Interactive Microbiology

To affect bacteria, an antimicrobial drug must physically bind to some part of the prokaryotic cell. This part of the cell is known as the drug’s target. It might be a lipid, a protein such as an enzyme, or some other bacterial molecule. Let's imagine that the drug’s target is a bacterial enzyme. The enzyme works like a factory, normally converting specific substrate molecules into important bacterial products. What happens when the anti-microbial enters the bacterium? Let's find out. In this case, notice how the drugs shape is similar to that of the factory’s normal substrate. This similarity in shape lets the drug fit into the entrance of the factory. But once there the drug gets stuck, jamming up the assembly line and shutting down the factory. Similarly the drug penicillin jams up and shuts down its particular target. Let's take a closer look at what is happening. Penicillin's target is the bacterial enzyme transpeptidase located outside the plasma membrane of the cell. The substrate of this enzyme is peptidoglycan, which the enzyme cross-links producing a product that strengthens the bacterial cell wall. Penicillin’s shape is similar to that of peptidoglycan, which allows penicillin to bind to and inactivate the transpeptidase enzyme, like shutting down the factory. As a result, the bacterial cell wall weakens and the bacterium eventually lysis. Remember that an antimicrobial drug is specific in its action. Cells contain many different components and a drug affects only one of them: the component that is the target of that particular drug. Other bacterial components are unaffected by the drug and they continue to function normally.