**Imoyin-Omene Emuobonuvie**

**17/MHS01/159**

**Human anatomy**

**300level**

A. Nitrofurantoin is an antibiotic that fights bacteria in the body, Nitrofurantoin is used to treat and prevent urinary tract infections.One shouldn’t take nitrofurantoin if you have severe kidney disease, urination problems, or a history of jaundice or liver problems caused by nitrofurantoin.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.

**B.Antibacterial Activities.**

Nitrofurantoin is an antibiotic medication that is used for the treatment of uncomplicated lower urinary tract infection. It is effective against most gram-positive and gram-negative organisms.More recently, several major guidelines have declared nitrofurantoin as the first-line therapy for treatment of uncomplicated lower urinary tract infections. Increasing resistance to newer antibiotics coinciding with increasing prevalence of extended-spectrum beta-lactamase (ESBL) producing bacteria has led to a resurgence in use of nitrofurantoin.

Nitrofurantoin is advantageous in this role as it concentrates in the lower urinary tract while maintaining a low serum concentration and also does not significantly affect bowel flora. The predominant cause of urinary tract infections is periurethral colonization of bacteria from a fecal reservoir, which then ascends the urinary tract. Nitrofurantoin is effective against many gram-positive and gram-negative organisms. Nitrofurantoin is bactericidal against most common urinary tract pathogens, including *Escherichia coli*, *Enterococci*, *Klebsiella*, *Staphylococcus saprophyticus*, and *Enterobacter*. Its spectrum of susceptibility also includes *Shigella*, *Salmonella*, *Citrobacter*, *Neisseria*, *Bacteroides*, group B streptococcus, *Staphylococcus aureus*, and *Staphylococcus epidermidis*. Studies have shown the effectiveness of nitrofurantoin does not differ between ESBL-producing *E. coli* and Non-ESBL-producing *E. coli* strains. Resistance to nitrofurantoin remains relatively rare despite several decades of widespread use. Nitrofurantoin interferes with the production of bacterial proteins,DNA and cell walls.

## **C.Mechanism of Action**

Nitrofurantoin’s mechanism action remains poorly understood since its discovery in the 1940’s. Nitrofurantoin uses several mechanisms to achieve an antimicrobial effect. 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.

**D.Pharmacokinetics.**

Bioavailability of nitrofurantoin is considered to be 80% in healthy patients.  Nitrofurantoin is well absorbed in the gastrointestinal tract (gut)with most absorption occurring in the proximal small bowel. Studies have shown that therapeutic urinary concentrations of the drug are increased if nitrofurantoin is taken with food. Serum concentrations are typically undetectable, although may increase in patients with severe renal failure. Nitrofurantoin only achieves therapeutically active concentrations in the lower urinary tract.Its half-life in plasma is very short less than 1hour or <1hr 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 tisssue 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 bike and urine.With the exception of the active drug secretion in the kidney tubule and biliary drug transport, Nitrofurantoin transfer across body membranes occur by diffusion.

**E.Adverse effects**

Nitrofurantoin is a relatively safe drug compared to alternatives. Comparator drugs such as trimethoprim-sulfamethoxazole and ciprofloxacin often have more reported side effects than nitrofurantoin. The most common reported side effects include nausea, vomiting, muscle weakness(tiredness),numbness or tingling in your hands and feet,loss of appetite, and diarrhea. These symptoms usually develop in the first week of therapy. The most well known severe reaction is pulmonary toxicity. Pulmonary toxicity caused by nitrofurantoin can be categorized into acute, subacute, and chronic pulmonary reactions. The acute pulmonary reaction syndrome is characterized by sudden onset of fever, chills, cough, myalgia,chestpain,itching, dark urine,headache, and dyspnea. Sub-acute pulmonary reactions also occur and are characterized by persistent dry cough, dyspnea,dizziness,drowsiness and fever. This chronic, pulmonary reaction is associated with the insidious onset of persistent dry cough,shortness of breath,pain in your hands and feet,pale skin and dyspnea. Acute, subacute, and chronic pulmonary toxicity are reversible with immediate cessation of the drug.Other rare adverse effects include hepatic reactions such as liver problems:holestatic jaundice, hepatitis, and hepatic necrosis;nerve damage(neuropathy),hemolysis(red blood cell damage),lung inflammation.Peripheral neuropathy is another known rare adverse effect, and is mostly associated with prolonged use in patients with poor renal function.