1. **Nitrofurantoin** is an antibiotic that fights bacteria in the body, Nitrofurantoin is used to treat 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
2. **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. Nitrofurantoin was approved by the FDA in 1953 for treatment of lower urinary tract infection. Nitrofurantoin is a synthetic antimicrobial created from furan and an added nitro group and a side change containing hydantoin. Nitrofurantoin was widely used the for treatment of lower urinary tract infections until the 1970s when trimethoprim-sulfamethoxazole and newer beta-lactam antibiotics became available. 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’s primary use has remained the treatment and prophylaxis of urinary tract infections. 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. Researchers think that nitrofurantoin’s continued effectiveness and minimal resistance patterns are in part attributable to its minimal effect on bowel flora. 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. A population-based survey of in vitro antimicrobial resistance of urinary*E. coli* isolates among United States outpatients showed resistance rate of 1.6%. A meta-analysis for clinical cure demonstrated overall equivalence between nitrofurantoin and its comparators when used for uncomplicated urinary tract infections. In long-term prophylaxis, numerous studies demonstrated that nitrofurantoin is an effective prophylactic agent and compares well to other antibiotics in this role.

## **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.

**D.Pharmacokinetics.**

Bioavailability of nitrofurantoin is considered to be 80% in healthy patients.  Nitrofurantoin is well absorbed in the gastrointestinal tract 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.

**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, loss of appetite, and diarrhea. These symptoms usually develop in the first week of therapy. Modern formulations, specifically the macrocrystalline form of the drug, have less frequency of these effects due to attempts by manufacturers to alter the crystal size, which effects gastrointestinal absorption.More severe reactions to nitrofurantoin exist. 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, and dyspnea. Sub-acute pulmonary reactions also occur and are characterized by persistent dry cough, dyspnea, and fever. This chronic, pulmonary reaction is associated with the insidious onset of persistent dry cough and dyspnea. Acute, subacute, and chronic pulmonary toxicity are reversible with immediate cessation of the drug. This effect remains uncommon, with one study showing the calculated frequency for all pulmonary reactions were onlypresent in 0.001% of nitrofurantoin courses. Other rare adverse effects include hepatic reactions such as cholestatic jaundice, hepatitis, and hepatic necrosis. The drug should be ceased immediately in these cases. Peripheral neuropathy is another known rare adverse effect, and is mostly associated with prolonged use in patients with poor renal function.