- Acute onset of diarrhea (≥ 3 unformed or watery stools occurring in ≤ 24 hours) AND
- Positive C. difficile toxin test or Pseudomembranous colitis on endoscopy OR high clinical suspicion ٠ Other signs/symptoms associated with CDI include:

.

- Mild to severe abdominal pain or cramping ٠
- Fever (>38° C or 100° F)
- Leukocytosis
- Dehydration ٠
- Radiographic evidence of toxic megacolon, colonic wall-thickening or pseudomembranous colitis ٠

#### **Risk Factors for CDI**

- Antibiotic use within past 90 days or currently receiving antibiotics ٠
- Colon disease or underlying cancer ٠ ٠
  - Previous C. difficile infection
- Use of proton pump inhibitors (e.g., Protonix or Nexium) ٠
- Receipt of antiperistaltic drugs (e.g., Lomotil or loperamide) . Infection Prevention
- Contact precautions: 1) Gown/gloves to enter room, 2) Continue precautions until treatment complete AND formed stool cleaned, 3) place in contact as soon as suspect C. difficile (don't wait for test results)
- Repeat testing NOT necessary after end of treatment. Test can not be repeated within a 7 day time frame. ٠
- Practice hand hygiene with soap and water before and after patient/environmental contact. ٠

#### General Measures

- Discontinue unnecessary/offending antibiotics or change to a lower risk agent if possible (high risk antibiotics include clii ٠ fluoroquinolones, 2nd or 3rd generation cephalosporins)
- Avoid for high risk drugs: proton pump inhibitors, pro-motility agents, antiperistaltic agents, binding agents, laxatives, sto ٠

Indication	Criteria	Treatment <sup>1-5</sup>	
Mild-Moderate CDI: First episode and first recurrence	<ul> <li>≥ 3 unformed or watery stools in ≤ 24 hours</li> </ul>	<ul> <li>Metronidazole 500 mg PO every 8 hours for 10-1 first recurrence)</li> <li>If symptoms worsen or not improving (diarrhea sho won't be completely resolved) in <u>4-6 days</u> consider Vancomycin 125 mg PO every 6 hours for 10-14 d</li> </ul>	
Mild-Moderate CDI: Second recurrence	Clinical signs/symptoms consistent with mild CDI (see above)	<ul> <li>Vancomycin 125 mg PO every 6 hours for 10-14</li> <li>Fidaxomicin* 200 mg PO every 12 hours for 10 e appropriate initial therapy and duration with m oral vancomycin)</li> </ul>	
Severe CDI: First episode and any recurrence	At least 1 of the following criteria: • Admission to ICU due to CDI • Leukocytosis (15,000 cells/µL) • Increasing SCr (1.5x baseline)	<ul> <li>Vancomycin 125 mg PO every 6 hours</li> <li>If symptoms worsen or not improving (diarrhea sho won't be completely resolved) in 4-6 days consider Metronidazole 500 mg IV every 8 hours for 10-14</li> <li>Consider ID, GI or surgery consult as clinically ind</li> <li>Fidaxomicin* may be considered following 4-6 da and IV metronidazole</li> </ul>	
Severe-complicated Disease: First episode and any recurrence	Meets criteria above for severe disease AND has any of the following: Ileus / Obstruction Perforation Toxic megacolon Colonic wall-thickening Pseudomembranous colitis Septic shock/hypotension	Vancomycin 500 mg PO/NG every 6 hours (if hig indications - requires ID consult or per protoco reduce dosage to 125mg q6h if only above criteri <u>Plus</u> Metronidazole 500 mg IV every 8 hours     Recommend ID, GI or surgery consult as clinically If <u>complete ileus</u> , may consider adding retention en mg every 6 hours	
Multiple recurrences: ≥ 3 episodes within 3 months	<ul> <li>≥ 3 unformed or watery stools in ≤ 24 hours</li> <li>Any of the other signs/symptoms listed above</li> </ul>	Vancomycin taper or pulse dosing • 125 mg every 6 hours x 10-14 days • 125 mg every 16 hours x 7 days • 125 mg daily x 7 days • 125 mg every 2-3 days for 2-8 weeks Fidaxomicin* 200 mg PO every 12 hours for 10 days following 1" recurrence in immunocompromised pati	



#### The hospital's ASP uses organizationalapproved multidisciplinary protocols.

- Anti-MRSA Agents
  - Ceftaroline
  - Daptomycin
  - Linezolid
- Broad-Spectrum
  - Carbapenems
  - Levofloxacin
  - Tigecycline
- Gram-Negative
  - Colistin
  - Ceftolozane-Tazobactam
  - Ceftazidime-Avibactam

Anti-CDI Agents
– Fidaxomicin

Antimicrobials with criteria for use at MDMC



## Aren't they all the same?







Mortality associated with carbapenem resistant (CR) vs. susceptible (CS) *Klebsiella pneumoniae* (KP)



Patel, et al. Infect Control Hosp Epidemiol. 2008; 29:1099-106.







#### FDA Drug Safety Communication: FDA warns of increased risk of death with IV antibacterial Tygacil (tigecycline) and approves new Boxed Warning



#### "In general, the deaths resulted from worsening infections, complications of infection, or other underlying medical conditions."

drug label and updated the Warnings and Precautions and the Adverse Reactions sections. A Boxed Warning is the strongest warning given to a drug. These changes to the Tygacil label are based on an additional analysis that was conducted for FDA-approved uses after issuing a Drug Safety Communication (DSC) about this safety concern in September 2010.



# **Active Strategies for AS**

- Prospective-audit and feedback (PAF)
  - Intervention that engages the provider <u>after</u> an antibiotic is prescribed
  - Labor and time intensive when performed manually
    - Clinical decision-support systems to supply ASP with relevant data and identify patients who should be prioritized for review
- Pre-authorization and restriction (PAR)
  - Prescriber seeks input from stewardship program <u>prior</u> to the first administered dose

#### Which Method is Better?



Tamma PD, et al. Clin Infect Dis. 2017;64:537–43.

#### Which Method is Better?

	PROS	CONS
PAR	<ul> <li>Most appropriate agents upfront</li> <li>Increased likelihood of appropriate culture collection prior to antibiotic initiation</li> <li>Limit patient exposure to antibiotics when no anti-infective therapy is warranted</li> </ul>	<ul> <li>Only select agents</li> <li>No impact on narrowing, duration</li> <li>Resource intensive: "on-call"</li> </ul>
PAF	<ul> <li>Flexibility of timing (staffing)</li> <li>More evidenced-based discussion <ul> <li>Micro and clinical data</li> </ul> </li> </ul>	<ul> <li>Time consuming <ul> <li>More data to review</li> </ul> </li> <li>Uptake is usually optional</li> <li>Does not address the <u>large</u> burden of empiric antibiotics started unnecessarily</li> </ul>

Pre-authorization and restriction (PAR) Prospective-audit and feedback (PAF)

## **Any other Strategies?**

- Prevention
  - Hand hygiene
  - Terminal cleaning
  - Vaccination



Nagel JL, et al. Infect Dis Clin N Am. 2016;30: 771-84.

# Improvement is a public health emergency



# Improving antibiotic use is a public health emergency

- Antibiotics are the only drug where use in one patient can impact the effectiveness in another.
- If everyone does not use antibiotics well, we will all suffer the consequences.



Get Smart for Healthcare – CDC

# Improving antibiotic use is a public health imperative

 Antibiotics are a shared resource, (and becoming a scarce resource).



Get Smart for Healthcare – CDC

#### Antimicrobial Drug Development



# Improving antibiotic use is a public health imperative

- Using antibiotics properly is analogous to developing and maintaining good roads.
- Bringing new antibiotics into our current environment is akin to buying a new car because you hit a pot hole, but doing nothing to fix the road.
- Fixing the "antibiotic use road" is part of the mission of public health.



## **Summary/Conclusions**

- Collaborative goals and strategies
  - Decrease problematic pathogens
  - Determine optimal management of these pathogens
- Collaborative measurement
  - Metrics for success (or failure)
  - Share/report this information to WIDE audience
- Efforts impact public health and the future of medicine!

