TOPIC: BROAD VS NARROW SPECTRUM DRUGS

Selective Toxicity

- Drugs can be classified by _____ types of microbes they are effective against.

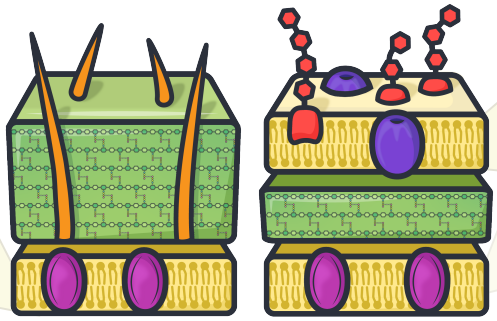
Broad Spectrum: toxic to _____ types of microbes.

Narrow Spectrum: toxic to ____ types of microbes.

- For bacteria, broad vs narrow often depends on _____ + / —.

Gram Positive (+):

- Single membrane.
- Cell wall is _____ to potential drugs.



Gram Negative (—):

- _____ membrane.
- Drugs typically must pass through _____

Broad Spectrum: often toxic to gram (+) _____ (—).

Narrow Spectrum: often toxic to gram ___ only.

PRACTICE

Do you think a doctor would be more likely to prescribe narrow-spectrum or broad-spectrum drugs if they did not know the source of an infection? Why?

a) Narrow-spectrum, because Gram-positive infections are more common, and narrow-spectrum drugs work on Gram-positive bacteria.

b) Narrow-spectrum, because if they are unsuccessful, the doctor can rule out certain infections.

c) Broad-spectrum, because broad-spectrum drugs are effective against a more diverse group of bacteria.

d) Broad-spectrum, because broad-spectrum drugs typically affect the cell wall, and both Gram-positive and Gram-negative cells have a cell wall.

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PRACTICE

Penicillin is an antibiotic that disrupts cell wall formation. Natural penicillins are considered narrow-spectrum drugs. Based on your knowledge of bacterial cell structure, which of the following chemical modifications to penicillin could make it broader spectrum?

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a) Addition of an amino group to make the molecule more polar, allowing it to pass through porins in the Gram-negative plasma membranes more easily.
b) Addition of a bulky side chain, to help protect it against antibiotic resistance mechanisms such as beta-lactamase.
c) Addition of a benzene ring, to increase stability in acidic environments.
d) Addition of a methyl group, to allow the drug to better mix with the hydrophobic cell wall.