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# Antibiotics in Hospital Setting

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# Disclosures

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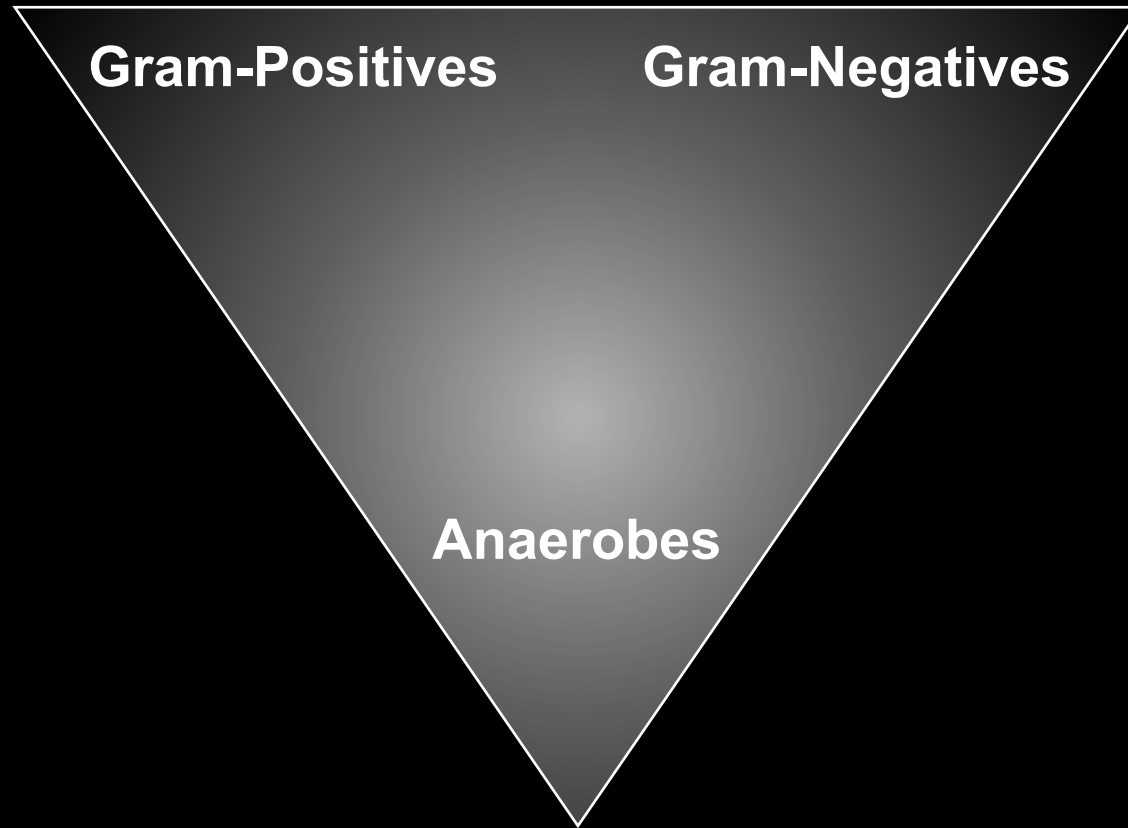
- ⟨ There are no relevant financial relationships with commercial interests to disclose

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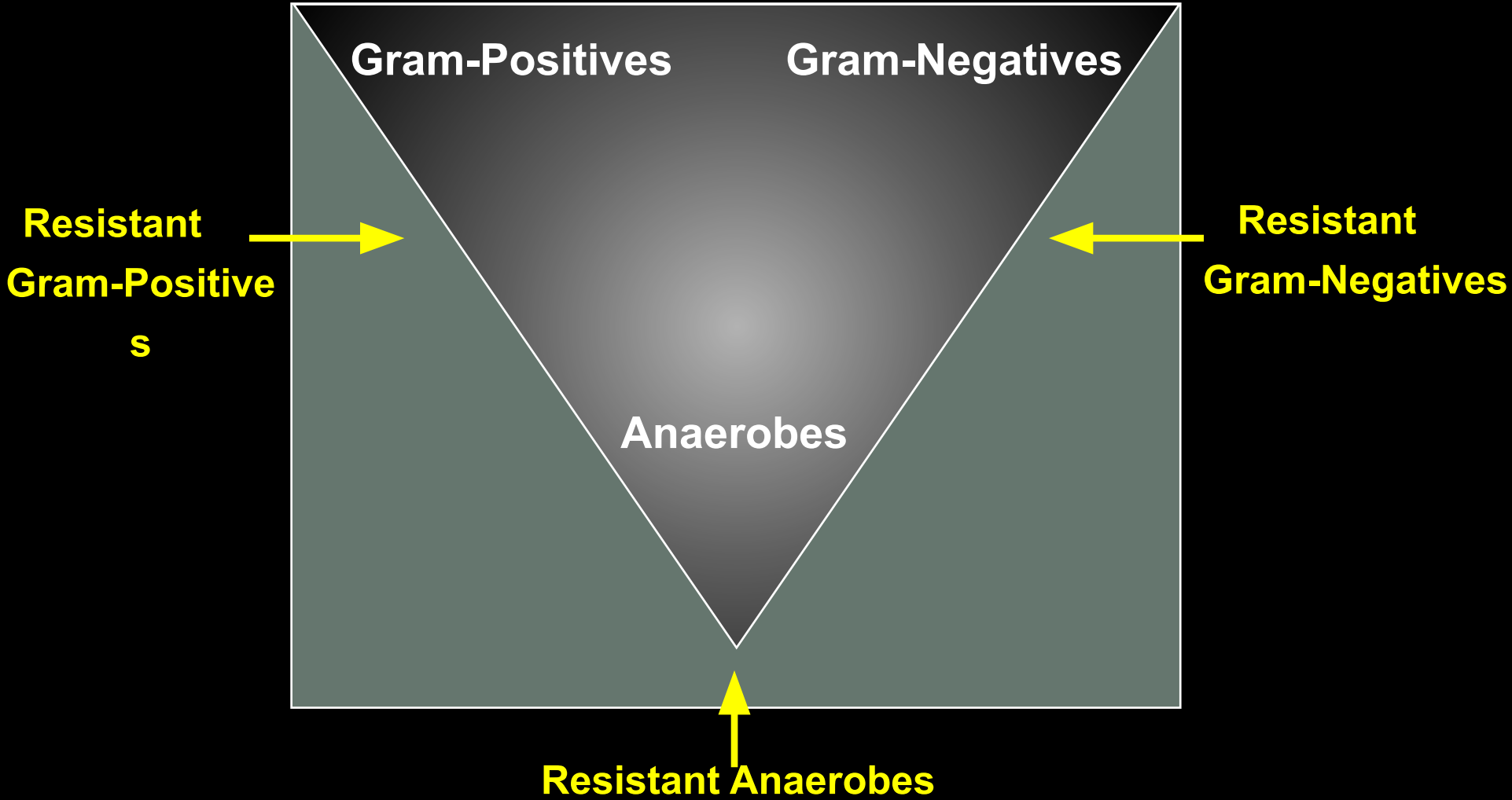
# Broad-Spectrum Agents

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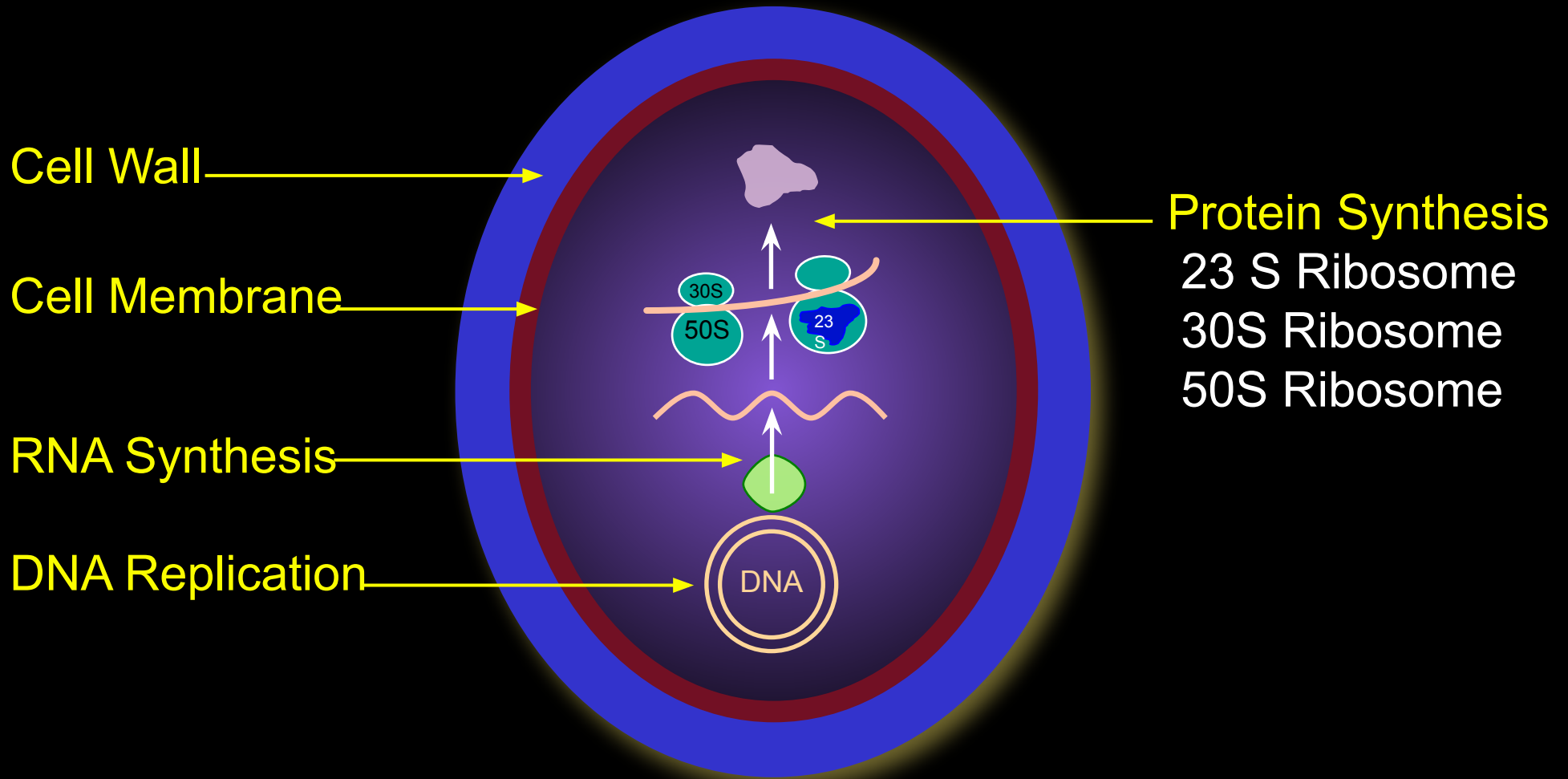
# Antimicrobial Spectrum