#### Strategies in Stewardship and Why Some Antimicrobials Should Be Protected

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#### **Microorganisms**

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(Vaginal flora. UTI: 2 <sup>th</sup> to E. coli in younger, sexually active famales)     Serentia spp. (UTNs, wound infections, menumonia)       Streptococcus spp.     Streptococcus spp.       Streptococcus spp.     B-hemolytic)       (Sinn non. Step firmal (bara-pathogan)     Streptococcus spp.       Streptococcus spp.	Staphylococcus saprophyticus	Morganella morganii
Strepticoccuts spp.         Shifelia spp. (Dysentery, Not G normal hore, pubugen)           Strepticoccuts spage.enception         Salamonalt spp. (Typion terv, durrkes, sepsis, carrier)           Strepticoccuts agalactica (Grp B β-hemolytic)         Yerinia enterocolitica (Diarhea)           (Nain Durs, Strepticoccuts agalactica (Grp B β-hemolytic)         Nonemicrobacterizaceae           (Nain Durs, Strepticoccuts agalactica (Grp B β-hemolytic)         Nonemicrobacterizaceae           (Nain Durs, Strepticoccuts agalactica (Grp B β-hemolytic)         Nonemicrobacterizaceae           (Nain Durs, Strepticoccuts (des Smiller) S. Initias, S. Smilis, Smil	(Vaginal flora. UTIs: 2 <sup>nd</sup> to <i>E. coli</i> in younger, sexually active females)	Serratia spp. (UTIs, wound infections, pneumonia)
Streptococcus space         Salmonella spp. (Typkod lever, duemach, sepsis, currier)           Streptococcus agalactie (Grp B β-hemolytic)         Yesinia enterocolitica (Narches)           Streptococcus agalactie (Grp B β-hemolytic)         Yesinia enterocolitica (Narches)           Streptococcus agalactie (Grp B β-hemolytic)         Yesinia enterocolitica (Narches)           Streptococcus preumoniae (a-hemolytic)         Yesinia enterocolitica (Narches)           Communit-squared preumonia (A-Ph ottis media, bacterial meningitis)         Yesinia enterocolitica (Narches)           Viridata Group Streptococci (a-hemolytic)         Yesinia enterocolitica (Narches)           Cil tora. Insta intercisors, endocanditis, sbecesse)         Sectorization (Narches)           S. salivoriza (Gala S, miller), S. mattans, S. mitis, S. sanguis, Camella morbillorum         Sectorization (Narches)           Steptococcus spit         Bartonella hemseliae and Pasteurella nutlocida           Cil tora. Uts haling infectors, heteromic, nuclearding, VRE)         Catastach disease)           Cil tora. Uts haling infectors, heteromic, if ond opionang)         Norise frame meningitis (Narches)           Streptococcus spit         Catastach disease)         Catastach disease)           Enterococcus faccilis and Enterococcus faccilis         Reference ender "diptimetoids"           Bacillus onthracis (Antras)         Acrobic Gram-Negative Bacilli           Streptococci (conenococcus faccilis		Shigella spp. (Dysentery. Not GI normal flora – pathogen)
Streptococcus progenes (Grp A β-hemolytic) (Skii flom. Step totor (dharquight, STR, sardie Reve, elemantic fever, giomentionephitis)         Fersinia enterocolitica (Diarchea)           Streptococcus galactiae (Grp B f-hemolytic) (Yaginal flom. Neontal menipitis, neuronia, and sepsis)         Nonenterobacteriaescae Preudomonas aerregitorsa (Nonenterobacteriaescae)           Streptococcus galactiae (Grp B f-hemolytic) (Yafans Group Streptococcus (do-hemolytic) (Community-sequited preunonia (CAP), ottis media, bacterial menipitis)         Nonenterobacteriaescae Nonenterobacteriaescae           Streptococcus progeneses (Grp D Nonenterococcal Strep.) (Cil flom. Associated with colon cancer)         Nonenterococcus faccium (Gil flom, Lassociated with colon cancer)         Nonenterococcus faccium (Gil flom, Lassociated with colon cancer)         Nonenterococcus faccium (Carm-Nositive Bacilli         Aerobic Gram-Negative Gram-Negative Cocci           Patterococcus faccium (Gil flom, LTB, bilary infections, bacteremia, endocarditis, VFF)         Noriseria gonorrheeae (STD - gonorthea, septis)         Noriseria gonortheeae (Streptococcus Cocci)           Streptoccus (Gatoroenitis) (60d poisoning))         Noracella catarrhalis (Respiratory infections)         Noracella catarrhalis (Respiratory infections)           Norsporte-FORMING Menoptis neorobic Gram-Negative Bacilli         Anaerobic Gram-Negative Bacilli         Noracella catarrhalis (Respiratory infections)           Norsporte-FORMING Menoptis in encodo darbace, sequencehrancous enterocolitis)         Noracella catarrhalis (Graginal flom, Abscesse) Bacteriaes projonal dineacus, abdoonal disease)           Nospo	<u>Streptococcus spp.</u>	Salmonella spp. (Typhoid fever, diarrhea, sepsis, carrier)
Streptococcus agalacita (Grp B - hemolytic) (Vaginal free Normania moningits, poemania, and sepsis)         Nonenterobacteriaccae (Nosconnial infections, Streptococcus pneumonia (Ca-hemolytic) (Community-acquired pneumonic (CAP), othis media, batterial meningits)         Nonenterobacter haumanii (Nosconnial infections)           Viridans Group Streptococci (a-hemolytic) (Community-acquired pneumonic (CAP), othis media, batterial meningits)         Acinotheotecr haumanii (Nosconnial infections)           S. anilvarius, S. singuis, Gamella morbiliorum Streptococcus post (Gil forn. Associated with colon cancer)         Bertorophononas (Xanthamonas) maltophilla (Nosconnial infections)           Enterococcus Spp.         Bertorophononas (Xanthamonas) maltophilla (Nosconnial infections)           Enterococcus Spp.         Bertorophononas (Valuenca)           Enterococcus Spp.         Bartonella hemselae and Pasteurella multocida (Camonella poempoliali (CAP)           Broche Gram-Positive Bacilli SpoRE-FORMING         Acrobic Gram-Negative Cocci           Compolacter joint (Dartens)         Neisseria spp.           Readilitis in non-pathogenic forms are called "diphtheoids" Historia monoutogragenes         Norszeria spp.           NonspORE-FORMING Compolacter joint (Dartens)         Anaerobic Gram-Negative Bacilli           SpoRE-FORMING Comportation spp.         Anaerobic Gram-Negative Bacilli           SpoRE-FORMING Constraitum spp.         Anaerobic Gram-Negative Bacilli           SpoRE-FORMING Contraitum spp.         Anaerobic Gram-Negative Cocci	<i>Streptococcus pyogenes</i> (Grp A β-hemolytic) (Skin flora. Strep throat (pharyngitis), SSTIs, scarlet fever, rheumatic fever, glomerulonenbritis)	Yersinia enterocolitica (Diarrhea)
Credit fors, Neumatinon, and sepsis)       Pseudomonas aeruginosa         Credit fors, Neumatinon, and sepsis)       Pseudomonas aeruginosa         Streptococcus pneumonia (CAP), otits media, basterial meningits)       Construction and the sense of the sense	Streptococcus agalactiae (Grp B 8-hemolytic)	Nonenterobacteriaceae
Streptococcus pneumoniae (a-hemolytic)       (Nooscomai infections: sepsis.)         (Comunity-experiment of pneumonic (APD, othis medica meningitis)       (Nooscomai infections: sepsis.)         Viridans Group Streptococci (a-hemolytic)       (Gil flora. Denti infections: sepsis.)       Stentorophononas (Xanthamonas) maltophilla (Nooscomial infections)         Stentorophononas (Xanthamonas) maltophilla (Nooscomial infections)       Heinophillas influenzae.       Heinophillas influenzae.         Stentorophononas (Xanthamonas) maltophilla (CAP)       Bordetella pertussis (Whooping cough)       Bartonella pneumophilla (CAP)         Bartonella pneumophillas (IAP)       Bartonella pneumophillas (IAP)       Bartonella pneumophillas (IAP)         Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)       Bartonella pneumophillas (IAP)         Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)         Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)         Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)         Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)         Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)       Bartonella preumophillas (IAP)         Bartonella preumophilas (IAP)       Bartonella preumophillas (IAP)<	(Vaginal flora. Neonatal meningitis, pneumonia, and sepsis)	Pseudomonas aeruginosa
