

Ciprofloxacin Uses in cats

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ABSTRACT

Ciprofloxacin is a synthetic drug commonly used in veterinary medicine. But our special emphasis is on cats in this article. It is a broad-spectrum antibiotic, a member of the fluoroquinolone group. It inhibits the DNA gyrase of bacteria which is required for their replication. Ciprofloxacin is administered against many pathogens that are responsible for gastrointestinal diseases, respiratory diseases, urinary tract diseases, and soft tissue diseases. However, its use in cats requires special consideration on the dose, route, and potential side effects for avoiding harmful conditions. It causes side effects like cartilage damage, tendonitis, gastrointestinal disorders, etc. The dose should be used at a reduced level in patients with kidney and liver malfunctions.

Keywords: Ciprofloxacin, Cat, Pharmacological action

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Introduction

Ciprofloxacin belongs to the fluoroquinolones group of antibiotics, used against bacterial infections in veterinary, mainly in cats. The broad-spectrum nature of this antibiotic makes it susceptible to various gram-negative and gram-positive bacteria [1]. It has high clinical efficacy and is best among other fluoroquinolones. It is frequently used in humans. The pharmacological features of ciprofloxacin make it suitable for use in cats. This article will highlight the characteristics of ciprofloxacin under various headings, such as ciprofloxacin, various systemic infections, dose, route, application, drug interaction, and side effects.

Ciprofloxacin

It belongs to the second generation of fluoroquinolones. Like its generation mates, it is also a broad-spectrum antibiotic. Its structural formula is 1-cyclopropyl-6-fluoro-1,4-dihydro-4-oxo-7-(1-piperazinyl)-3-quinoline carbonic acid [2]. It is effective against many gram-negative and some gram-positive (*Staphylococcus aureus*). The fluorine atom in the 6th carbon is responsible for this activity. Moreover, the piperazine ring in the 7th carbon is responsible for its activity against *Pseudomonas aeruginosa*. Ciprofloxacin also has antibacterial properties against *Chlamydia* spp. *Mycoplasma* spp. and *Rickettsia* spp.

The mechanism of bactericidal action is dependent upon the inhibition of DNA gyrase. DNA gyrase consists of four subunits (two alpha and two beta). Ciprofloxacin specifically targets alpha subunits. This unwinding of chromosomes leads to bacterial death [3]. This action is limited to the bacterial cell, not cause harm to the mammalian cells. However, bacterial resistance is mostly due to chromosomal resistance and somehow due to plasmidic resistance.

It is a zwitterion, possesses acid and base functions at pKa 7.4 and pKa 6, respectively, and is hydrophobic (lipid-soluble) in nature [4]. It has a high volume of distribution due to low plasma protein binding. Ciprofloxacin metabolites are not involved in marked antibacterial activity.

Comparison to Other Antibiotics

Doxycycline

It belongs to the tetracycline group. It shows its mechanism by inhibiting the synthesis of bacterial proteins. It is commonly prescribed for respiratory tract infections but is less effective against gram-negative bacteria in contrast to ciprofloxacin [6].

Amoxicillin

It belongs to the penicillin group and is effective against gram-positive bacteria. It shows its antibacterial activity by inhibiting cell wall synthesis, but ciprofloxacin inhibits DNA synthesis [7].

Enrofloxacin

It also belongs to the fluoroquinolone group of antibiotics, but it is administered in severe reactions as compared to ciprofloxacin.

Respiratory Tract Infections

Urinary Tract Infections (UTIs)

Ciprofloxacin is effective for both lower and upper urinary tract infections. It is susceptible to the major colonizers of the urinary tract which are *E. coli* and many other gram-negative pathogens [8]. When antibiotics like amoxicillin are not working, we can use ciprofloxacin.

Gastrointestinal Tract Infections

Various infections of GIT, caused by Clostridium, campylobacter, and salmonella can be treated by ciprofloxacin.

Bone and joint Infections

Ciprofloxacin is very effective in curing septic arthritis and osteomyelitis in cats, as these heal poorly due to reduced blood supply to the bones and joints.

Eye Infections

In ocular infections like conjunctivitis, and keratitis, ciprofloxacin is effective. It locates the site of infection by penetrating the cornea and killing bacterial infections [9].

Soft Tissue Infections

Ciprofloxacin is used as a drug in various soft tissue infections which are quite deep. It is effective in treating abscesses, cellulitis, and wound infections.

Dose and Administration

The recommended dose is 10mg/kg, IV. It can also be given per-oral, but availability reduces than IV. It can be administered for 10-14 days to completely eradicate the infection [5]. It is available in powder or capsule form. It is available as ointments and eye drops for eye ailments. The dosage is 1-2 drops and repeats after 6 hours.

Drug Interaction and Excretion

Antacids and sucralfate can reduce absorption and reduce its action by binding to ciprofloxacin, respectively [10]. Theophyllin can interact with it and increase its levels. It is excreted by the glomerular filtration, tubular secretion, and feces.

Side Effects and Contradictions

The complications it causes concern disorders of the gastrointestinal system, stimulation of the nervous system, and damage to the cartilage [11]. The prolonged duration of antibiotics can cause tendon injuries. Rarely, cats can get allergic reactions like skin irritation, swelling, and mild dyspnea. It should be avoided in kittens due to the side effects of cartilage damage. Caution is also required while administering ciprofloxacin in pregnant and lactating cats, only administer when benefits are more as compared to side effects [12]. Cats with impaired hepatic and renal functions are advised to prescribe at low doses.

Conclusion

Ciprofloxacin is the second-generation antibiotic of the fluoroquinolone group. Its broad-spectrum antibacterial activity makes it an amazing drug for treating multiple infections in veterinary medicine, especially cats. It acts on the DNA gyrase of the bacteria and stops its synthesis and proliferation of bacteria. It can cure a variety of bacterial diseases of urinary, respiratory, and soft tissues and others. Proper route, dosage, and duration are necessary for its optimum function. It has some side effects like cartilage damage and GIT abnormalities.

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