# Antimicrobial Spectrum



# Antimicrobials: Site of Action

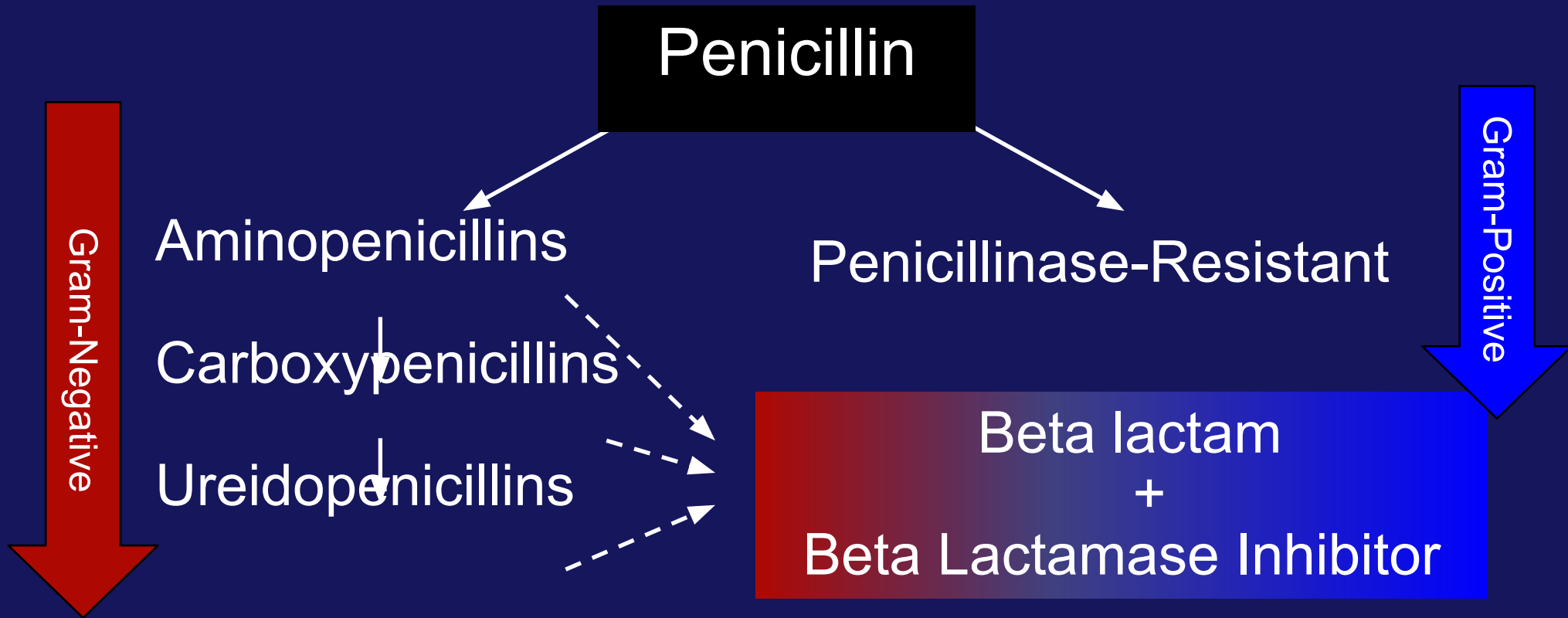


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# Beta-Lactams

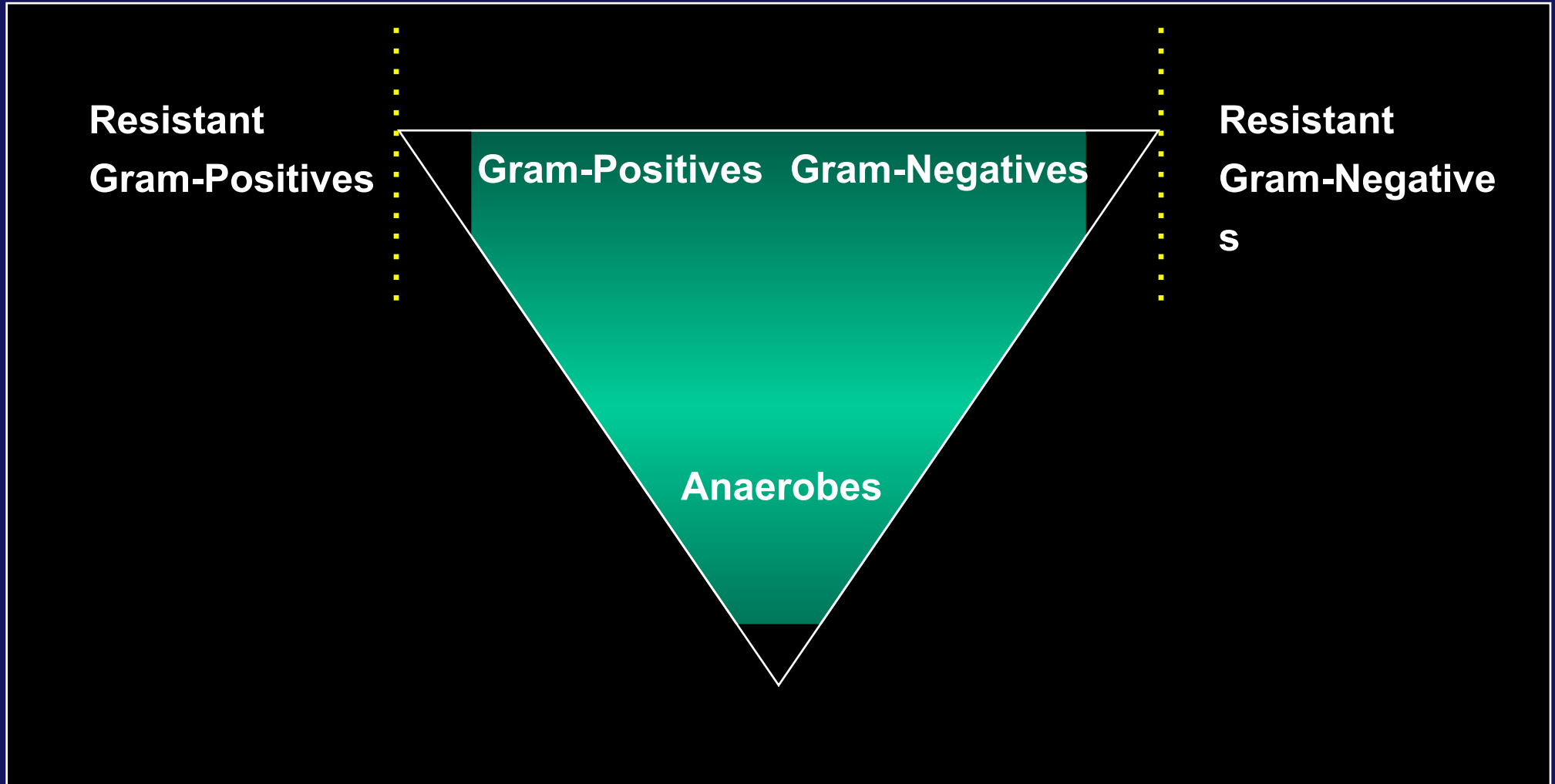
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# Penicillins





