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DEPARTMENT:MLS 400l

Assignment Title: Bacterial protein synthesis inhibitors

Course code: MLS302

Course Title: Introductory pharmacology and ToxicologyII

Question:

1. Write on a named bacterial protein synthesis inhibitor,stating its mechanism of action,indication for use, toxicity and adverse effects.

Answers

Proteins are long chains of individual units called amino acids . The amino acids are joined together like beads on a string to make the protein. The instructions for making proteins are found in DNA. In bacteria, the DNA is found packaged up in the bacterial chromosome of the cell. The DNA instructions are transcribed into RNA. Transcription

is a way of taking the information from DNA, and making RNA. RNA acts as a go-between for DNA and proteins. This lets the DNA stay safely in one part of the cell.

The RNA then moves to a part of the cell called a ribosome. Ribosomes are protein-making factories found in all cells, from humans to bacteria. The ribosome will scan down the RNA, like a train going down tracks, adding in amino acids to the protein being produced. When the ribosome reaches the end of the RNA, the protein is released. This process is called translation . In bacteria, transcription and translation are often linked. As a piece of RNA is being made, it immediately gets fed into a ribosome to begin making the actual protein.

The synthesis of proteins in bacteria is essentially a two-stage process involving transcription (the synthesis of a messenger RNA (mRNA) intermediate using one strand of the duplex DNA as the template) and translation (the decoding of the information in the mRNA into an ordered arrangement of amino acids to form a polypeptide). The DNA strand that acts as the template for the mRNA (and to which it is complementary) is

known as the anticoding or template strand, and the DNA strand that bears the same sequence (except for the replacement of thymine by uracil) is known as the coding strand. Transcription is the synthesis of RNA using DNA as a template. The process is carried out by the enzyme RNA polymerase. The same enzyme is responsible for the transcription of all of the genes in a bacterial cell, including mRNA, rRNA and transfer RNA (tRNA). RNA polymerase initiates and terminates transcription at specific points in the DNA. Transcription is initiated downstream of specific sequences called promoters, sites that are recognized and bound by RNA polymerase. The process of transcription can be divided into a series of stages: template recognition, initiation, elongation, and termination. The linear sequence of nucleotides in mRNA is decoded and translated into a linear sequence of peptide bond-linked amino acids that make up the equivalent protein. The process of translation is carried out on large ribonuclear-protein complexes called ribosomes.

## Protein synthesis in inhibitors

There are some molecules that can stop protein synthesis in bacteria, there are several stages of protein synthesis that must happen to make a protein.

Many of the medications that we call antibiotics are protein synthesis inhibitors. An antibiotic is something used to either kill bacteria (termed bactericidal) or stop the bacteria from growing(bacteriostatic).Tetracycline antibiotics for example,stops the amino acid from going into the ribosome.If a bacterium can't join amino acids,it certainly can't make proteins.Other classes of antibiotics like aminoglycosides, prevents the ribosome from being made Without the factory of ribosome,protein produced .

## Tetracycline

Tetracycline is an antibiotic that fights infection caused by bacteria.Tetracycline is used to treat many different bacterial infections of the skin, intestines, respiratory tract, urinary tract, genitals, lymph nodes, and

other body systems. It is often used in treating severe acne, or sexually transmitted diseases such as syphilis,gonorrhea or chlamydia.

## Mechanism of action

- Tetracyclines enter susceptible organisms via passive diffusion and also by an energy-dependent transport protein mechanism unique to the bacterial inner cytoplasmic membrane.
- Tetracyclines concentrate intracellularly I'm susceptible organisms.
- The drug bind reversibly to the 30S subunit of the bacterial ribosome.
- This action prevents binding of tRNA to the mRNA ribosome complex,there by inhibiting bacteria protein synthesis.

## Indication for use and toxicity

Tetracycline works best when taken on an empty stomach 1 hour before or 2 hours after meals. If stomach upset occurs, ask your doctor if you can take this medication with food. Take each dose with a full glass of water(8 ounces or 240 milliliters) unless your doctor directs you otherwise. Do not lie down for at least 10 minutes after taking this medication. For this reason, do not take it right before bedtime.

Take this medication 2-3 hours before or after taking any products containing magnesium , aluminum, or calcium. Some examples include antacids , certain forms of didanosine (chewable/dispersible buffered tablets or pediatric oral solution),Vitamins /minerals, and sucralfate. Follow the same instructions with dairy products (e.g., milk, yogurt) calcium enriched
Juice, bismuth subsalicylate, iron, and zinc.

These products bind with tetracycline, preventing its full absorption.

Dosage is based on your medical condition and response to therapy. For use in children older than 8 years of age, the dosage is also based on weight.For the best effect, take this antibiotic at evenly spaced times. To help you remember, take this medication at the same time(s) every day.Continue to take this medication until the full-prescribed amount is finished even if symptoms disappear after a few days. Stopping the medication too early may allow bacteria to continue to grow, which may result in a relapse of the infection.

Inform your doctor if your condition persists or worsens.

## Adverse effect

Nausea, vomiting, diarrhea , loss of appetite, mouth sores, black hairy tongue, sore throat, dizziness, headache, or rectal discomfort may occur.

## Aminoglycosides

Aminoglycosides are used for the treatment of serious infections due to aerobic gram negative bacilli. However, their clinical utility is limited by serious toxicites.

## Mechanism of action

- Aminoglycosides diffuse through porin channels in the outer membrane of susceptible organisms.
- Inside the cell ,they bind the 30S ribosomal subunit.

## Indication for use and toxicity

aminoglycosides are indicated for empiric therapy in patients with severe illness; this includes empiric treatment for patients with infective endocarditis, sepsis, complicated intraabdominal infections, and complicated genitourinary infections. Typically, in these settings,

aminoglycosides should not be used for more than two days, due to toxicity to the patient.

For directed treatment, aminoglycoside use for longer than 48 hours is acceptable. They are part of directed combination treatment for brucellosis, listeriosis, CNS nocardiosis, and *Pseudomonas aeruginosa* infection. Aminoglycosides monotherapy is for tularemia, resistant mycobacteria, bacteremia caused by *Campylobacter* and *Yersinia*, and drug-resistant gram-negative pathogens.

Adverse effect

ototoxic damage, vestibulo-toxic impairments, nephrotoxicity (kidney damage), and encephalopathy