



The Fight Against Disease

Natural Defenses

The skin and mucous membranes form the body's first line of defense against disease. Most microscopic pathogens, or microbes, cannot pass through unbroken skin, although they can easily enter through cuts and other wounds. Mucous membranes protect internal organs that are connected with the outside of the body. These membranes, which line the respiratory, digestive, urinary, and reproductive tracts, secrete a sticky fluid called mucus, which traps microbes. The mucus may then be expelled from the body, perhaps in a cough or sneeze or in feces. If the mucus is swallowed, digestive juices kill the microbes.

Small hairlike projections on the lining of the nose, throat, and bronchial tubes work in conjunction with mucus to trap and remove foreign substances. In the ears, tiny hairs plus a sticky wax defend against the entry of germs. Tears secreted by the lachrymal gland wash away germs and other small objects that may enter the lid area of the eye. Tears also contain a protein that kills certain germs.

If a pathogen breaches the body's outer barriers, the defenses of the immune system spring into action. Some of these defenses are effective against a variety of invaders, while others are tailor-made to fight a specific organism. White blood cells called phagocytes constantly travel through the bloodstream on the lookout for foreign objects. If they come upon a microorganism, they surround, engulf, and digest it.

If the infection persists and there are too many organisms for the phagocytes to fight by themselves, the immune system produces proteins called antibodies. Each antibody is designed to combat a particular antigen, or foreign protein. Two types of white blood cells are involved in this process. B cells release the antibody, which attaches to the outer covering of the antigen, marking it for destruction. T cells attack the tagged antigen and also stimulate B cells into action. Once the body has produced antibodies to a specific microorganism, it generally is immune to future invasions by that organism. That is why people who have had chicken pox or measles as a child will not get the disease again as an adult. The reason people