An Overview on Streptomycin: Its Mechanism and Clinical Applications

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DESCRIPTION

Ampicillin is a broad-spectrum antibiotic belonging to the penicillin group. It is widely used in the medical field to treat various bacterial infections. This research aims to provide a comprehensive overview of Ampicillin, including its mechanism of action, indications, dosage, side effects, and its significance in the treatment of bacterial infections.

Mechanism of action

Streptomycin, a ground breaking antibiotic discovered in the mid-20th century, has played a pivotal role in revolutionizing the treatment of various bacterial infections. Its discovery marked the beginning of the antibiotic era, saving countless lives and significantly improving global public health. This note will delve into the history, mechanism of action, clinical applications, resistance development, and potential side effects of streptomycin. Additionally, we will explore its impact on medicine, highlighting the importance of this wonder drug in the on-going battle against bacterial pathogens.

Streptomycin was first isolated from the soil-dwelling bacterium Streptomyces griseus by Dr. Selman Waksman and his team in 1943. This groundbreaking discovery earned Waksman the Nobel Prize in Physiology or Medicine in 1952. Streptomycin's ability to effectively treat tuberculosis, a devastating disease at the time, brought hope to millions of patients suffering from this lethal infection. The drug soon became widely recognized as the first-line treatment for TB.

Mechanism of action

Streptomycin belongs to a class of antibiotics known as aminoglycosides. It works by irreversibly binding to the bacterial ribosome, specifically targeting the 30S subunit. This binding inhibits protein synthesis, preventing the bacteria from producing essential proteins necessary for survival. By disrupting bacterial protein synthesis, streptomycin effectively kills or inhibits the growth of a wide range of gram-negative and some gram-positive bacteria.

Clinical applications of Streptomycin

Streptomycin's initial success in treating Tuberculosis (TB) led to its exploration for other bacterial infections. The drug has proven effective against a variety of pathogens, including *Mycobacterium* tuberculosis, *Yersinia pestis* (the causative agent of plague), *Francisella tularensis* (the cause of tularemia), and many others. It has also been used to combat infections caused by bacteria such as Escherichia coli, Klebsiella pneumoniae, and Enterobacter species.

Resistant development

Despite its effectiveness, bacterial resistance to streptomycin has emerged as a significant concern. The misuse and overuse of the drug, inadequate dosing, and incomplete treatment regimens have contributed to the development of resistant strains. Bacteria can acquire resistance through genetic mutations or the acquisition of resistance genes through horizontal gene transfer. These resistant strains pose a significant threat to public health, as they limit treatment options and increase the risk of treatment failure. The emergence of Multi Drug-Resistant TB (MDR-TB) and Extensively Drug-Resistant TB (XDR-TB) highlights the urgent need for judicious use of streptomycin and other antibiotics to prevent further resistance development.

Side effects and precautions

While streptomycin has been a lifesaving drug, it is not without side effects and precautions. The most notable side effect is ototoxicity, which can lead to irreversible hearing loss. Patients receiving streptomycin should be carefully monitored for any auditory disturbances. Another significant side effect is nephrotoxicity, which can result in kidney damage. Other potential adverse effects include neurotoxicity, allergic reactions, and hematological disorders. Due to the risks associated with

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streptomycin, it should be administered under the supervision of a healthcare professional, with careful consideration of the benefits and potential side effects.

Impact on medicine

Streptomycin's discovery and subsequent use in the treatment of bacterial infections revolutionized medicine. It paved the way for the development of numerous other antibiotics and introduced a new era of infectious disease management. Streptomycin's success inspired scientists to explore and discover other antibiotics, leading to the development of drugs such as penicillin, tetracycline, and erythromycin. The profound impact of streptomycin on global public health cannot be overstated, as it continues to save lives and improve outcomes in the treatment of various bacterial infections.

Streptomycin stands as a remarkable milestone in medical history, providing an effective treatment option against a wide range of bacterial infections. Its discovery and subsequent use have changed the trajectory of infectious disease management, highlighting the importance of antibiotic stewardship to prevent the emergence of drug-resistant bacteria and preserve the efficacy of this invaluable drug.