(Community-acquired pneumonin (ZAP) ottis media, bacterial meningitis)       Activational (Xanthamonas) (Monscomial infections)         (Community-acquired pneumonin (ZAP) ottis media, bacterial meningitis)       Activational (Xanthamonas) malophilia (Noseconital infections)         (GI non. Dental infections, endocardits, abscesses)       Sanginova (Xanthamonas) malophilia (Noseconital infections)         S. anginova (Az S. milis, septisti (Article and Pacturella multicida (CAP)       Bartonella henselae and Pacturella multicida (CAP)         Bartonella henselae and Pacturella multicida       (Animo blassesse)       (Animo blassesse)         Enterococcus spos       Helicobacter pylori (H. pylori) (GI duens, gaarinis)       Bartonella henselae and Pacturella multicida (CAP)         Bartolla henselae and Pacturella multicida       (Animo blassesse)       (Animo blassesse)         (GI Inst. Ascientadi with coin cancer)       Vibrio cholera (Di aduent eves)       (Di aduent eves)         (GI Inst. Scienta and Enterococcus faecium       (Di aduent eves)       (Di aduent eves)         (GI Inst. Scienta and Faeterone endocarditis, VRE)       Vibrio cholera (Di aduent eves)       (Di aduent eves)         Bacillus subtracis (Antras)       Baciseria ganorrhoea (SID - gonorthea, septia arthritis)       Meisseria ganorrhoea (SID - gonorthea, septia arthritis)         NonSPORE-FORMING       Anaerobic Gram-Negative Bacilli       Anaerobic Gram-Negative Bacilli       Anaerobic Gram-Negative Bacilli	Streptococcus pneumoniae (a-hemolytic)	(Nosocomial infections: pneumonia, osteomyelitis, sepsis, UTIs, endocarditis)
Viridans Group Streptococci (a-hemolytic) (G1 Guo. Denta infections. andocasis)       Stenotrophomonas (Xanthanonas) maliophilia (Nosoconial infections)         (G1 Guo. Denta infections. andocasis)       Stenotrophomonas (Xanthanonas) maliophilia (Nosoconial infections)         S. salivarius, S. sanguis, Gamella morbillorum       Enterococcus sovis (Gr D Nonenterococcal Strep.)         (G1 form. Associated with colon cancer)       Legiconella pneumophilia (CAP)         (G1 form. Associated with colon cancer)       Catesmich disease)         (G1 form. Associated with colon cancer)       Catesmich disease)         (G1 form. UTIs, biliny infections, bacteremia, endocarditis, VRE)       Bordetella pertussic (Nicolandi Fevers)         Vibrio cholera (Diarthea)       Carmylobacter (piquin (Diarthea))         Aerobic Gram-Positive Bacilli       Aerobic Gram-Negative Cocci         Steseria gonorrhoeae (S1 der Grp B Strep, and E. coli) and immunosuppressed)       Neisseria gonorrhoeae (STD - gonorhea, septic arthritis)         NonspORE-FORMING       Moraxella catarrhalis (Respiratory infections)         Mycobacterium spp.       Bacteroides spp.         Mycobacterium spp.       Bacteroides spp.         Mycobacterium spp.       Bacteroide srgailis (Gl/vaginal forn. Asbecesse)         Mycobacterium spp.       Bacteroide srgailis (Gl/vaginal forn. Asbecesse)         Clostridium perfringens (Gas Gangene - celluitis/wound infecions)       Bacteroide srgailis (Gl/vaginal	(Community-acquired pneumonia (CAP), otitis media, bacterial meningitis)	Acinetobacter baumannii (Nosocomial infections)
(c1 from. Dental infections, endocarditis, abscesses)       Haemophillus influenzae         S. anginovas (Ack S. miller), S. mitars, S. mitars,       S. anginovas (Ack S. miller), S. mitars, S. mitars,         S. salivarius, S. sanguis, Gamella morbillorum       Bartonella pneumophilla (CAP)         Streptoceccus bovis (Grp D Nonenterococcal Strep.)       Bartonella henselae and Pasteurella multocida         (C1 forn. Associated with colon cance)       Bartonella henselae and Pasteurella multocida         (C1 das senach disease)       Atimal binex/senaches)         Heteroporcus facealis and Enterococcus faceium       Brucella syp.         (G1 forn. Associated with colon cance)       Vibrio cholera (Diarthea)         Campylobacter jejuni (Diarthea)       Campylobacter jejuni (Diarthea)         Aerobic Gram-Positive Bacilli       Aerobic Gram-Negative Cocci         SPORE-FORMING       Neisseria gonorrhoeae (STD - gonorhea, septic arthritis)         Bacillus stepp.       Neisseria gonorrhoeae (STD - gonorhea, septic arthritis)         Morazella catarrhalis (Respiratory infections)       Norazella catarrhalis (Respiratory infections)         Nonsponket-foreming, Colume contaminant, non-pathogenic forms are called "diphtheroids"       If and and there, service         Listeria monocytogeros       Maerobic Gram-Negative Bacilli       Anaerobic Gram-Negative Bacilli         Nocardia spp. (oportunistic pathogen)       Bacteroides spp.       Bacter	Viridans Group Streptococci (α-hemolytic)	Stenotrophomonas (Xanthamonas) maltophilia (Nosocomial infections)
S. anginosus (aka S. milleri), S. mutans, S. mitis,     Influenzae, meningitis, egiptionitis, sepsis)       S. salivarius, S. sanguisto, S. anguetta, S.	(GI flora. Dental infections, endocarditis, abscesses)	Haemophilus influenzae
S. salivarius, S. sanguis, Gamella morbillorum       Legonella preumophila (CAP)         Streptosoccus boris (Grp D Nonenterococcal Strep.)       Borteella preumophila (CAP)         Gil fora. Associated with colo cancer)       Borteella preumophila (CAP)         Enterococcus spp.       Borteella preumophila (CAP)         Enterococcus faccalis and Enterococcus faccium       (Can strath disease)       (Animal bites/strathes)         (Gil fora. Associated with colo cancer)       Uitro cholera (Damhes)       (Can strath disease)       (Maina)         (Gil fora. TITs, bilay infections, bacterenia, endocarditis, VRE)       Brucella spp. (Undulan tevers)       (Undustres)         (Gil fora. Cuttrs, blags spp.       Aerobic Gram-Positive Bacilli       Aerobic Gram-Positive Spp.       Neisseria gonorrhoeae (STD - gonorhea, septic arthritis)         Bacillus steereus (Gastroenteritis (foot poisoning))       Noraxella catarrhalis (Respiratory infections)       Moraxella catarrhalis (Respiratory infections)         Nona Cuture contaminant, non-pathogenic forms are called "diptheroids"       Moraxella catarrhalis (Respiratory infections)         Nocardia spp. coportunistic pathogeni       Anaerobic Gram-Negative Bacilli       Moraxella catarrhalis (Respiratory infections)         Mycobacterium spp.       Coloration uberculasis       Anaerobic Gram-Negative Bacilli       Glacteroides, fragilis (Glyaginal flora. Abscesse)         Mycobacterium spp.       Coloration diffection, acteroide	S. anginosus (aka S. milleri), S. mutans, S. mitis,	(Influenzae, meningitis, epiglottitis, septic arthritis, sepsis)
Streptococcus boris (Grp D Nonenterococcal Strep.) (GI forn. Associated with colon cancer)       Bordetella pertussis (Whooping cough)         Enterococcus spp.       Bartonella henselae and Pasteurella multiocida (Cat stratch disease)         Enterococcus spp.       Helicobacter pylori (H. pylori) (GI ulcen, gastritis)         Enterococcus spp.       Funcella spp. (Undulant fovers)         Interoscoccus spp.       Vibrio cholera (Darthea)         Campylobacter jejuni (Danthea)       Campylobacter jejuni (Danthea)         Aerobic Gram-Positive Bacilli       Aerobic Gram-Negative Cocci         SPORE-FORMING       Meisseria meningitidis (Meningitis (<1 yo), sepsis)	S. salivarius, S. sanguis, Gamella morbillorum	Legionella pneumophilia (CAP)
(GI flora. Associated with colon cancer)       Bartonella henselae and Pasteurella mullocida         (Cat scratch disease)       (Cat scratch disease)       (Cat scratch disease)       (Cat scratch disease)         Enterococcus facecalis and Enterococcus faceium       Bartenella spp. (Undulant fevers)       (Undulant fevers)         (GI flora. UTIS, bilay infections, bacteronia, endocarditis, VRE)       Brucella spp. (Undulant fevers)       (Undulant fevers)         (GI flora. UTIS, bilay infections, bacteronia, endocarditis, VRE)       Aerobic Gram-Negative Cocci       Designation (Unarthea)         (GI flora. UTIS, bilay infections, bacteronia, endocarditis, VRE)       Neisseria spp.       Neisseria spp.         SPORE-FORMING       Neisseria gonorrhoeae (STD - gonorrhea, septic arthritis)       Neisseria gonorrhoeae (STD - gonorrhea, septic arthritis)         Nonsporterium spp.       Moraxella catarrhalis (Respiratory infections)       Noraxella catarrhalis (Respiratory infections)         Nocardia spp. (opportunistic pathogen)       Moraxella catarrhalis (Respiratory infections)       Bacteroides spp.         Mycobacterium spp.       Bacteroides spp.       Bacteroides spp.       Bacteroides spp.         Mycobacterium spp.       Bacteroides spp.       Bacteroides spp.       Bacteroides spp.         Mycobacterium spp.       Bacteroides spp.       Bacteroides spp.       Bacteroides spp.       Bacteroides spp.       Bacteroides spp. <td>Streptococcus bovis (Grp D Nonenterococcal Strep.)</td> <td>Bordetella pertussis (Whooping cough)</td>	Streptococcus bovis (Grp D Nonenterococcal Strep.)	Bordetella pertussis (Whooping cough)