# Piperacillin-Tazobactam



# Cephalosporins

## Generation

## Spectrum of Activity

First



Staphylococcus, Streptococcus

Second



2 Groups: Above & Below Diaphragm

Third



2 Groups: Broader gram-negative

Fourth



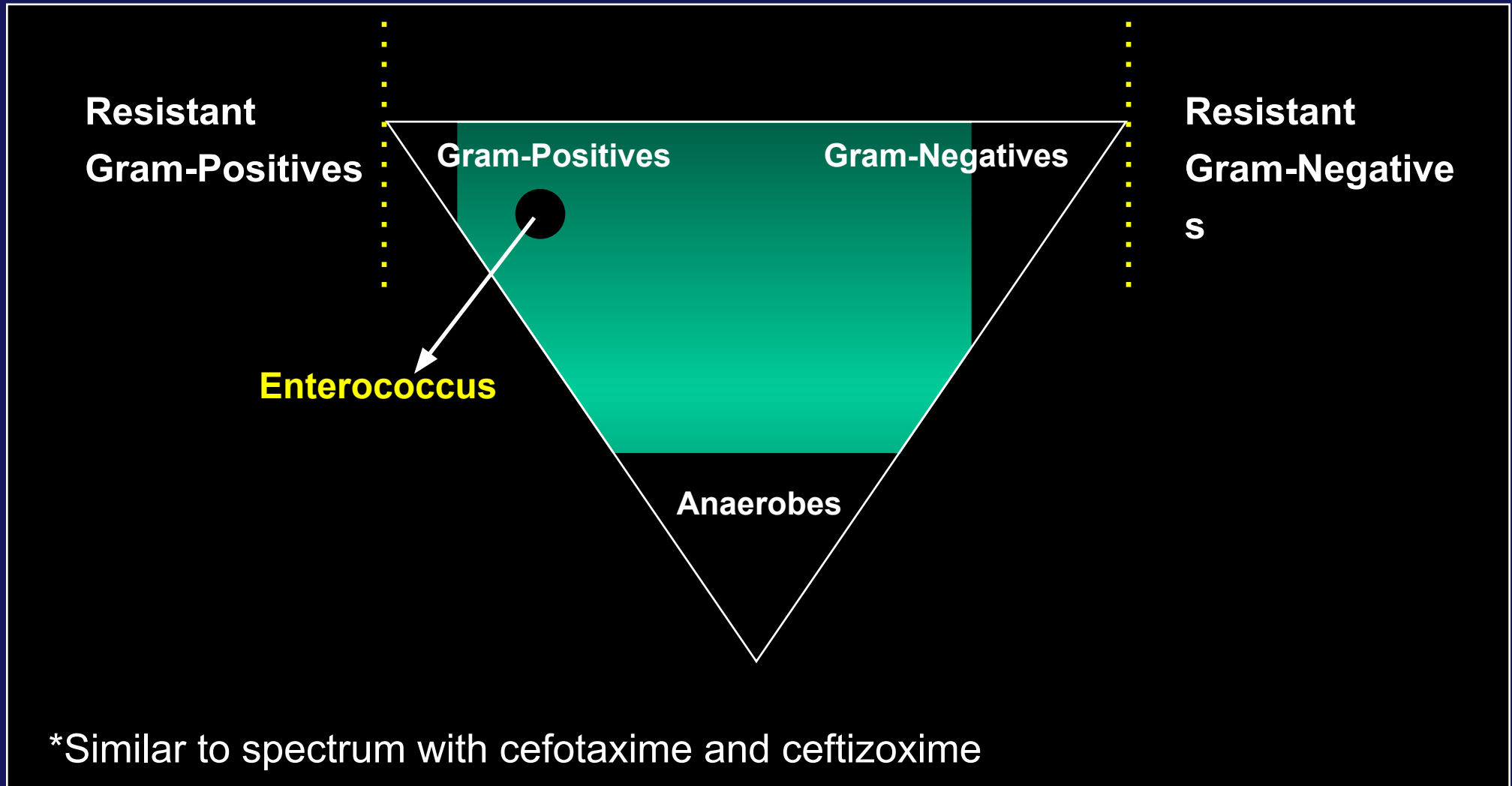
Gram-positive & Gram-negative

Fifth

