

NAME: Peter Cynthia Eleojo

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COURSE: SYSTEM PHARMACOLOGY

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1. A drug used in the treatment of urinary tract infection causes brown coloration of urine. Explain in full detail the pharmacology of the drug under the following headings:

- a. Name of the drug
- b. Antibacterial activity
- c. Mechanism of action
- d. Pharmacokinetics
- e. Adverse effects

1. Name of the drug

There are Some drugs can cause colouration in urine example

Metronidazole, Nitrofurantoin etc

Nitrofurantoin is an antibiotic used to treat and prevent Urinary Tract Infections

Nitrofurantoin is a nitrofuran antibiotic used to treat uncomplicated urinary tract infections. Nitrofurantoin is converted by bacterial nitroreductases to electrophilic intermediates which inhibit the citric acid cycle as well as synthesis of DNA, RNA, and protein. This drug is more resistant to the development of bacterial resistance because it acts on many targets at once. Nitrofurantoin is a second line treatment to trimethoprim/sulfamethoxazole. It is one of the few drugs commonly used to treat UTIs in pregnancy. It however should not be used in late pregnancy due to the potential risk of Hemolytic Anemia in newborn.

2. Antibacterial activity

Nitrofurantoin interferes with the production of bacterial proteins, DNA, and cell walls. It is effective against E.Coli, **Enterobacter cystitis**, **Enterococcus**, Klebsiella, and Staphylococcus aureus.

3. Mechanism of action

Nitrofurantoin is taken up by bacterial intracellular nitroreductases to produce the active form of the drug via reduction of the nitro group. Intermediate metabolites that result from this reduction then bind to

bacterial ribosomes and inhibit bacterial enzymes involved in the synthesis of DNA, RNA, cell wall protein synthesis, and other metabolic enzymes. It is bactericidal, especially to bacteria present in acid urine.

4. Pharmacokinetics

Nitrofurantoin is well absorbed from the gut. Its half-life in plasma is very short (less than 1 hour or < 1 hr) and therapeutic plasma concentrations are not achieved. It is excreted largely unchanged in the urine, giving urinary concentrations high enough to treat lower urinary tract infections, but the low tissue concentrations are inadequate for the treatment of acute pyelonephritis. **Nitrofurantoin** is readily absorbed and quickly **distributed** into most body fluids. It is rapidly excreted in large amounts in bile and urine. With the exception of the active drug secretion in the kidney tubule and biliary drug transport, **nitrofurantoin** transfer across body membranes occurs by diffusion.

5. Adverse effects

The adverse effects and their symptoms can include the following:

- Lung inflammation (pulmonary toxicity) . Symptoms can include:
 - tiredness
 - shortness of breath
 - fever
 - chills

- cough
 - chest pain
- Liver problems (Hepatotoxicity) ; Symptoms can include:
 - itching
 - yellowing of your skin or the whites of your eyes
 - nausea or vomiting
 - dark urine
 - loss of appetite
- Nerve damage (Neuropathy). Symptoms can include:
 - numbness or tingling in your hands and feet
 - muscle weakness
- Hemolysis (red blood cell damage). Symptoms can include:tiredness weakness and pale skin.
- Some common side effects include;
 - ◆ vomiting
 - ◆ Nausea
 - ◆ Somach pain
 - ◆ Diarrhea
 - ◆ Loss of appetite
 - ◆ numbness in your hands and feet

- ◆ dizziness
- ◆ drowsiness
- ◆ headache
- ◆ weakness
- ◆ Pain in your hands and feet