Clear exercise disease)       (Anima bites/secratches)         Entercocccus spp.       Helicobacter pylori (H. pylori) (Gulders, gastritis)         Entercocccus faecalis and Entercoccus faecium       Helicobacter pylori (H. pylori) (Gulders, gastritis)         Gance (Gance, UTIs, biliary infections, bacteremia, endocarditis, VRE)       Campylobacter jejuni (Dambea)         Aerobic Gram-Positive Bacilli       Aerobic Gram-Negative Cocci         SPORE-FORMING       Neisseria gonorrhoeae (STD - gonorrhea, septic arthritis)         Bacillus sontinatis (food poisoning))       NonsPORE-FORMING         NonsPORE-FORMING       Neisseria gonorrhoeae (STD - gonorrhea, septic arthritis)         Mycobacterium spp.       Moraxella catarrhalis (Respiratory infections)         Mycobacterium spp.       Moraxella catarrhalis (Respiratory infections)         Mycobacterium spp.       Anaerobic Gram-Positive Bacilli         SPORE-FORMING       Bacteroides spp.         Mycobacterium spp.       Bacteroides spp.         Mycobacterium spp.       Galarenoie Gram-Positive Bacilli         SPORE-FORMING       Bacteroides spp.         Clostridium perfringera       Cellitis/wound infections)         Clostridium perfringera       Galarenoie Gram-Positive Bacilli         NonsPORE-FORMING       Cateroides spp.         Clostridium perfringera       Cellitis/wound infections) <td>(GI flora. Associated with colon cancer)</td> <td>Bartonella henselae and Pasteurella multocida</td>	(GI flora. Associated with colon cancer)	Bartonella henselae and Pasteurella multocida
Enterococcus spp. Enterococcus spp. Enterococcus faeculis and Enterococus faecum (Gl Hon. UTs, biliary infections, bacteremia, endocarditis, VRE)         Helicobacter pijotin (El. pylort) (Gl ulcers, gastritis)           Aerobic Gram-Positive Bacilli         Strucella spp. (Undulant fvers), Vibrio cholera (Diarchea)         Campylobacter jejuin (Diarchea)           Aerobic Gram-Positive Bacilli         Aerobic Gram-Negative Cocci         Neisseria spp. Neisseria spp.           Bacillus sultiracis (Antrax)         Bacillus cereus (Gastroenteritis (food poisoning))         Neisseria gonorrhoeae (STD - gonorrhea, septic arthritis)           NONSPORE-FORMING         Moraxella catarrhalis (Respiratory infections)         Moraxella catarrhalis (Respiratory infections)           Nonsarbic Gram-Positive Bacilli         Anaerobic Gram-Negative Bacilli         Moraxella catarrhalis (Respiratory infections)           Mycobacterium spp. Mycobacterium spp.         Bacteroides proglitive Gas Gastroenterolitis)         Bacteroides proglitive Gastroenterolitis)           NonsporRE-FORMING         Bacteroides proglitive Gastroenterolitis)         Bacteroides proglitive Gastroenterolitis)           NonsporRE-FORMING         Bacteroides proglitis (Glvaginal flora. Abscesses)         Bacteroides spg. (Glvaginalmouth flora. Aperation pneumonia, periodontal disease)           Antaerobic Gram-Positive Cocci         Xapotacterium spp. (Glvaginalmouth flora. Abscesses, appiration pneumonia)         Yeillonella spp. (Periodontal diseases)           NonsporRE-FORMING Actinomyces spp., Propion		(Cat scratch disease) (Animal bites/scratches)
Enterococcus faecalis and Enterococcus faecium (GI flora. UTIs, biliary infections, bacteremia, endocarditis, VRE)         Brucella spp. (Undulant fevers)           Aerobic Gram-Positive Bacilli         Aerobic Gram-Negative Cocci           SPORE-FORMING         Meisseria app. Neisseria app.           Bacillus anthracis (Antrax)         Neisseria app. Neisseria gonorrhoeae (STD - gonorhea, septic arthritis)           Bacillus cereus (Gastroenteritis (food poisoning))         Neisseria gonorrhoeae (STD - gonorhea, septic arthritis)           NONSPORE-FORMING Corynebacterium spp. (Skin flora. Culture contaminant; non-pathogenic forms are called "diphtheroids" Listeria monocytogenes         Moraxella catarrhalis (Respiratory infections)           Mycobacterium spp. Nocardia spp. (opportunistic pathogen)         Meinseria         Meanerobic Gram-Negative Bacilli           SPORE-FORMING Clostridium spp. (Clostridium spp. Clostridium ferfingens (Gas Gangrene - cellulitis/wound infections)         Maacrobic Gram-Negative Bacilli           SPORE-FORMING Clostridium difficile (Clvraginal/mouth flora. Aspiration pneumonia, periodontal disease)         Bacteroides melaninogenicus (Clvraginal/mouth flora. Aspiration pneumonia, periodontal diseases)           NONSPORE-FORMING Clostridium difficile (Clvraginal/mouth flora. Aspiration pneumonia, periodontal diseases)         Frevotella spp. (Periodontal diseases)           NONSPORE-FORMING Clostridium difficile (Clvraginal/mouth flora. Abscesses, appration pneumonia)         Yeuidal mouth flora. Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)	Enterococcus spp.	Helicobacter pylori (H. pylori) (GI ulcers, gastritis)
(GI fora. UTIs, biliary infections, bacteremia, endocarditis, VRE)       Vibrio cholera (Diarnhea)         Aerobic Gram-Positive Bacilli       Aerobic Gram-Negative Cocci         SPORE-FORMING       Neisseria spp.         Bacillus sathracis (Antrax)       Neisseria meningitidis (Meningitis (<1 yo), sepsis)	Enterococcus faecalis and Enterococcus faecium	Brucella spp. (Undulant fevers)
Campslobacter jeinni (Diarrhea)         Aerobic Gram-Positive Bacilli         SPORE-FORMING         Bacillus spp.         Bacillus anthracis (Antrax)         Bacillus cereus (Gastroenteritis (food poisoning))         NONSPORE-FORMING         Corynebacterium spp.         (Skin floar, Culture contaminant; non-pathogenic forms are called "diphtheroids"         Listeria monocytogenes         (Meningitis in enomates (3 <sup>rd</sup> after Grp B Strep, and E. coli) and immunosuppressed)         Nocardia spp.         Mycobacterium spp.         Mycobacterium spp.         Mycobacterium spp.         Mycobacterium spp.         Mycobacterium fuberculosis         Clostridium spp.         Clostridium perfringens (Gas Gangrene - cellulitis/wound infections)         Clostridium difficile         (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)         NonSPORE-FORMING         Clostridium perfringens (Gas Gangrene - cellulitis/wound infections)         Clostridium performed diarhea, Pseudomembraneous enterocolitis)         NonSPORE-FORMING         Clostridium performed diarhea, Pseudomembraneous enterocolitis)         NonSPORE-FORMING         (Glvaginal/mouth floar, Abscesses)         Prevotella spp.         Anaerobic Gram-Negative Cocci	(GI flora. UTIs, biliary infections, bacteremia, endocarditis, VRE)	Vibrio cholera (Diarrhea)
Aerobic Gram-Negative Cocci         SPORE-FORMING       Neisseria spp.         Bacillus spp.       Neisseria meningitidis (Meningitis (<1 yo), sepsis)		Campylobacter jejuni (Diarrhea)
SPORE-FORMING         Neisseria spp. Neisseria meningitiäis (Meningitis (<1 yo), sepsis)	Aerobic Gram-Positive Bacilli	Aerobic Gram-Negative Cocci
Bacillus spp.       Neisseria meningitidis (Meningitis (<1 yo), sepsis)	SPORE-FORMING	<u>Neisseria spp.</u>
Bacillus anthracis (Antrax)       Neisseria gonorrhoeae (STD - gonorrhea, septic arthritis)         Bacillus cereus (Gastroenteritis (food poisoning))       Moraxella catarrhalis (Respiratory infections)         NONSPORE-FORMING (Skin nora. Culture contaminant, non-pathogenic forms are called "diphtheroids" Listeria monocytogenes (Meningitis in neonates (3" after Grp B Strep, and E. coli) and immunosuppressed)       Moraxella catarrhalis (Respiratory infections)         Mycobacterium spp. (Meningitis pathogen)       Anaerobic Gram-Negative Bacilli       Seconda Strep Stre	Bacillus spp.	Neisseria meningitidis (Meningitis (<1 yo), sepsis)
