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**Pharmacology assignment**

**A** drug used in the treatment of urinary tract infection that also cause brown coloration of urine

**a. Name of drug**

Nitrofurantoin

**b. Antibacterial Activity**

Nitrofurantoin has antibacterial activity against several gram-negative and gram- positive aerobic bacteria including many isolates of klebsiella, Escherichia, enterobacter, enterococcus, staphylococcus and salmonella. It has little or no activity against most strains of proteus and no activity against pseudomonas. Nitrofurans have moderate activity against anaerobic bacteria and are most active in anaerobic conditions. Nitrofurantoin is rapidly absorbed from the gut. It is rapidly eliminated and therapeutic blood concentrations cannot be maintained. Sensitive bacteria reduce the drug to an active agent that inhibits various enzymes and damages DNA. Activity is greater in acidic urine.

**c. Mechanism of Action**

Nitrofurantoin is activated inside bacteria by reduction via the flavoprotein nitrofurantoin reductase to unstable metabolites, which disrupt ribosomal RNA, DNA, and other intracellular components. It is bactericidal, especially to bacteria present in acid urine. It is converted by bacterial nitroreductases to electrophilic intermediates which inhibit the citric acid cycle as well as synthesis of DNA, RNA, and proteins. Nitrofurantoin damages DNA since its reduced form is highly reactive.

**d. Pharmacokinetics**

Nitrofurantoin is a urinary tract antibacterial agent whose clinical effectiveness depends on the high urinary drug levels encountered during therapeutic drug dosage. Nitrofurantoin is readily absorbed and quickly distributed into most bodily fluids. It is rapidly excreted in large amounts in bile and urine. Nitrofurantoin has a short elimination half-life in whole blood or plasma. Antibacterial concentration is not achieved in plasma following ingestion of recommended doses because the drug is rapidly eliminated. It is not used for pregnant women, individuals with impaired renal functions, children younger than 1 month of age. It is not recommended for the treatment of pyelonephritis or prostatis, it colors the urine brown.

**d. Adverse Effects**

Common side effects of nitrofurantoin include:

* Headache, rashes, itching
* Gastro intestinal disturbances such as: nausea, vomiting, diarrhea
* Change in urine color
* Loss of appetite, abdominal pain
* Acute pneumonitis
* Neurological problems such as nystagmus, polyneuropathies with demyelination may occur
* Hemolytic anemia: reduced blood cell count by breaking red blood cells.
* Lung injury
* Vasculitis