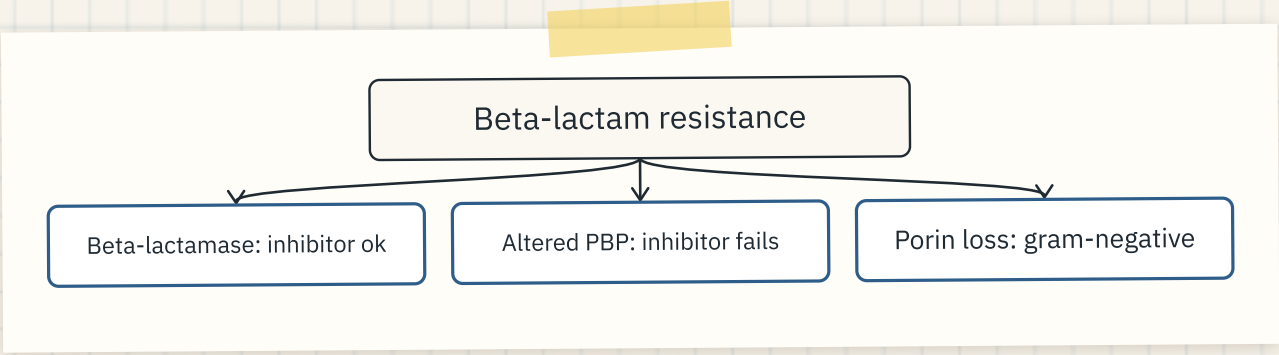
Beta-lactam resistance

Destroy, change, keep out



Step by step

1. Beta-lactams bind PBPs and block wall building
2. Beta-lactamases hydrolyse the ring
3. Inhibitors disable the enzyme and guard the partner drug
4. mecA makes PBP2a, with low affinity for beta-lactams
5. Porins matter only in gram-negatives

Mechanism	Example	Inhibitor helps?
Destroy the drug	Beta-lactamase	Often (classic inhibitors: not metallo-enzymes)
Change the target	PBP2a (MRSA), pneumococcal PBPs	No
Keep it out	Fewer porins (OprD), efflux	No

Three mechanisms

Rule of thumb

Inhibitor restores activity: beta-lactamase

Gram-positive coccus resists nearly all: altered PBP

Gram-negative: porins can matter too

Exam traps

- Inhibitors are given to protect the partner drug, not to kill; none of the classic three touches zinc-dependent metallo-beta-lactamases.
- An inhibitor cannot rescue an altered PBP: no enzyme is destroying the drug.
- A gram-positive organism has no outer membrane and no porins to lose.
- Mechanisms combine: fewer porins plus a beta-lactamase.

Beta-lactamase and antibiotic resistance: three ways bacteria win

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/microbiology/beta-lactamases-and-antibiotic-resistance

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