Bacillus cereus (Gastroenteritis (food poisoning))       Moraxella catarrhalis (Respiratory infections)         NONSPORE-FORMING       Moraxella catarrhalis (Respiratory infections)         Corynebacterium spp.       Moraxella catarrhalis (Respiratory infections)         Listeria monocytogenes       Moraxella catarrhalis (Respiratory infections)         Mocoacterium spp.       Moraxella catarrhalis (Respiratory infections)         Mycobacterium tuberculosis       Anaerobic Gram-Negative Bacilli         Anaerobic Gram-Positive Bacilli       Anaerobic Gram-Negative Bacilli         SPORE-FORMING       Bacteroides spp.         Clostridium spp.       Bacteroides spp.         Clostridium gerfringens (Gas Gangrene - cellulitis/wound infections)       Bacteroides spp.         Clostridium difficile       (Gl/vaginal/mouth flora. Asscesses)         Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)       Fusobacterium spp.         NONSPORE-FORMING       Caspiration pneumonia, periodontal diseases)         Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.       Prevotella spp. (Periodontal diseases, abdominal/pelvic abscesses)         Prevotella spp. (Gi normal flora. Ascesses, aspiration pneumonia)       Veillonella spp. (Gi normal flora. Rare case of osteomyelitis and endocarditis)         (Gl/vaginal/mouth flora. Ascesses, aspiration pneumonia)       Mycoplasma pneumoniae (Atypical organism. CAP)         Chlamydophil	<b>Bacillus anthracis</b> (Antrax)	Neisseria gonorrhoeae (STD - gonorrhea, septic arthritis)
NONSPORE-FORMING Corynebacterium spp. (Skin flora . Culture contaminant; non-pathogenic forms are called "diphtheroids" Listeria monocytogenes (Meningitis in neonates (3° after Grp B Strep. and E. coli) and immunosuppressed) Nocardia spp. (opportunistic pathogen)Moraxella catarrhalis (Respiratory infections)Mycobacterium spp. Mycobacterium tuberculosisAnaerobic Gram-Negative BacilliAnaerobic Gram-Positive BacilliAnaerobic Gram-Negative BacilliSPORE-FORMING Clostridium perfringens (Gas Gangrene - cellulitis/wound infections) Clostridium difficile (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)Bacteroides melaninogenicus (GI/vaginal/mouth flora. Asscesses) Fusobacterium spp. (Aspiration pneumonia, periodontal diseases)NONSPORE-FORMING Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. (Clostridium flora. Aspesses, aspiraton pneumonia)Fusobacterium spp. (Aspiration pneumonia, periodontal diseases)Nonsport Clastridium flora. Aspesses, aspiraton pneumonia)Veillonella spp. (Gi normal flora. Asre cases of osteomyelitis and endocarditis)Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPrevotella spp. (Gl/vaginal/mouth flora. Aspesses, aspiraton pneumonia)Veillonella spp. (Gi normal flora. Rare cases of osteomyelitis and endocarditis)Gl/saginal/mouth flora. Aspesses, aspiraton pneumoniae (Aspirato pneumoniae (Atypical organism. CAP) Borrelia burgdorferi (Lym disease)Mycoplasma pneumoniae (Atypical organism. CAP) Borrelia burgdorferi (Lym disease)Chamydophilia (formerly chamydia) pneumoniae (Atypical organism. CAP)Mycoplasma pneumoniae (Mypical organism. CAP) Borrelia burgdorferi (Lym disease)Rickettsii rickettsii (Rock	Bacillus cereus (Gastroenteritis (food poisoning))	
NONSPORE-FORMING         Corynebacterium spp.         (Skin flora. Culture contaminant; non-pathogenic forms are called "diphtheroids"         Listeria monocytogenes         (Meningitis in neonates (3 <sup>rd</sup> after Grp B Strep, and E. coli) and immunosuppressed)         Nocardia spp.         Mycobacterium tuberculosis         Anaerobic Gram-Positive Bacilli         SPORE-FORMING         Clostridium perfringens (Gas Gangrene - cellulitis/wound infections)         Clostridium perfringens (Gas Gangrene - cellulitis/wound	NONGRODE FORMING	Moraxella catarrhalis (Respiratory infections)
Corynebacterium spp.       (Skin flora. Abscesses)         (Skin flora. Abscesses, aspiration pneumonia)       (Glvaginal/mouth flora. Abscesses)         Nocardia spp.       (Gas Gangrene - cellulitis/wound infections)         Bacteroides fragilis       (Glvaginal/mouth flora. Abscesses)         NONSPORE-FORMING       Bacteroides spp.         (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)       Bacteroides Gram-Negative Bacilli         NONSPORE-FORMING       Bacteroides spp.         Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.       (Glvaginal/mouth flora. Aspiration pneumonia, periodontal diseases)         NONSPORE-FORMING       Prevotella spp.         Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.       (Aspiration pneumonia, periodontal diseases)         Prevotella spp. (Gl normal flora. Abscesses)       Prevotella spp.         Actinomyces spp., And Peptococcus spp.       Weillonella spp. (Gl normal flora. Rare cases of osteomyelitis and endocarditis)         Chamydia trachomatis (STD)       Mycoplasma pneumoniae (Atypical organism. CAP)         Chlamydophilia (formerly chlamydia) pneumoniae       Barceniae ungorferi (Lyme disease)         Rickettsia rickettsii (Rocky Mountain Spotted Fever)       Treponema pallidum (Syphilis)	NONSPORE-FORMING	
(Skin ford. Culture contaminant, non-parlogene forms are called alphinerous Listeria monocytogenes       (Meningitis in neonates (3 <sup>rd</sup> after Grp B Strep. and E. coli) and immunosuppressed)         Nocardia spp. (opportunistic pathogen)       Mycobacterium spp.         Mycobacterium tuberculosis       Anaerobic Gram-Negative Bacilli         Anaerobic Gram-Positive Bacilli       Anaerobic Gram-Negative Bacilli         SPORE-FORMING       Bacteroides spp.         Clostridium spp.       Bacteroides fragilis (Gl/vaginal flora. Abscesses)         Clostridium gerfringens (Gas Gangrene - cellulitis/wound infections)       Bacteroides melaninogenicus         (Glvraginal/mouth flora. Aspiration pneumonia, periodontal disease)       Fusobacterium spp.         NONSPORE-FORMING       (Glvraginal/mouth flora. Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)         NONSPORE-FORMING       Charrobic Gram-Negative Cocci         Anaerobic Gram-Negitive Cocci       Anaerobic Gram-Negative Cocci         Anaerobic Gram-Negative Cocci       Anaerobic Gram-Negative Cocci         Peptostreptococcus spp. and Peptococcus spp.       Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)         (Glvaginal/mouth flora. Abscesses, aspiration pneumonia)       Mycoplasma pneumoniae (Atypical organism. CAP)         Chlamydia trachomatis (STD)       Mycoplasma pneumoniae (Atypical organism. CAP)         Chlamydo organism. CAP)       Trepone	Corynebacterium spp.	
Listeria monologyogenes         (Meningitis in neonates (3 <sup>ad</sup> after Grp B Strep. and E. coli) and immunosuppressed)         Nocardia spp. (opportunistic pathogen) <u>Mycobacterium tuberculosis</u> Anaerobic Gram-Positive Bacilli         Anaerobic Gram-Positive Bacilli         SPORE-FORMING         Clostridium ppfringens (Gas Gangrene - cellulitis/wound infections)         Clostridium difficile         (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)         NONSPORE-FORMING         Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.         Anaerobic Gram-Negative Cocci         Anaerobic Gram-Negative Cocci         Anaerobic Gram-Negative Cocci         Peptostreptococcus spp. and Peptococcus spp.         (Gl/vaginal/mouth flora. Abscesses, aspiration pneumonia)         (Gl/vaginal/mouth flora. Abscesses, aspiration pneumonia)         Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)         (Gl/vaginal/mouth flora. Abscesses, aspiration pneumonia)         Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)         (Gl/vaginal/mouth flora. Abscesses, aspiration pneumonia)         Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)         (Gl/vaginal/mouth flora. Abscesses, aspiration pneumonia)         Veillonella spp. (GI normal flora. Rare case	(Skin flora . Culture contaminant; non-pathogenic forms are called diphtheroids	