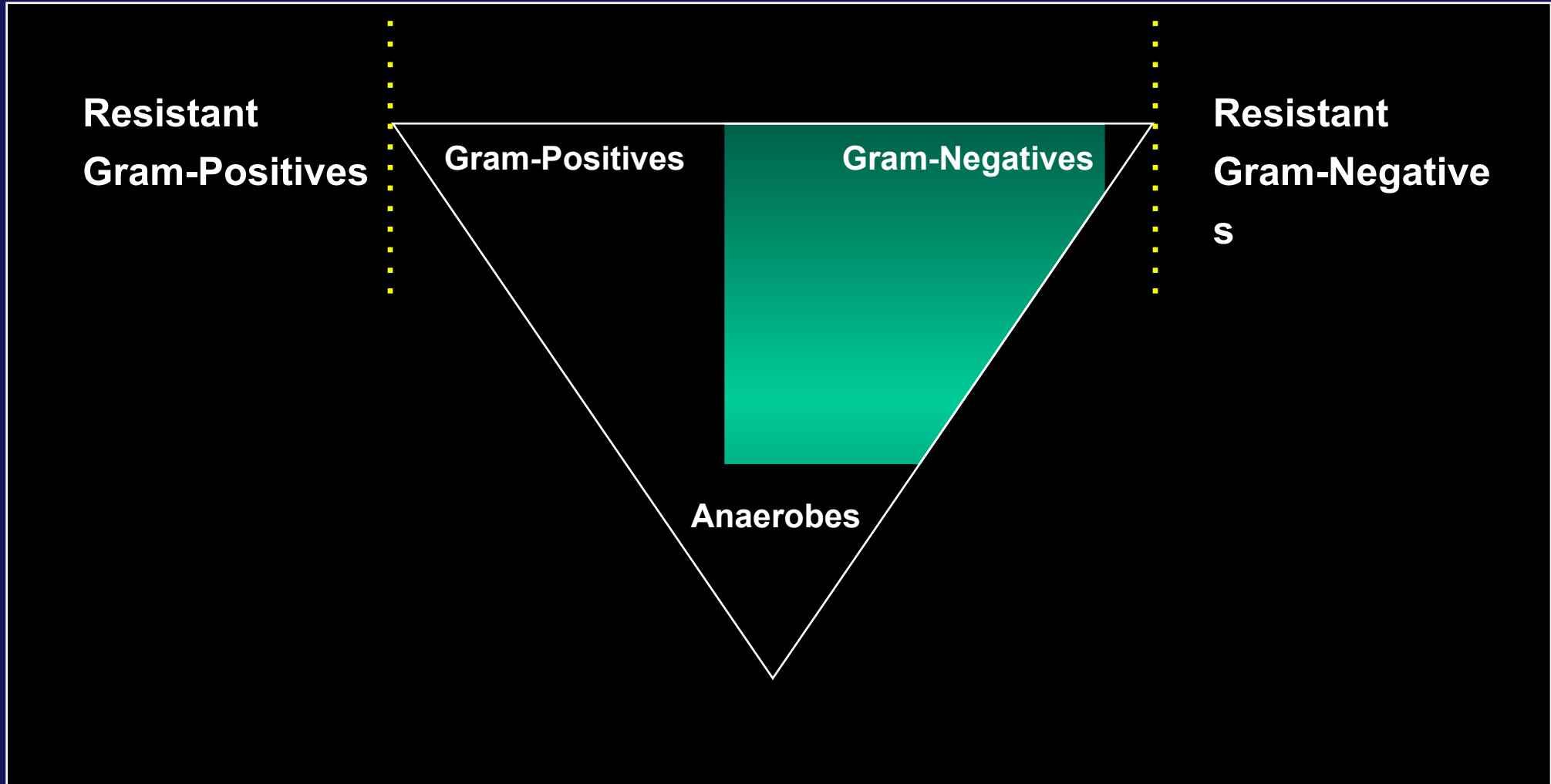


Variable

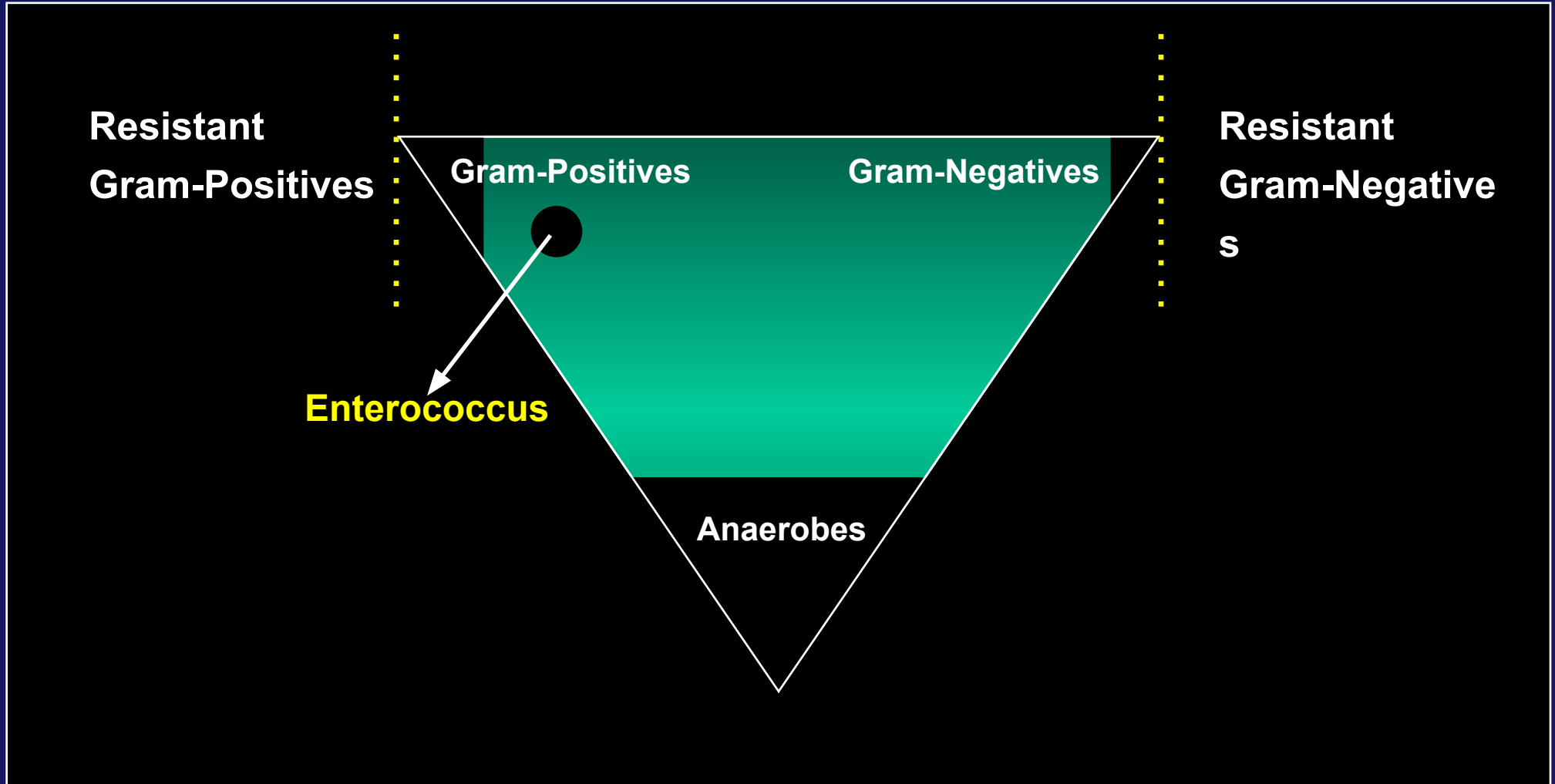
# Ceftriaxone\* (3rd-Generation Cephalosporin)



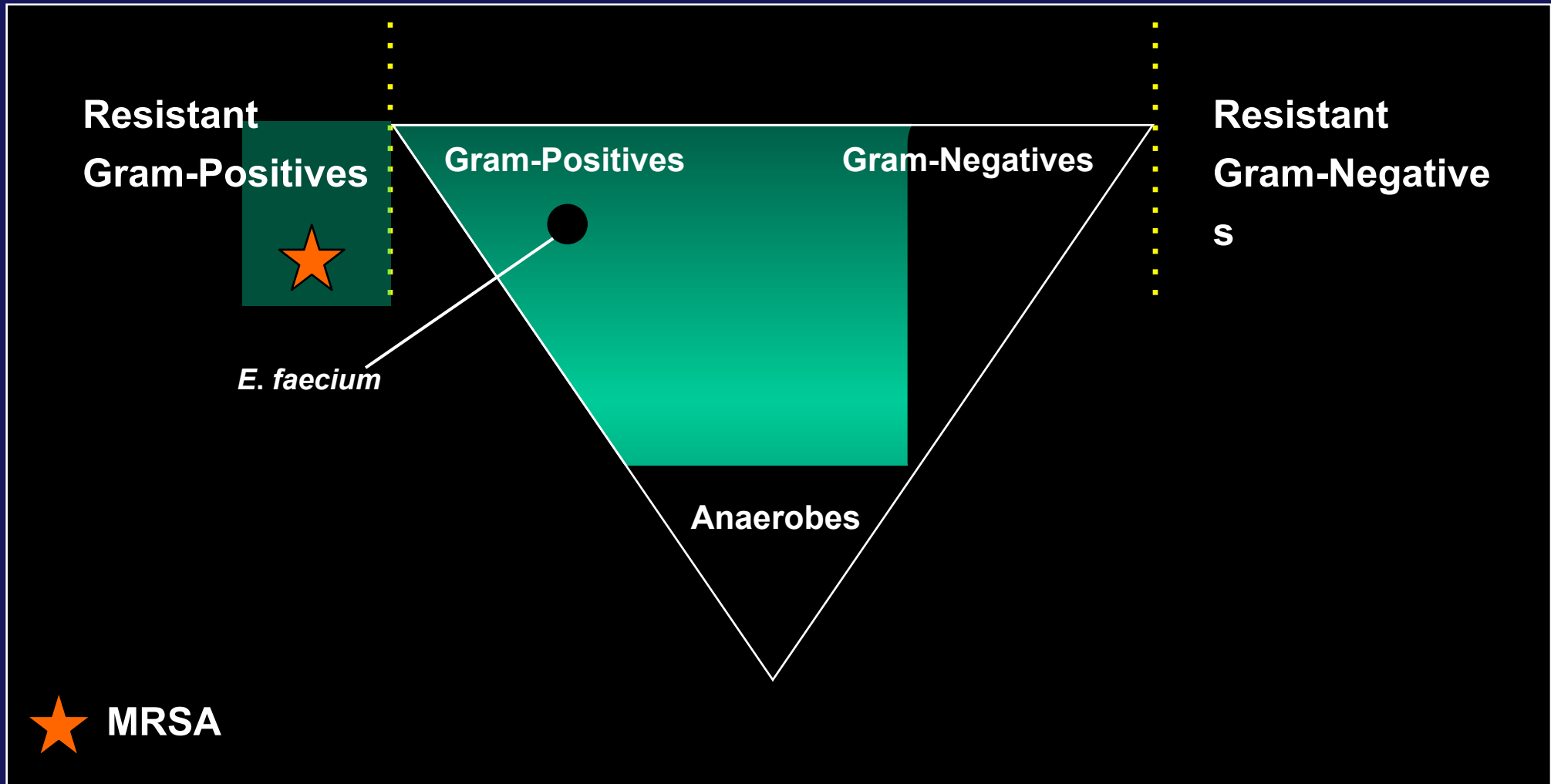
# Ceftazidime (3rd-Generation Cephalosporin)



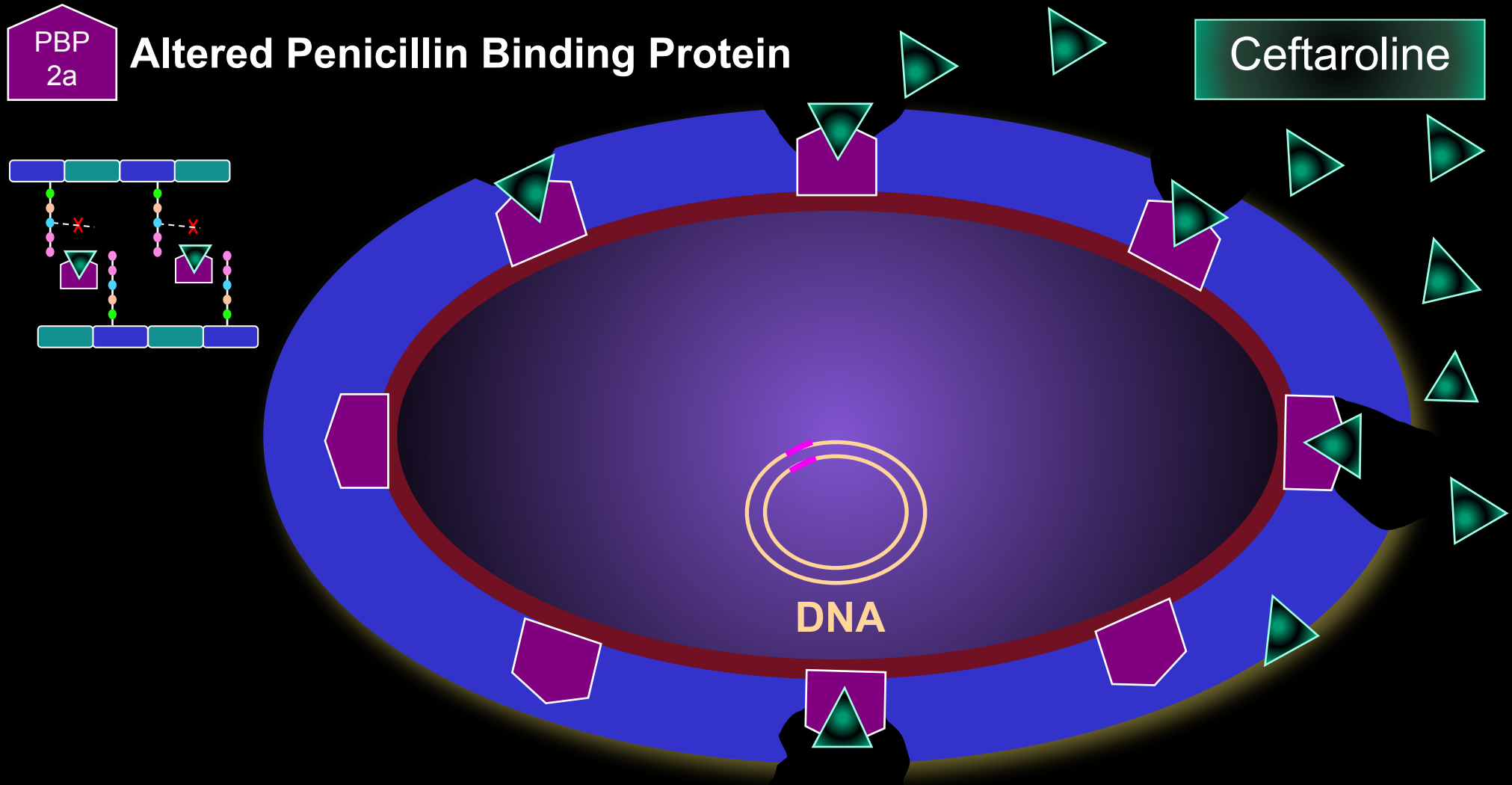
# Cefepime (4th-Generation Cephalosporin)



