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**Question**: A drug in the treatment of urinary tract infection causes brown colouration of urine. Explain in full detail the pharmacology of the drug under the following

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

Answer

**Name of drug**: Nitrofurantoin

**Antibacterial activity**: It has a narrow antimicrobial spectrum, frequent bacterial resistance and toxicity that are why it is less commonly employed for treating urinary tract infections (UTIs). 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. The antibacterial activity is higher in acidic urine.

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 damages DNA since its reduced form is highly reactive.

It 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 cell, thereby inhibiting protein synthesis.

**Pharmacokinetics**: Nitrofurantoin is absorbed rapidly and completely from the GIT tract. Antibacterial concentrations are not achieved in plasma following ingestion of recommended doses because the drug is rapidly eliminated.

Nitrofurantoin colors the 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:** Gastrointestinal disturbances: these side effects include nausea, vomiting, and diarrhoea.

Acute pneumonitis

Neurological problems such as headache, nystagmus, and polyneuropathies with demyelination may occur.

Haemolytic anemia: is a disorder in which red blood cells are destroyed faster than they can be made. The destruction of red blood cells is called haemolysis. Red blood cells carry oxygen to all parts of your body. If the amount lower than normal amount of red blood cells, that case is called anemia.