Nocardia spp.       (opportunistic pathogen) <u>Mycobacterium spp.</u> <u>Mycobacterium tuberculosis</u> <u>Anaerobic Gram-Positive Bacilli</u> <u>Anaerobic Gram-Negative Bacilli</u> <u>SPORE-FORMING</u> <u>Bacteroides spp.</u> <u>Clostridium perfringens</u> (Gas Gangrene - cellulitis/wound infections) <u>Bacteroides melaninogenicus</u> <u>Clostridium difficile</u> (Gl/vaginal/mouth flora. Aspiration pneumonia, periodontal disease) <u>Antierobic Gram-Positive Cocci</u> <u>Fusobacterium spp.</u> <u>Anterobic Gram-Positive Cocci</u> <u>Anaerobic Gram-Negative Cocci</u> <u>Anaerobic Gram-Positive Cocci</u> <u>Anaerobic Gram-Negative Cocci</u> <u>Anaerobic Gram-Positive Cocci</u> <u>Anaerobic Gram-Negative Cocci</u> <u>Pervotella spp.</u> (GI normal flora. Rare cases of osteomyelitis and endocarditis)       Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)         (Gl/vaginal/mouth flora. Abscesses, aspiration pneumonia)       Mycoplasma pneumoniae (Atypical organism. CAP) <u>Chlamydophilia</u> (formerly chlamydia) pneumoniae       Mycoplasma pneumoniae (Syphilis) <u>Kickettsia rickettsii</u> (Rocky Mountain Spotted Fever)       Treponema pallidum (Syphilis)	(Meningitis in peoples (3 <sup>rd</sup> after Grn B Strep, and F, coli) and immunosuppressed)	
Mycobacterium spp. Mycobacterium tuberculosis       Anaerobic Gram-Negative Bacilli         Anaerobic Gram-Positive Bacilli       Anaerobic Gram-Negative Bacilli         SPORE-FORMING       Bacteroides spp. Clostridium spp. Clostridium perfringens (Gas Gangrene - cellulitis/wound infections)       Bacteroides fragilis (Gl/vaginal flora. Abscesses)         Clostridium difficile (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)       Bacteroides melaninogenicus (Gl/vaginal/mouth flora. Aspiration pneumonia, periodontal disease)         NONSPORE-FORMING Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. (Gl/vaginal/mouth flora. Abscesses, abdominal/pelvic abscesses)       Prevotella spp. (Periodontal diseases)         Anaerobic Gram-Positive Cocci       Anaerobic Gram-Negative Cocci         Peptostreptococcus spp. and Peptococcus spp. (Gl/vaginal/mouth flora. Abscesses, aspiration pneumonia)       Veillonella spp. (Gl normal flora. Rare cases of osteomyelitis and endocarditis)         Chlamydophilia (formerly chlamydia) pneumoniae (Atypical organism. CAP)       Mycoplasma pneumoniae (Atypical organism. CAP)         Rickettsia rickettsii (Rocky Mountain Spotted Fever)       Treponema pallidum (Syphilis)	Nocardia snn (opportunistic pathogen)	
Mycobacterium spp.       Anaerobic Gram-Positive Bacilli       Anaerobic Gram-Negative Bacilli         Anaerobic Gram-Positive Bacilli       Bacteroides spp.         SPORE-FORMING       Bacteroides spp.         Clostridium perfringens (Gas Gangrene - cellulitis/wound infections)       Bacteroides melaninogenicus         Clostridium difficile       (Gl/vaginal/mouth flora. Aspiration pneumonia, periodontal disease)         (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)       Fusobacterium spp.         NONSPORE-FORMING       (Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)         Anaerobic Gram-Positive Cocci       Anaerobic Gram-Negative Cocci         Anaerobic Gram-Positive Cocci       Anaerobic Gram-Negative Cocci         Peptostreptococcus spp. and Peptococcus spp.       (Gl/vaginal/mouth flora. Asc cases of osteomyelitis and endocarditis)         (Gl/vaginal/mouth flora. Abscesses, aspiration pneumonia)       Mycoplasma pneumoniae (Atypical organism. CAP)         Chlamydophilia (formerly chlamydia) pneumoniae       Mycoplasma pneumoniae (Syphilis)         (Atypical organism. CAP)       Treponema pallidum (Syphilis)         Rickettsia rickettsii (Rocky Mountain Spoted Fever)       Treponema pallidum (Syphilis)	<b>Trocarata Spp.</b> (opportunistic pathogen)	
Mycobacterium tuberculosis       Anaerobic Gram-Positive Bacilli         Anaerobic Gram-Positive Bacilli       Anaerobic Gram-Negative Bacilli         SPORE-FORMING       Bacteroides spp.         Clostridium spp.       Bacteroides fragilis (GI/vaginal flora. Abscesses)         Clostridium difficile       Bacteroides melaninogenicus         (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)       Bacteroides melaninogenicus         NONSPORE-FORMING       (Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)         Anaerobic Gram-Positive Cocci       Anaerobic Gram-Negative Cocci         Anaerobic Gram-Positive Cocci       Anaerobic Gram-Negative Cocci         Petostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)       Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)         Chlamydia trachomatis (STD)       Mycoplasma pneumoniae (Atypical organism. CAP)         Chlamydophilia (formerly chlamydia) pneumoniae (Atypical organism. CAP)       Mycoplasma pneumoniae (Syphilis)         Rickettsia rickettsii (Rocky Mountain Spotted Fever)       Treponema pallidum (Syphilis)	<u>Mycobacterium spp.</u>	
Anaerobic Gram-Positive BacilliAnaerobic Gram-Negative BacilliSPORE-FORMINGBacteroides spp.Clostridium spp.Bacteroides fragilis (GI/vaginal flora. Abscesses)Clostridium perfringens (Gas Gangrene - cellulitis/wound infections)Bacteroides melaninogenicus(GI/vaginal/mouth flora. Aspiration pneumonia, periodontal disease)Fusobacterium spp.(Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)Fusobacterium spp.(Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)(GI/vaginal/mouth flora. Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)NONSPORE-FORMING Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.(Periodontal diseases)Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPeptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)Chlamydia trachomatis (STD)Mycoplasma pneumoniae (Atypical organism. CAP)Chlamydophilia (formerly chlamydia) pneumoniaeBorrelia burgdorferi (Lyme disease)(Atypical organism. CAP)Treponema pallidum (Syphilis)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Treponema pallidum (Syphilis)	Mycobacterium tuberculosis	
SPORE-FORMINGBacteroides spp.Clostridium spp.Bacteroides fragilis (GI/vaginal flora. Abscesses)Clostridium perfringens (Gas Gangrene - cellulitis/wound infections)Bacteroides melaninogenicusClostridium difficile(GI/vaginal/mouth flora. Aspiration pneumonia, periodontal disease)(Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)Fusobacterium spp.NONSPORE-FORMING(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.Prevotella spp. (Periodontal diseases)Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPeptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesse, aspiration pneumonia)Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)Chlamydia trachomatis (STD)Mycoplasma pneumoniae (Atypical organism. CAP)Chlamydophilia (formerly chlamydia) pneumoniaeBorrelia burgdorferi (Lyme disease)(Atypical organism. CAP)Treponema pallidum (Syphilis)	Anaerobic Gram-Positive Bacilli	Anaerobic Gram-Negative Bacilli
Clostridium spp. Clostridium perfringens (Gas Gangrene - cellulitis/wound infections) Clostridium difficile (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)Bacteroides fragilis (GI/vaginal/mouth flora. Abscesses) Bacteroides melaninogenicus (GI/vaginal/mouth flora. Aspiration pneumonia, periodontal disease)NONSPORE-FORMING Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.Fusobacterium spp. (Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPeptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)(GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Mycoplasma pneumoniae (Atypical organism. CAP) Borrelia burgdorferi (Lyme disease)(Atypical organism. CAP)Treponema pallidum (Syphilis)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Treponema pallidum (Syphilis)	SPORE-FORMING	Bacteroides spp.
Clostridium perfringens (Gas Gangrene - cellulitis/wound infections) Clostridium difficile (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)Bacteroides melaninogenicus (GI/vaginal/mouth flora. Aspiration pneumonia, periodontal disease)NONSPORE-FORMING Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. Anaerobic Gram-Positive CocciFusobacterium spp. (Aspiration pneumonia, periodontal diseases)Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPeptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)Chlamydia trachomatis (STD) Chlamydophilia (formerly chlamydia) pneumoniae (Atypical organism. CAP)Mycoplasma pneumoniae Borrelia burgdorferi (Lyme disease)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Treponema pallidum (Syphilis)	Clostridium spp.	<b>Bacteroides fragilis</b> (GI/vaginal flora. Abscesses)