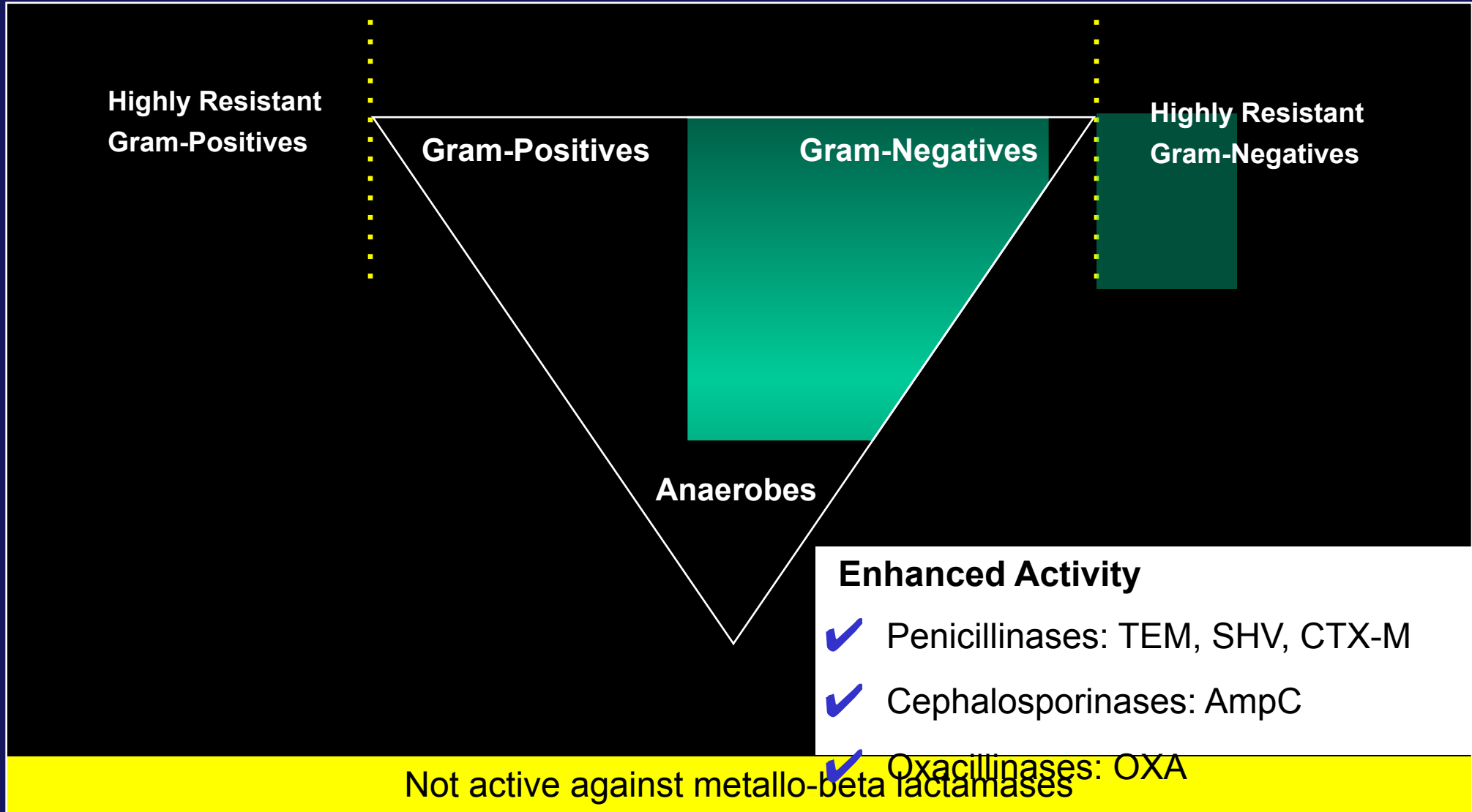
# Ceftaroline (Unclassified Cephalosporin)



