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Matric No: 18/MHS05/013

Department: Physiology

Course Code: PHA 306

Course Title: Systemic Pharmacology

Date: 12th April, 2020.

Question

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;

1. Name of the drug
2. Antibacterial activity
3. Mechanism of action
4. Pharmacokinetics
5. Adverse effects

**Name of Drug; NITROFURANTOIN**

It is less commonly used for treating urinary tract infections because of its narrow antimicrobial spectrum, frequent bacterial resistance and toxicity.

**Antibacterial Activity;**

Sensitive bacteria reduce the drug to an active agent that inhibits various enzymes and damages DNA. Activity is greater in acidic urine.

Nitrofurantoin is bacteriostatic for most susceptible micro-organisms at concentrations of 32ug/ml or less and is bactericidal at concentrations of 100ug/ml and more. It is active against many strains of *E.coli* and enterococci. However, most species of *proteus* and *pseudomonas* and many species of *Enterobacter* and *klebsiella* are resistant.

**Mechanism of Action;**

Nitrofurantoin is rapidly reduced in bacterial cells by flavoproteins (*nitrofuran reductase*) to multiple reactive intermediates that attack ribosomal proteins, DNA, respiration, pyruvate metabolism and other macromolecules within the bacterial cells, thereby inhibiting protein synthesis.

N.B; Nitrofurantoin damages DNA since its reduced form is highly reactive.

**Pharmacokinetics;**

Nitrofurantoin is absorbed rapidly and completely from the GIT tract. Antibacterial concentrations are not achieved in plasma following ingestion of recommended doses because it is rapidly eliminated. **Nitrofurantoin colors urine brown**. It is not used for pregnant women, individuals with impaired renal function, children younger than one month of age. It is not recommended for the treatment of pyelonephritis or prostatis.

**Adverse Effects**

It can cause;

* Gastrointestinal disturbances e.g. nausea, vomiting, diarrhea
* Acute pneumonitis
* Neurological problems e.g. headache, nystagmus (rapid involuntary eye movement)