Clostridium difficile (Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)(GI/vaginal/mouth flora. Aspiration pneumonia, periodontal disease)NONSPORE-FORMING Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.Fusobacterium spp. (Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPeptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)Chlamydia trachomatis (STD) Chlamydophilia (formerly chlamydia) pneumoniae (Atypical organism. CAP)Mycoplasma pneumoniae Borrelia burgdorferi (Lyme disease)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Treponema pallidum (Syphilis)	<b>Clostridium perfringens</b> (Gas Gangrene - cellulitis/wound infections)	Bacteroides melaninogenicus
(Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)Fusobacterium spp. (Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)NONSPORE-FORMING Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.Fusobacterium spp. (Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPeptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)Chlamydia trachomatis (STD) Chlamydophilia (formerly chlamydia) pneumoniae (Atypical organism. CAP)Mycoplasma pneumoniae (Atypical organism. CAP) Borrelia burgdorferi (Lyme disease)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Treponema pallidum (Syphilis)	Clostridium difficile	(GI/vaginal/mouth flora. Aspiration pneumonia, periodontal disease)
NONSPORE-FORMING Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPetostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Veillonella spp. (Periodontal diseases)MiscellareousChlamydia trachomatis (STD) Chlamydophilia (formerly chlamydia) pneumoniae (Atypical organism. CAP)Mycoplasma pneumoniae (Atypical organism. CAP) Borrelia burgdorferi (Lyme disease)Kickettsia rickettsii (Rocky Mountain Spotted Fever)Treponema pallidum (Syphilis)	(Antibiotic-induced diarrhea, Pseudomembraneous enterocolitis)	Fusch actavium ann
NONSPORE-FORMING       (Aspiration preumonia, periodontal diseases, abdomina/period baseses)         Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.       Prevotella spp. (Periodontal diseases)         Anaerobic Gram-Positive Cocci       Anaerobic Gram-Negative Cocci         Peptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)       Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)         Chlamydia trachomatis (STD)       Miscellaneous         Chlamydophilia (formerly chlamydia) pneumoniae (Atypical organism. CAP)       Borrelia burgdorferi (Lyme disease)         Rickettsia rickettsii (Rocky Mountain Spotted Fever)       Treponema pallidum (Syphilis)		r usobacierium spp.
Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.Intervient spp. (remodential diseases)Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPeptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)(GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)MiscellaneousChlamydia trachomatis (STD)Mycoplasma pneumoniae (Atypical organism. CAP)Chlamydophilia (formerly chlamydia) pneumoniaeBorrelia burgdorferi (Lyme disease)(Atypical organism. CAP)Treponema pallidum (Syphilis)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Veillonella spp.	NONSPORE-FORMING	(Aspiration pneumonia periodontal diseases abdominal/pelvic abscesses)
Anaerobic Gram-Positive CocciAnaerobic Gram-Negative CocciPeptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)(GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Miscella sep.Chlamydia trachomatis (STD)Mycoplasma pneumoniae (Atypical organism. CAP)Chlamydophilia (formerly chlamydia) pneumoniaeBorrelia burgdorferi (Lyme disease)(Atypical organism. CAP)Treponema pallidum (Syphilis)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Veillonella sep.		(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)
Peptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis) (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)Chlamydia trachomatis (STD)Miscella meous Mycoplasma pneumoniae (Atypical organism. CAP)Chlamydophilia (formerly chlamydia) pneumoniae (Atypical organism. CAP)Miscella burgdorferi (Lyme disease)Kickettsia rickettsii (Rocky Mountain Spotted Fever)Treponema pallidum (Syphilis)	Actinomyces spp., Propionibacterium acnes, Lactobacillus spp.	(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses) <b>Prevotella spp.</b> (Periodontal diseases)
(GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)       Miscellaneous         Chlamydia trachomatis (STD)       Mycoplasma pneumoniae (Atypical organism. CAP)         Chlamydophilia (formerly chlamydia) pneumoniae       Borrelia burgdorferi (Lyme disease)         (Atypical organism. CAP)       Treponema pallidum (Syphilis)         Rickettsia rickettsii (Rocky Mountain Spotted Fever)       Vecena pallidum (Syphilis)	Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. Anaerobic Gram-Positive Cocci	(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses) <b>Prevotella spp.</b> (Periodontal diseases) <b>Anaerobic Gram-Negative Cocci</b>
MiscellaneousChlamydia trachomatis (STD)Mycoplasma pneumoniae (Atypical organism. CAP)Chlamydophilia (formerly chlamydia) pneumoniaeBorrelia burgdorferi (Lyme disease)(Atypical organism. CAP)Treponema pallidum (Syphilis)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Vertical organism (Syphilis)	Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. Anaerobic Gram-Positive Cocci Peptostreptococcus spp. and Peptococcus spp.	(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses) Prevotella spp. (Periodontal diseases) Anaerobic Gram-Negative Cocci Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)
Chlamydia trachomatis (STD)Mycoplasma pneumoniae (Atypical organism. CAP)Chlamydophilia (formerly chlamydia) pneumoniaeBorrelia burgdorferi (Lyme disease)(Atypical organism. CAP)Treponema pallidum (Syphilis)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Fever	Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. Anaerobic Gram-Positive Cocci Peptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia)	(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses) Prevotella spp. (Periodontal diseases) Anaerobic Gram-Negative Cocci Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)
Chlamydophilia (formerly chlamydia) pneumoniaeBorrelia burgdorferi (Lyme disease)(Atypical organism. CAP)Treponema pallidum (Syphilis)Rickettsia rickettsii (Rocky Mountain Spotted Fever)Treponema pallidum (Syphilis)	Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. Anaerobic Gram-Positive Cocci Peptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia) Misce	(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses) Prevotella spp. (Periodontal diseases) Anaerobic Gram-Negative Cocci Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis) llaneous
(Atypical organism. CAP) <b>Treponema pallidum</b> (Syphilis) <b>Rickettsia rickettsii</b> (Rocky Mountain Spotted Fever)	Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. Anaerobic Gram-Positive Cocci Peptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia) Misce Chlamydia trachomatis (STD)	(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)         Prevotella spp. (Periodontal diseases)         Anaerobic Gram-Negative Cocci         Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)         Illaneous         Mycoplasma pneumoniae (Atypical organism. CAP)
Rickettsia rickettsii (Rocky Mountain Spotted Fever)	Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. Anaerobic Gram-Positive Cocci Peptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia) Misce Chlamydia trachomatis (STD) Chlamydophilia (formerly chlamydia) pneumoniae	(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses)         Prevotella spp. (Periodontal diseases)         Anaerobic Gram-Negative Cocci         Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis)         Illaneous         Mycoplasma pneumoniae (Atypical organism. CAP)         Borrelia burgdorferi (Lyme disease)
	Actinomyces spp., Propionibacterium acnes, Lactobacillus spp. Anaerobic Gram-Positive Cocci Peptostreptococcus spp. and Peptococcus spp. (GI/vaginal/mouth flora. Abscesses, aspiration pneumonia) Misce Chlamydia trachomatis (STD) Chlamydophilia (formerly chlamydia) pneumoniae (Atypical organism. CAP)	(Aspiration pneumonia, periodontal diseases, abdominal/pelvic abscesses) Prevotella spp. (Periodontal diseases) Anaerobic Gram-Negative Cocci Veillonella spp. (GI normal flora. Rare cases of osteomyelitis and endocarditis) Ilaneous Mycoplasma pneumoniae (Atypical organism. CAP) Borrelia burgdorferi (Lyme disease) Treponema pallidum (Syphilis)



