

ANTIBIOTICS

Antibiotics are mostly found in microorganisms—they give the microbes a competitive advantage in their environment. For example, penicillin is made by the *Penicillium* mold. *Streptomyces* is a soil bacteria that makes all kinds of antibiotics: tetracycline, rifampin, vancomycin, kanamycin, streptomycin, erythromycin, chloramphenicol, and others! Some species of *Bacillus* produce bacitracin.

It should not come as a surprise, therefore, that lots of bacteria have methods of becoming resistant to the wide variety of antibiotics out there.

Antibiotics usually work in one of the following ways:

1. Inhibit DNA replication or mRNA transcription
 - rifampin
 - quinolones
 - metronidazole
2. Inhibit protein synthesis
 - tetracycline
 - chloramphenicol
 - erythromycin (used when a patient is allergic amoxicillin)
 - aminoglycosides (end in –mycin or –micin; examples include gentamicin, streptomycin, neomycin)
 - aminoglycosides can be used against Gram negative infections but they can cause damage to the 8th cranial nerve (hearing loss) and kidney damage.
3. Block metabolic pathways (for example, folate production)
 - Sulfa drugs (sulfanilamide)
4. Inhibit cell wall formation
 - penicillin (and other –cillins)
 - bacitracin
 - cephalosporin
 - vancomycin (not an aminoglycoside, despite its –mycin ending!)
 - Vancomycin is so toxic that it must be infused very slowly, or it will cause generalized mast cell degranulation. All that histamine will cause leaky vessels and can lead to Red Man Syndrome.