Fluoroquinolones Antibiotics

Fluoroquinolones are a family of broad-spectrum antibiotic drugs that commonly end with suffix “-floxacin” like ciprofloxacin and moxifloxacin. These drugs are bactericidal and eradicate bacteria by interfering with DNA replication. Fluoroquinolones inhibit topoisomerase II enzymes including bacterial DNA gyrase. These enzymes cut both strands of the DNA helix in order to unwind DNA tangles and supercoils which is necessary for proper DNA replication. These drugs are broad-spectrum antibiotics that play an important role in the treatment of serious bacterial infections, especially against gram-negative rod infections. Fluoroquinolones, especially ciprofloxacin, is commonly used in the treatment of urinary tract infections and also used in the treatment of Pseudomonas and Neisseria infections. Products containing multivalent cations, like aluminum or magnesium-containing antacids, result in a drastic reduction of oral absorption and should not be taken together. In general, the adverse effects of fluoroquinolones are mild to moderate and include diarrhea, skin rashes, and headaches. On occasion, more serious adverse effects can occur. Fluoroquinolones can damage cartilage and ligaments and can cause spontaneous tendon rupture. They are also associated with fibromyalgia-like symptoms including leg cramps and myalgias in children. Because they can damage cartilage and ligaments, they are not recommended for use in pregnant women or children and are considered a teratogen.

PLAY PICMONIC

-floxacin
Flock-of-oxen
Fluoroquinolones commonly end with suffix “-floxacin”, for example ciprofloxacin, levofloxacin, norfloxacin, ofloxacin, sparfloxacin, moxifloxacin, and gatifloxacin. Drugs of this class that do not end with "-floxacin", include enoxacin and nalidixic acid.

Mechanism of Action

Inhibits Topoisomerase II & IV
Inhibiting-chains on Tadpoles with (2) Tutu and (4) Fork
Fluoroquinolones inhibit topoisomerase II (a.k.a. DNA gyrase) and IV enzymes. These enzymes cut both strands of the DNA helix in order to unwind DNA tangles and supercoils which is necessary for proper DNA replication. Resistance to these drugs can be due to mutations in these bacterial enzymes, plasmid-encoded efflux pumps, or changes in cell wall permeability.

Bactericidal
Bacteria-sliders
Unlike bacteriostatic agents, which simply stop bacteria from reproducing, bactericidal agents actually cause bacterial cell death.

Indications

Gram-negative Rods
Graham-cracker Negative-devil with Rod
These drugs are broad-spectrum antibiotics that play an important role in the treatment of serious bacterial infections, especially against gram negative rod infections. It should be noted that newer generation fluoroquinolones have improved, but have limited gram-positive coverage.

Pneumonia
Nude-Mona
Fluoroquinolones are effective in the treatment of pneumonia. In fact, levofloxacin, gemifloxacin, and moxifloxacin are referred to as the “respiratory fluoroquinolones” for this reason. These antibiotics are also effective in cases of atypical pneumonia caused by Legionella, Chlamydophila pneumoniae, and Mycoplasma.

Gastrointestinal Infections
GI-guy and Infectious-bacteria
Bacterial gastroenteritis caused by organisms such as Campylobacter jejuni, Salmonella, Shigella, Yersinia, and non-cholera Vibrio species can be treated with fluoroquinolones.

Urinary Tract Infection

Urinary-tract-on-fire

Fluoroquinolones like ciprofloxacin are a commonly prescribed antibiotic for urinary tract infections (UTI) in females. Note that fluoroquinolones are now second-line treatment for UTIs (after nitrofurantoin, trimethoprim-sulfamethoxazole, and fosfomycin) due to increasing bacterial resistance.

Genital Infections

Genital-gentleman and Infectious-bacteria

Genital infections caused by Neisseria gonorrhoeae, Chlamydia trachomatis, and Ureaplasma urealyticum are all amenable to treatment with fluoroquinolones.

Drugs

Levofloxacin

Levitating-flock-of-oxen

Levofloxacin is a powerful fluoroquinolone used to treat multiple infections such as community-acquired pneumonia, acute bacterial rhinosinusitis, chronic prostatitis, and acute pyelonephritis. It is also used as postexposure prophylaxis for anthrax caused by Bacillus anthracis.

Ciprofloxacin

Sippy-cup-rope

Ciprofloxacin is a second generation fluoroquinolone antibiotic that is used to treat a number of infections including osteomyelitis, gastroenteritis, malignant otitis externa, respiratory tract infections, and skin infections. This drug is considered a P450 inhibitor and can result in increased plasma concentrations of other drugs metabolized by this hepatic enzyme complex.

Has Pseudomonas Coverage

Sumo-Mona Covered

Pseudomonas aeruginosa is a gram-negative, aerobic bacillus that has been increasingly recognized as an opportunistic human pathogen. It can cause a variety of infections including osteomyelitis (especially in burn patients), endocarditis, pneumonia, and UTIs. Ciprofloxacin and levofloxacin both have efficacy against Pseudomonas.

Considerations

Avoid Polyvalent Cations

Avoid-sign Polly and Cat-ions

Metals such as magnesium (Mg²⁺), calcium (Ca²⁺), iron (Fe²⁺, Fe³⁺), and aluminum (Al³⁺) should be avoided when taking fluoroquinolones. These elemental ions may reduce absorption of the antibiotic. They are commonly found in dietary supplements, antacids, or prescribed for certain medical conditions (e.g. iron tablets for anemia).