# Ceftaroline and MRSA: PBP2a Binding

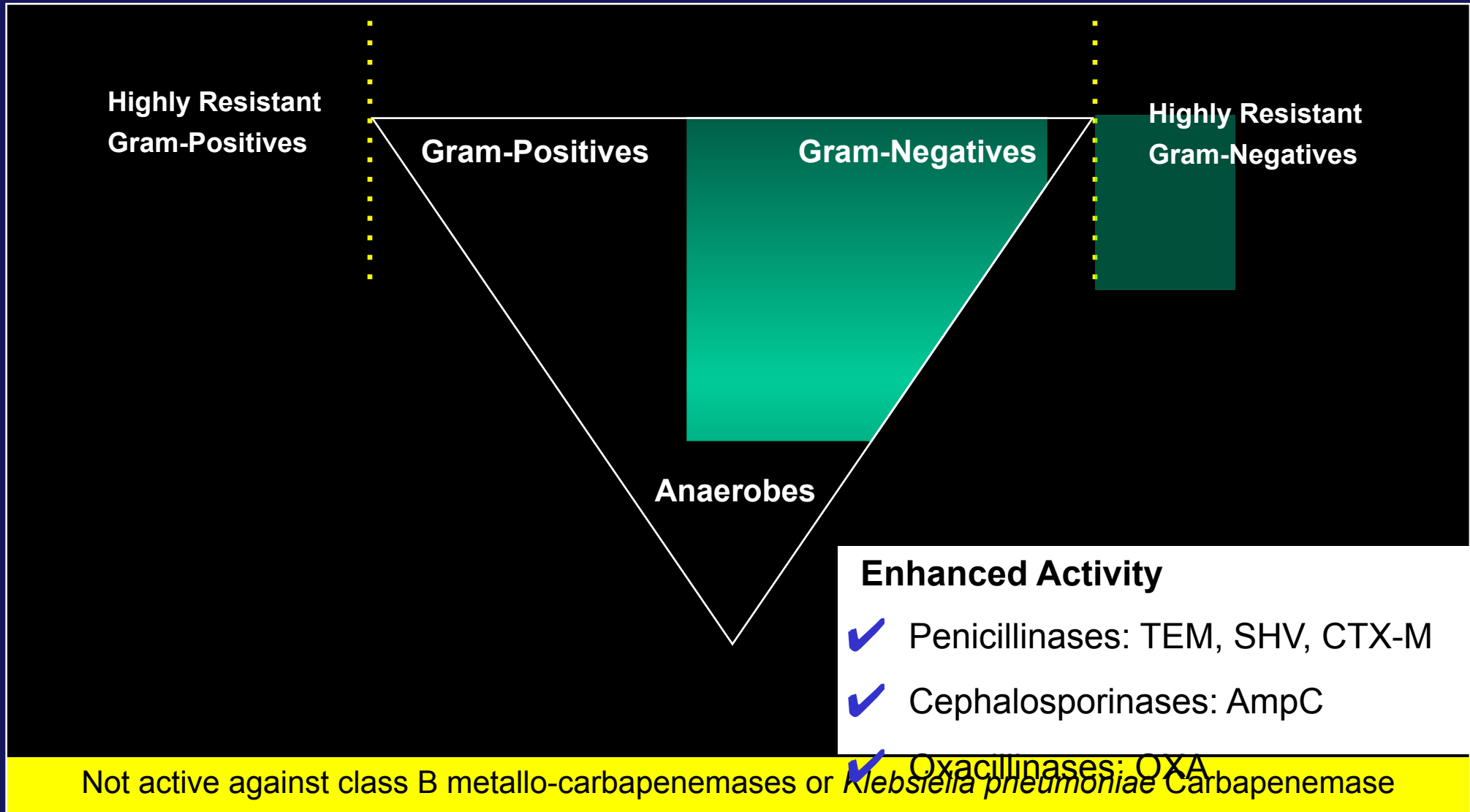


# Ceftazidime-Avibactam (Unclassified Cephalosporin)





# Ceftolozane-Tazobactam (Unclassified Cephalosporin)

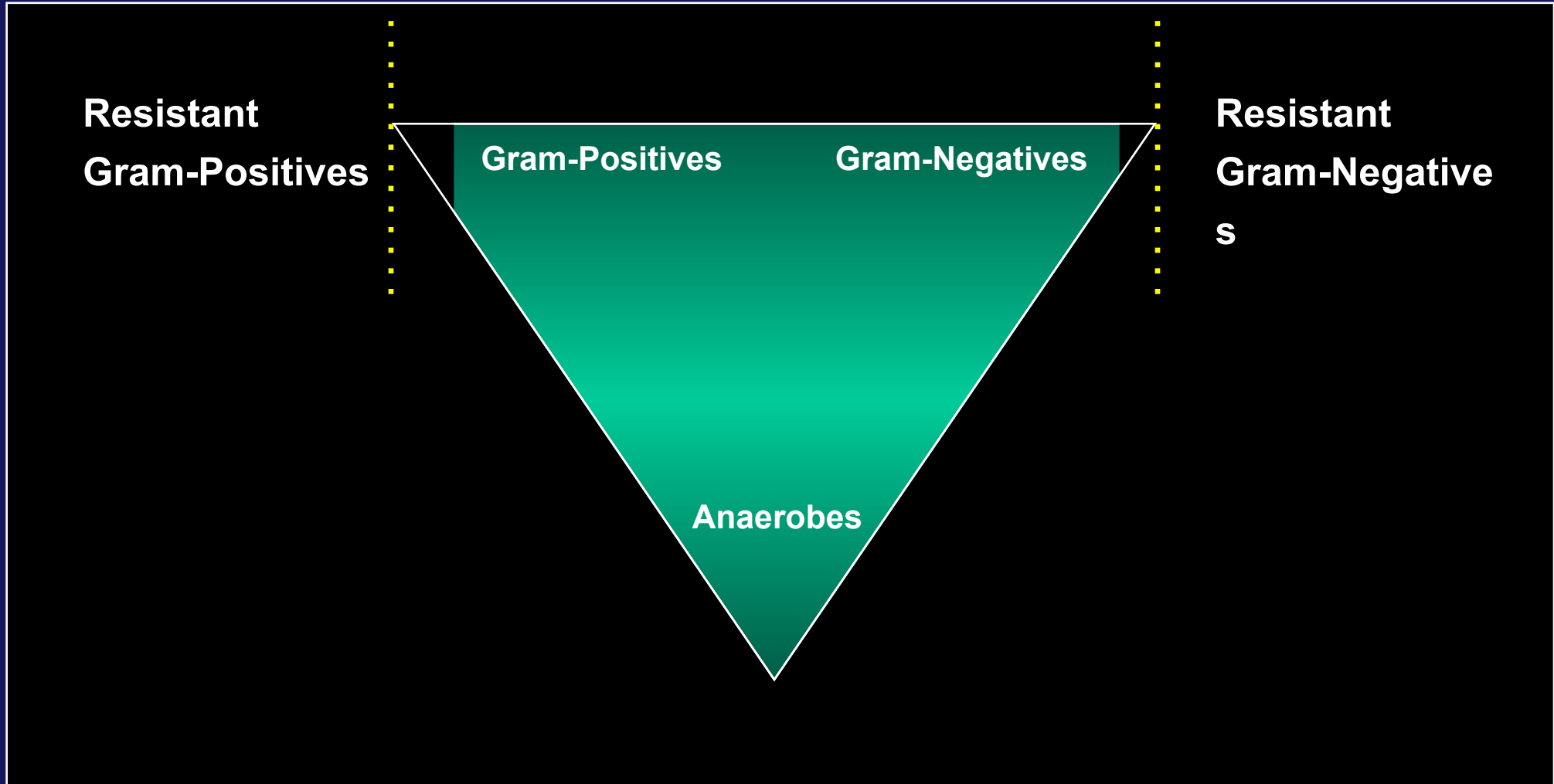


# Carbapenems

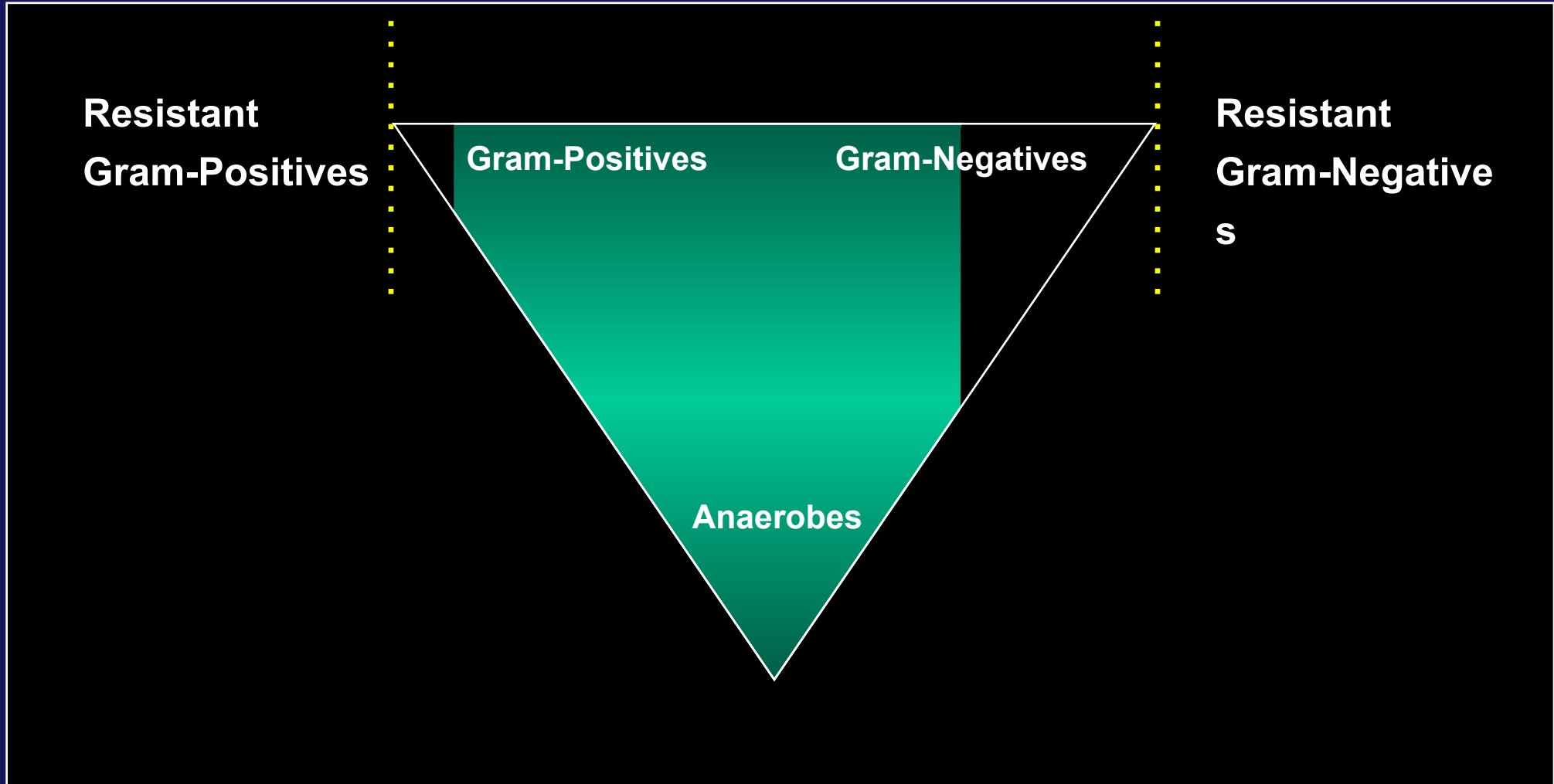
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- Imipenem-cilastatin
- Imipenem-cilastatin-relebactam
- Meropenem
- Meropenem-vaborbactam
- Ertapenem
- Doripenem