#### **Common Antibacterial Agents**

Common Antibucter ful Argentis	
<u>Beta Lactams</u>	• Inhibits cell wall synthesis by binding to transpeptidase, the penicillin binding protein (PBPs)
Penicillins	Bactericidal
Natural Penicillins	
Panicillin G VK	
Ponzathino/Propaino PCNa	
Benzannie/Frocane FCNs	
Anti-Staphylococcal Penicillins	
Nafcillin	
Oxacilin	
Dicloxacillin	
Aminopenicillin	
Ampicillin	
Ampicillin/sulbactam (Unasym)	
Ampiculus subacium (Onasyn)	
Amoxicillin/clavulanate (Augmentin)	
Anti-pseudomonal Penicillins	
Piperacillin/tazobactam (Zosyn)	
Ticarcillin/clavulanate (Timentin)	
Cephalosporins	
1 <sup>st</sup> generation	
Cefadroxil (Duricef)	
Cofeelin (Anosf)	
Cejazolin (Ancej)	
<i>Cephalexin</i> (Keflex)	
<u>2<sup>nd</sup> generation</u>	
Cefoxitin	
<u>3<sup>rd</sup> generation</u>	
Cefdinir (Omnicef)	
Cefixime (Suprax)	
Ceftibuten (Cedax)	
Cofnodorimo provotil (Vantin)	
Colditorian (Spectra of)	
Cefailoren (Speciracej)	
Cefotaxime (Claforan)	
Ceftriaxone (Rocephin)	
Ceftazidime (Fortaz)	
4 <sup>th</sup> generation	
Cefepime (Maxipime)	
5 <sup>th</sup> generation	
<u>Ceftaroline</u> (Teflaro)	
Carbonanama	
Imipenem/cilastatin (Primaxin)	
Meropenem (Merrem)	
Ertapenem (Invanz)	
Doripenem (Doribax)	
Monohactam	• Inhibits cell wall synthesis by binding to transpeptidase, the penicillin binding protein (PBPs)
Aztreonam (Azactam)	• Bactericidal
A min o aluco aid o a	Individual and the second s
Aminoglycosides	• Initial protein synthesis by binding to independent in the initial decoding region of the 505 suburit of
Gentamicin	prokaryone noosomes and interferes with mKINA translation and translocation
Tobramycin	• Bactericidal
Amikacin	
Fluoroquinolones	<ul> <li>Inhibits DNA synthesis by binding to DNA gyrase and topoisomerase IV and cleaves DNA in these enzyme-</li> </ul>
Cinvoflorgain (Cinvo)	DNA complexes
	- Basterioidal
Levofloxacin (Levaquin)	
Moxifloxacin (Avelox)	
Gemifloxacin (Factive)	
Polymixin E	• Colistimethate in vivo → hydrolyzes to colistin (active drug).
Colistimethate sodium: Colistin	• Catatonic detergent. Binds and penetrates cell membrane $\rightarrow$ interacts with phospholinids in the membrane $\rightarrow$
(Columnia M)	distinct the membrane and alter exercise barrier $\rightarrow$ causes lackage of assential interaction methods interaction interactions in the membrane $\gamma$
(Coly-Mycin-M)	and an energy and an energy show of the second states in the second stat
	• Bactericidai
Glycopeptide	Binds to D-alanyl-D-alanine and interferes with peptidoglycan cross linkage and transpeptidase causing
Vancomycin	defective cell wall synthesis $\rightarrow$ cell wall lysis.
	• Bactericidal

Oxazolidinone Linezolid (Zyvox)	<ul> <li>Inhibits protein synthesis by binding to the 23S ribosomal RNA of the 50S subunit → preventing initiation complex formation with the 70S ribosomal subunit.</li> <li>Bactericidal: Streptococci spp. Bacteriostatic: Staphylococci spp. and Enterococci spp.</li> </ul>
Cyclic Lipopeptide Daptomycin (Cubicin)	<ul> <li>Interacts with bacterial cell membrane through a calcium-dependent binding mechanism → causes K+ leakage, membrane depolarization, and bacterial cell death → inhibits protein, DNA and RNA synthesis.</li> <li>Bactericidal</li> </ul>
Lipoglycopeptide Telavancin (Vibativ)	<ul> <li>Telavancin inhibits bacterial cell wall synthesis by interfering with the polymerization and cross-linking of peptidoglycan. Telavancin binds to the bacterial membrane and disrupts membrane barrier function.</li> <li>Synthetic derivative of vancomycin</li> <li>Bactericidal</li> </ul>
<u>Streptogramin</u> Quinupristin/dalfopristin (Synercid)	<ul> <li>Inhibits protein synthesis: bind to 50S subunits of the 70S ribosome.</li> <li>Bactericidal: <i>Streptococcus</i> spp. and <i>Staphylococcus</i> spp. Bacteriostatic: <i>Enterococcus faecium</i></li> </ul>
<u>Rifamycins</u> Rifampin - aka Rifampicin Rifabutin (Mycobutin) Rifapentine (Priftin) Rifaximin (Xifaxan)	<ul> <li>Inhibits the β-subunit of DNA dependent RNA polymerase in prokaryotic organisms.</li> <li>Bactericidal</li> </ul>
<u>Trimethoprim/Sulfamethoxazole,</u> <u>TMP/SMX; Co-trimoxazole (</u> Bactrim; Septra)	<ul> <li>Two step inhibition of folic acid synthesis and subsequent pyrimidine synthesis in the bacterial cell (inhibits bacterial DNA synthesis).</li> <li>Bactericidal (combination)</li> </ul>
Lincosamide Clindamycin (Cleocin)	<ul> <li>Inhibits protein synthesis by binding to the 50S ribosomal unit</li> <li>Bacteriostatic</li> </ul>
<u>Tetracyclines</u> Tetracycline Doxycycline (Vibramycin) Minocycline (Minocin)	<ul> <li>Inhibits protein synthesis by binding to the 30S ribosomal subunit of bacteria and blocks entry of amino-acyl transfer RNA into the A site of the ribosome</li> <li>Bacteriostatic</li> </ul>
<u>Glycylcycline</u> Tigecycline (Tygacil)	<ul> <li>Inhibits protein synthesis by binding to the 30S ribosomal subunit of bacteria and blocks entry of amino-acyl transfer RNA into the A site of the ribosome</li> <li>Structurally similar to minocycline, but overcomes tetracycline resistance</li> <li>Bacteriostatic</li> </ul>
<u>Chloramphenicol</u>	<ul> <li>Inhibits protein synthesis in bacteria by preventing the binding of the amino acid-containing end of the aminoacyl tRNA to the acceptor site on the 50S ribosomal subunit</li> <li>Inhibits mitochondrial protein synthesis in mammalian cells</li> <li>Bacteriostatic</li> </ul>
<u>Macrolides</u> Erythromycin (Erythrocin) Azithromycin (Zithromax) Clarithromycin (Biaxin)	<ul> <li>Inhibits protein synthesis: binds to 23S rRNA of the 50S ribosomal subunit</li> <li>Bacteriostatic</li> </ul>
<u>Nitrofurantoin</u> (Macrodantin, Macrobid)	<ul> <li>Enzymatic reduction in the bacterial cell → binds to ribosomal proteins and damages bacterial DNA → interferes with bacterial metabolism and cell wall synthesis</li> <li>Bactericidal</li> </ul>
<u>Metronidazole (Flagyl)</u>	<ul> <li>Prodrug; enters cell by passive diffusion and activates. Produces a metabolite that damages bacterial DNA → cell death</li> <li>Bactericidal</li> </ul>
<u>Fosfomycin</u> (Monurol)	<ul> <li>Phosphoric acid derivative, fosfomycin inhibits bacterial wall synthesis by inactivating the enzyme, pyruvyl transferase, which is critical in the synthesis of cell walls by bacteria</li> <li>Bactericidal</li> </ul>