

Penicillins*

Overview

Alexander Fleming accidentally discovered penicillin in 1928, after noticing that a mold contaminant had inhibited growth of *Staphylococcus* on a culture plate. Initially penicillin was utilized for its effectiveness against staphylococcal organisms that were resistant to sulfonamides. World War II provided the urgency for research and development of this antimicrobial. In the early years of the war, staphylococcal organisms and gas gangrene were responsible for more deaths than the immediate damage caused by weapons of war. By 1944, when the Allies invaded France, 95% of the wounded survived after treatment with penicillin. Fleming, Florey and Chain were awarded the Nobel Prize in Medicine in recognition of their efforts to develop a potent, functional penicillin product.

The penicillins inhibit enzymes beneath the organism's cell wall. These enzymes are often referred to as "penicillin-binding proteins". Penicillins prevent these enzymes from creating cross-links between peptide chains in the cell wall. Penicillins, like all β -lactams, subsequently activate the bacteria's endogenous autolytic system leading to cell lysis and death.

Penicillins are considered unstable chemically. They are sensitive to heat, light, pH extremes, heavy metals, and oxidizing and reducing agents. Penicillins are characterized by a β -lactam nucleus. Penicillinase, also referred to as β -lactamase enzyme, can cleave this nucleus and inactivate the drug. Biosynthetic or synthetic modification of the 6-aminopenicillanic acid nucleus has produced several penicillin antimicrobials used in clinical medicine and veterinary medicine. These penicillins are characterized by differences in antimicrobial spectrum, pharmacokinetic characteristics, and susceptibility to enzymatic degradation by microbes.

Penicillins of all types are well distributed in body fluids (synovial fluid, pleural fluid, pericardial fluid and bile). Lower concentrations are found in prostatic and ocular fluids. Since penicillins are not lipid soluble, they do not cross the blood-brain barrier, however in the presence of meningeal inflammation, penicillins may reach therapeutic levels in cerebrospinal fluid (CSF).

***References available by request. Call the Infectious Disease Epidemiology Section, Office of Public Health, Louisiana Department of Health and Hospitals (504-219-4563)**