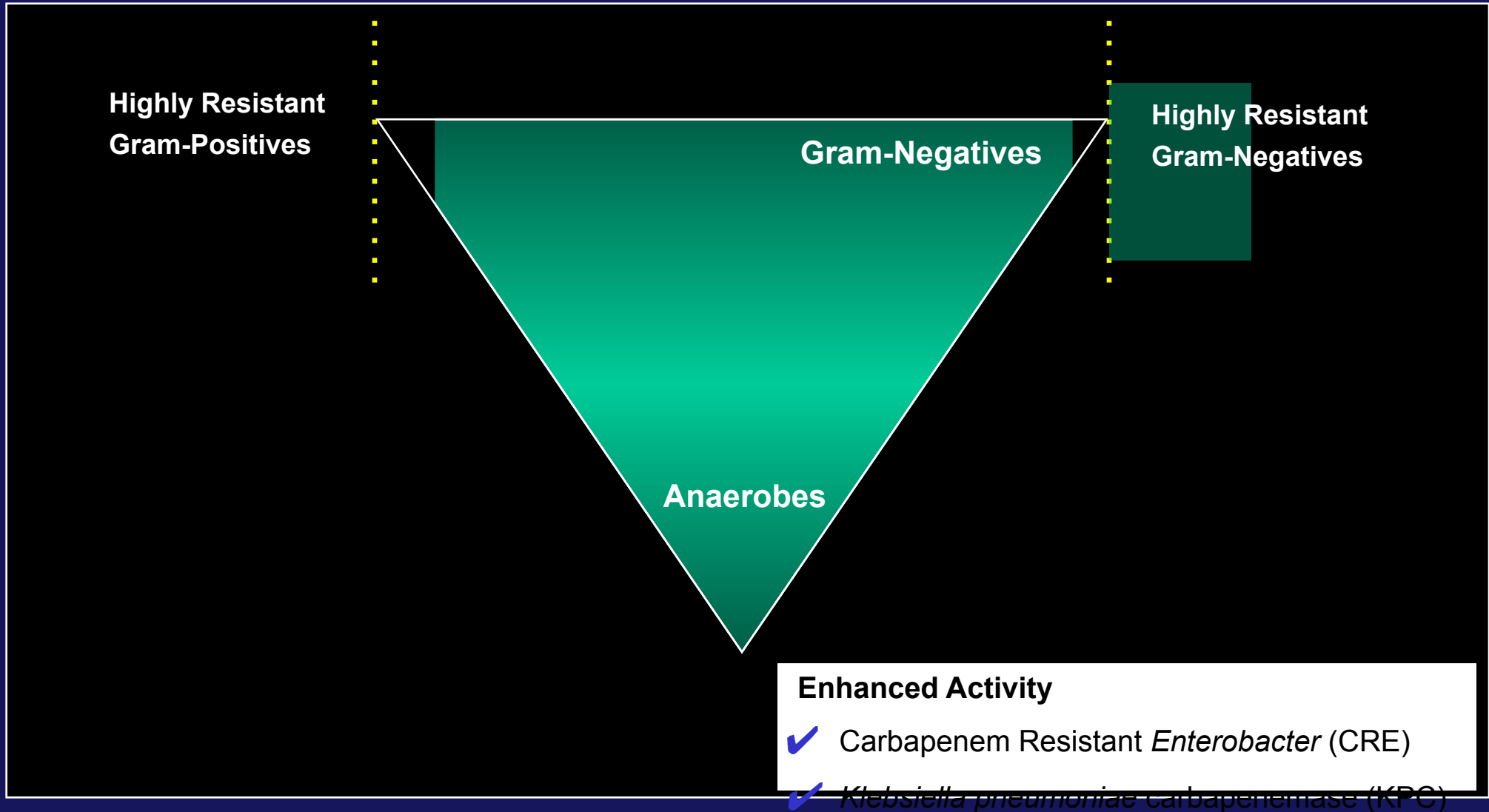
# Imipenem & Meropenem & Doripenem



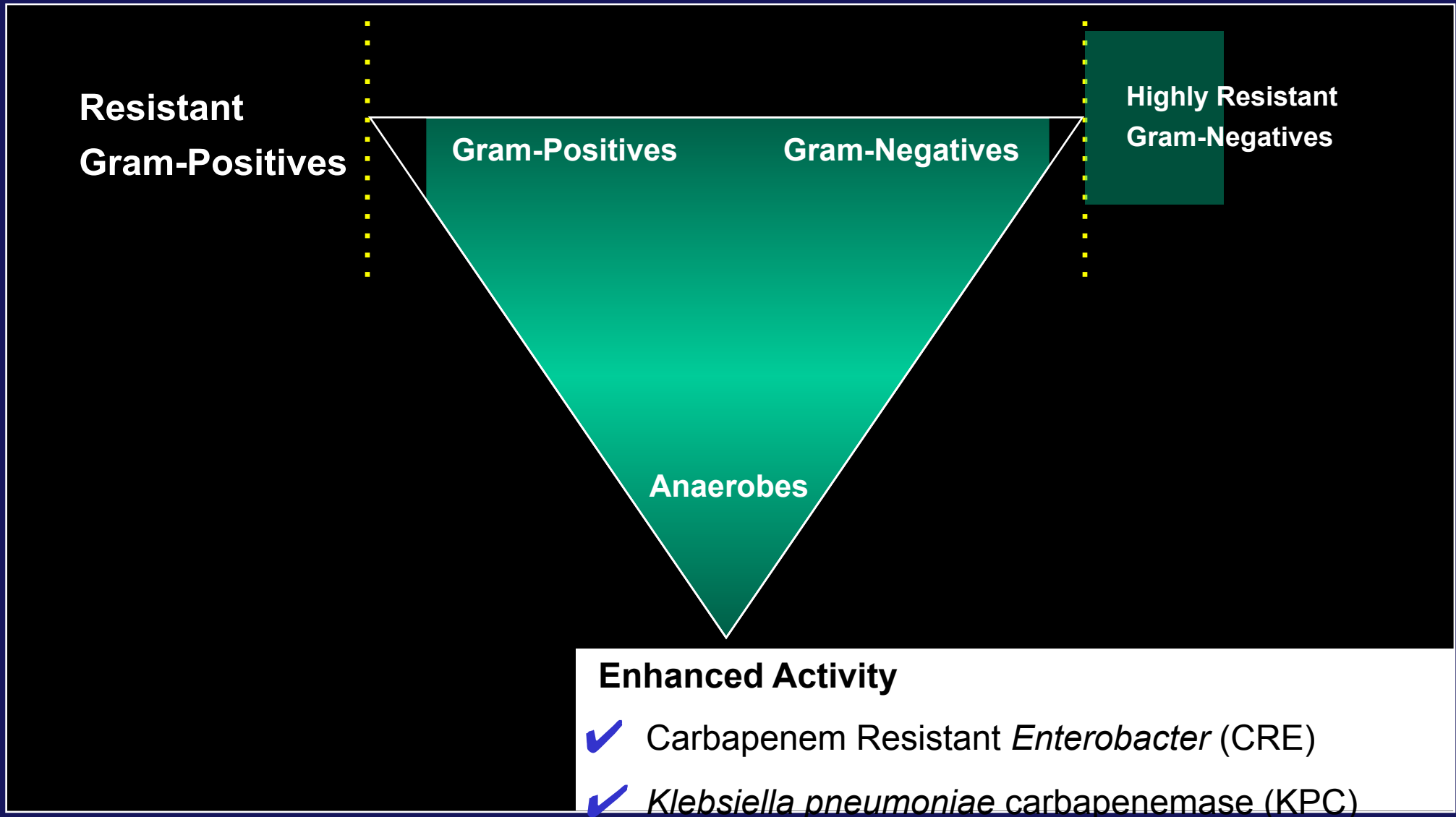
# Ertapenem



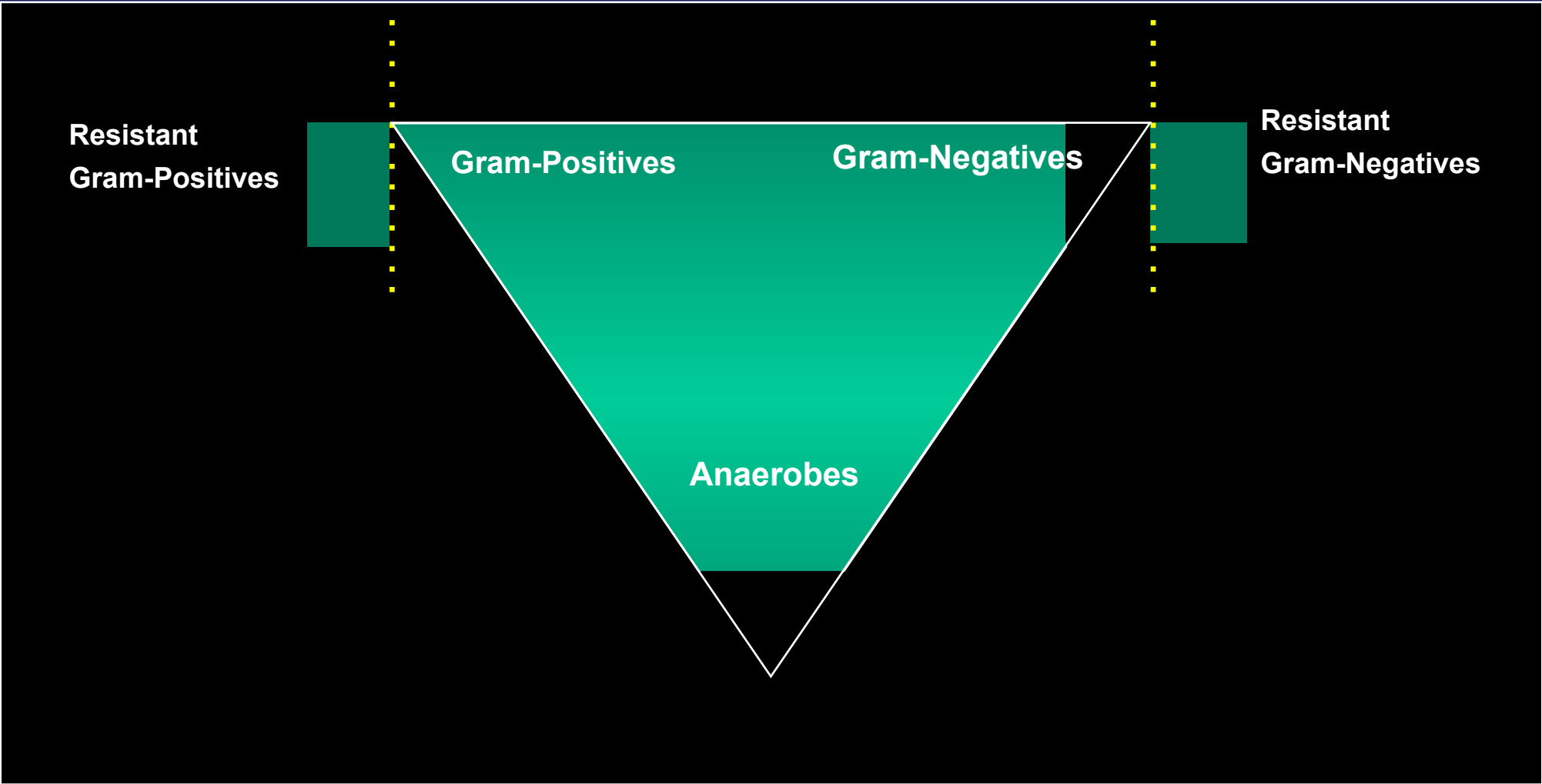
# Meropenem-Vaborbactam



# Imipenem-Cilastatin-Relabactam



# Tigecycline



# Antimicrobials: Nosocomial Pneumonia

- A healthy 36-year-old woman is suffers major trauma in a MVA (broken leg, fractured pelvis, broken ribs, and head trauma. She undergoes multiple surgeries and 48 hours after admission she develops a fever. Chest radiograph shows a focal right-sided infiltrate. She remains intubated.
- What would recommended for treatment of ventilator-associated pneumonia in this setting?
- How long should you treat for VAP?



