WRITE ON A NAMED BACTERIAL PROTEIN SYNTHESIS INDICATOR STATING ITS MECHANISM OF ACTION,INDICATION OF USE AND TOXICITY AND ADVERSE EFFECT

Penicillin was discovered in 1928 by Scottish scientist Alexander .The term "penicillin" was used originally for benzylpenicillin, penicillin G. Currently, "Penicillin" is used as a generic term for antibiotics that contain the beta lactam unit in the chemical structure. People began using it to treat infections in 1942.Penicillin(PCN or pen) is a group of antibiotics, derived originally from common moulds known as Penicillium moulds; which includes penicillin G (intravenous use), penicillin V (use by mouth), procaine penicillin, and benzathine penicillin (intramuscular use). Penicillin antibiotics were among the first medications to be effective against many bacterial infections caused by staphylococci and streptococci. All penicillins are β-lactam antibiotics, which are some of the most powerful and successful achievements in modern science. For example, amoxicillin tablets may be labelled as "a penicillin". Other derivatives such as procaine benzylpenicillin (procaine penicillin), benzathine benzylpenicillin (benzathine penicillin), and phenoxymethylpenicillin(penicillin V) are also described as "penicillins". Procaine penicillin and benzathine penicillin have the same antibacterial activity as benzylpenicillin but act for a longer period of time. Phenoxymethylpenicillin is less active against gram-negative bacteria than benzylpenicillin.Benzylpenicillin, procaine penicillin and benzathine penicillin can only be given by intravenous or intramuscular injections, but phenoxymethylpenicillin can be given by mouth because of its acidic stability. Penicillin inhibits activity of enzymes that are needed for the cross linking of peptidoglycans in bacterial cell walls, which is the final step in cell wall biosynthesis. It does this by binding to penicillin binding proteins with the beta-lactam ring, a structure found on penicillin molecules.This causes the cell wall to weaken due to fewer cross links and means water uncontrollably flows into the cell because it cannot maintain the correct osmotic gradient. This results in cell lysis and death.

ADVERSE EFFECT

Common (1% of people) adverse drug reactions associated with use of the penicillins include diarrhoea, hypersensitivity, nausea, rash, neurotoxicity, urticaria, and superinfection (including candidiasis). Infrequent adverse effects (0.1–1% of people) include fever, vomiting, erythema, dermatitis, angioedema, seizures (especially in people with epilepsy), and pseudomembranous colitis. Penicillin can also induce serum sickness or a serum sickness-like reaction in some individuals. Serum sickness is a type III hypersensitivity reaction that occurs one to three weeks after exposure to drugs including penicillin. It is not a true drug allergy, because allergies are type I hypersensitivity reactions, but repeated exposure to the offending agent can result in an anaphylactic reaction.[medical citation needed] Allergy will occur in 1-10% of people, presenting as a skin rash after exposure. IgE-mediated anaphylaxis will occur in approximately 0.01% of patients.Pain and inflammation at the injection site are also common for parenterally administered benzathine benzylpenicillin, benzylpenicillin, and, to a lesser extent, procaine benzylpenicillin.

MECHANISM OF ACTION

Bacteria constantly remodel their peptidoglycan cell walls, simultaneously building and breaking down portions of the cell wall as they grow and divide. β-Lactam antibiotics inhibit

the formation of peptidoglycan cross-links in the bacterial cell wall; this is achieved through binding of the four-membered β-lactam ring of penicillin to the enzyme DD-transpeptidase. As a consequence, DD-transpeptidase cannot catalyze formation of these cross-links, and an imbalance between cell wall production and degradation develops, causing the cell to rapidly die. The enzymes that hydrolyze the peptidoglycan cross-links continue to function, even while those that form such cross-links do not. This weakens the cell wall of the bacterium, and osmotic pressure becomes increasingly uncompensated—eventually causing cell death (cytolysis). To build-up of peptidoglycan precursors triggers the activation of bacterial cell wall hydrolases and autolysins, which further digest the cell wall's peptidoglycans. The small size of the penicillins increases their potency, by allowing them to penetrate the entire depth of the cell wall. This is in contrast to the glycopeptide antibiotics vancomycin and teicoplanin, which are both much larger than the penicillins.Gram-positive bacteria are called protoplasts when they lose their cell walls. Gram-negative bacteria do not lose their cell walls completely and are called spheroplasts after treatment with penicillin.
Penicillin shows a synergistic effect with aminoglycosides, since the inhibition of peptidoglycan synthesis allows aminoglycosides to penetrate the bacterial cell wall more easily, allowing their disruption of bacterial protein synthesis within the cell. This results in a lowered MBC for susceptible organisms.

Penicillins, like other β-lactam antibiotics, block not only the division of bacteria, including cyanobacteria, but also the division of cyanelles, the photosynthetic organelles of the glaucophytes, and the division of chloroplasts of bryophytes. In contrast, they have no effect on the plastids of the highly developed vascular plants. This supports the endosymbiotic theory of the evolution of plastid division in land plants.

The chemical structure of penicillin is triggered with a very precise, pH-dependent directed mechanism, effected by a unique spatial assembly of molecular components, which can activate by protonation. It can travel through bodily fluids, targeting and inactivating enzymes responsible for cell-wall synthesis in gram-positive bacteria, meanwhile avoiding the surrounding non-targets. Penicillin can protect itself from spontaneous hydrolysis in the body in its anionic form while storing its potential as a strong acylating agent, activated only upon approach to the target transpeptidase enzyme and protonated in the active centre. This targeted protonation neutralizes the carboxylic acid moiety, which is weakening of the β-lactam ring N–C(=O) bond, resulting in a self-activation.