# Antimicrobials: Nosocomial Pneumonia

- What Antibiotics Should Be Used for the Treatment for MRSA HAP/VAP?
- Which Antibiotic Should Be Used to Treat Patients With HAP/VAP Due to *P. aeruginosa*?
- Should Monotherapy or Combination Therapy Be Used to Treat Patients With HAP/VAP due to *P. aeruginosa*?

# Case History

- A 56-year-old man with diabetes with cancer and neutropenia. develops a painful skin lesion on his right 5<sup>th</sup> toe. He appears acutely ill and is hypotensive.
- What would you recommend?



# Necrotizing Skin & Soft Tissue Infections

## Diagnostic Clues

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- Bullous lesions
- Dark discoloration (blue/purple/grey)
- Subcutaneous gas
- Painful area that becomes anesthetic
- Systemic toxicity
- Rapidly advancing lesion

# Antimicrobials: Bone/Joint Infections

- A 44-year-old man suffers a tibial fracture and has surgical repair that includes placement of a plate and multiple screws. Nine weeks after the surgery he develops redness and swelling at the operative site. He has a temp of 38.3° but otherwise appears well and BP is normal.
- What approach would you recommended for this man?

# Antimicrobials: Bone/Joint Infections

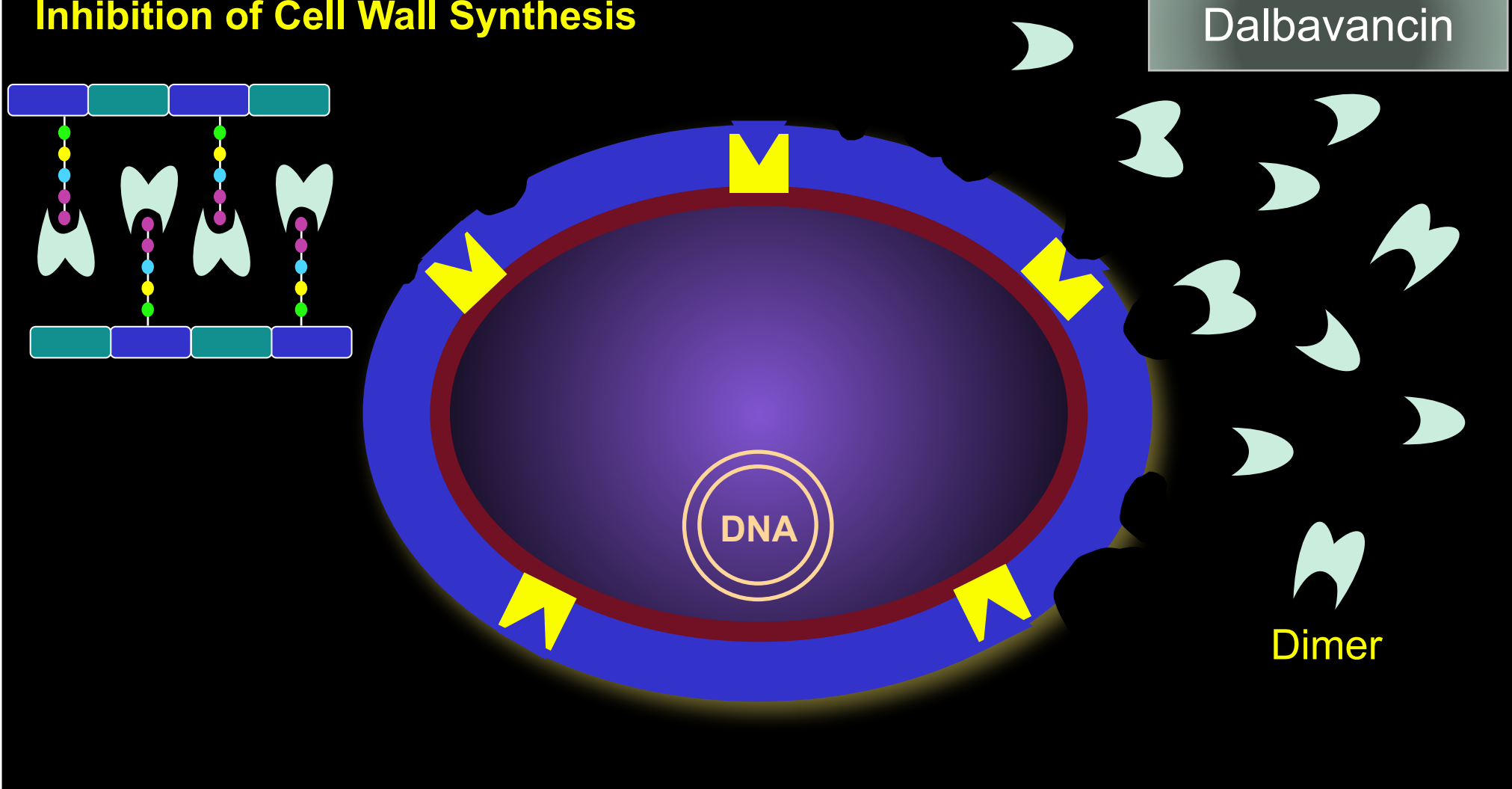
- In the OR the surgeon notes visible infection in the bone and around the hardware. The entire area is cleaned out and the plate and screws are replaced. Cultures are sent
- Once you have culture results back, what would you recommend for duration of therapy?
- How long would you have recommended if all hardware had been removed?

# Antimicrobials: Bacteremia

- A 23-year-old man who regularly injects heroin is admitted to the hospital with a severe shoulder abscess and a large area of surrounding cellulitis. The abscess is drained in the OR and cultures show MRSA. Blood cultures are negative. He does well with IV vancomycin, but on day 3, he is noted to be main-lining heroin into his central line on 2 occasions.
- What options would you consider now other than continuing the vancomycin?

# Dalbavancin: Mechanism of Action

## Inhibition of Cell Wall Synthesis



# Dalbavancin

- Clinical Indication: approved for SSTI caused by gram-positive bacteria  
(MSSA, MRSA, *S. pyogenes*, *S. agalactiae*, *S. anginosus* group)
- Mechanism: Lipoglycopeptide that inhibits cell wall synthesis
- Dosing
  - 1 Dose Regimen: 1500 mg IV x 1
  - 2 Dose Regimen: 1000 mg IV followed 1 week later by 500 mg IV
- Dose Reduction for CrCL < 30 mL/min and no regular hemodialysis
- Adverse Effects: nausea, headache, diarrhea



# Antimicrobials: Fever on Meropenem

- A 61-year-old woman has been in the hospital for 3 weeks with multiple complications following abdominal surgery. She is febrile and has a new VAP and is receiving meropenem and vancomycin.
- A culture from a BAL show 4+ gram-negative rods with an organism the lab has not yet identified. It is resistant to almost all antibiotics except TMP-SMZ?
- What should you do?

# Case History: MRSA Bacteremia

- A 67-year-old woman undergoes abdominal surgery and has a central intravenous catheter for short term TPN. She develops fever and blood cultures grow *Staphylococcus aureus*, resistant to methicillin. The central venous catheter is removed.
- Should an ECHO be performed?
- If vancomycin is used, what trough should you aim for?
- How long a treatment course is needed?

# 2010 IDSA Practice Guidelines

## Therapy for MRSA Bacteremia

- ECHO recommended for all; TEE preferred
- Vancomycin mainstay of therapy, but less effective with MSSA
- Daptomycin 6 mg/kg/day<sup>^</sup> is alternative to vancomycin
- Addition of gentamicin or rifampin NOT recommended
- Duration for uncomplicated\* bacteremia: 14 days
- Duration for complicated bacteremia: 4-6 weeks

<sup>^</sup>Daptomycin dosing: some experts recommend daptomycin dose of 8-10 mg/kg/day

\*Uncomplicated bacteremia: absence of endocarditis; no implanted prostheses, follow-up blood cultures negative at day 2-4, fever resolves within 72 hours of starting therapy; and no metastatic site of infection

# MRSA Bacteremia: Treatment

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- What would you recommend regarding vancomycin?
  - A. Give vancomycin by continuous infusion
  - B. Give vancomycin 15-20 mg/kg q 12h
  - C. Give rifampin 600 mg IV q12h
  - D. Check trough before 2<sup>nd</sup> dose

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Thank you!

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