PRODUCT MONOGRAPH
INCLUDING PATIENT MEDICATION INFORMATION

[Pr]Ciprofloxacin Injection USP

2 mg/mL in 5% dextrose injection

Sterile Solution

Antibacterial Agent

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PART I: HEALTH PROFESSIONAL INFORMATION

SUMMARY PRODUCT INFORMATION

Table 1 – Product Information Summary

Route of Administration	Dosage Form, Strength	Clinically Relevant Nonmedicinal Ingredients
Intravenous	Solution for Injection 2 mg/mL in 5% dextrose injection	For a complete listing, see **DOSAGE FORMS, COMPOSITION AND PACKAGING**.

INDICATIONS AND CLINICAL USE

Intravenous Administration

CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose injection) may be indicated for the treatment of patients with the following infections caused by susceptible strains of the indicated micro-organisms:

Respiratory Tract Infections

Acute pneumonia caused by:
Enterobacter cloacae
Escherichia coli
Haemophilus influenzae
Haemophilus parainfluenzae
Klebsiella pneumoniae
Proteus mirabilis
Pseudomonas aeruginosa
Staphylococcus aureus
Streptococcus pneumoniae

CIPROFLOXACIN INJECTION USP should not be prescribed to patients with acute bacterial exacerbations of simple/uncomplicated chronic obstructive pulmonary disease (ie. patients who have chronic obstructive pulmonary disease without underlying risk factors).

CIPROFLOXACIN INJECTION USP is not indicated for acute bronchitis.

Due to the nature of the underlying conditions which usually predispose patients to pseudomonas infections of the respiratory tract, bacterial eradications may not be achieved in patients who display clinical improvement despite evidence of *in vitro* sensitivity. In patients requiring subsequent courses of therapy, CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose injection) should be used alternately with other antipseudomonal agents. Some strains of *Pseudomonas aeruginosa* may develop resistance during treatment. Therefore, susceptibility testing should be performed periodically during therapy to detect the emergence of bacterial resistance.

Urinary Tract Infections

Upper and lower complicated urinary tract infections including pyelonephritis caused by:
Citrobacter diversus
Escherichia coli
Klebsiella pneumoniae
Proteus mirabilis
Pseudomonas aeruginosa

In cases of uncomplicated acute bacterial cystitis, limit the use of CIPROFLOXACIN INJECTION USP to circumstances where no other treatment options are available. A urine culture should be obtained prior to treatment to ensure ciprofloxacin susceptibility.

Skin or Skin Structure Infections

Caused by:
Enterobacter cloacae
Escherichia coli
Klebsiella pneumoniae
Morganella morganii
Proteus mirabilis
Proteus vulgaris
Pseudomonas aeruginosa
Staphylococcus aureus
Streptococcus pyogenes

Septicemia

Caused by:
Escherichia coli
Salmonella typhi

Bone

Caused by:
Enterobacter cloacae
Pseudomonas aeruginosa

Complicated Intra-abdominal Infections only when used in Combination with Metronidazole
(See **DOSAGE AND ADMINISTRATION**)

Caused by:
Escherichia coli
Pseudomonas aeruginosa
Klebsiella pneumoniae
Bacteroides fragilis

Note: Most anaerobic bacteria, including *Bacteroides fragilis,* are resistant to ciprofloxacin. Therefore, ciprofloxacin should not be used as single agent therapy for complicated intra-abdominal infections. Efficacy against *Enterococcus* sp. in clinical trials has been shown to be only 75 %.

Empiric Therapy in Febrile Neutropenic Patients (in Combination with Piperacillin Sodium)
(See **DOSAGE AND ADMINISTRATION**)

To reduce the development of drug-resistant bacteria and maintain the effectiveness of CIPROFLOXACIN INJECTION USP, and other antibacterial drugs, CIPROFLOXACIN INJECTION USP should be used only to treat infections that are proven or strongly suspected to be caused by susceptible bacteria. When culture and susceptibility information are available, they should be considered in selecting or modifying antibacterial therapy. In the absence of such data, local epidemiology and susceptibility patterns may contribute to the empiric selection of therapy.

Limit the use of CIPROFLOXACIN INJECTION USP to patients where no other treatment options exist AND where ciprofloxacin susceptibility is demonstrated, OR ciprofloxacin susceptibility is highly likely, typically greater than or equal to 95%, based on local susceptibility patterns.

Appropriate culture and susceptibility tests should be performed prior to initiating treatment in order to isolate and identify organisms causing the infection and to determine their susceptibilities to ciprofloxacin. Therapy with CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose injection) may be initiated before results of these tests are known. However, modification of this treatment may be required once results become available or if there is no clinical improvement. Culture and susceptibility testing performed periodically during therapy will provide information on the possible emergence of bacterial resistance. If anaerobic organisms are suspected to be contributing to the infection, appropriate therapy should be administered.

Geriatrics (≥ 65 years of age)
Elderly patients should receive a dose dependent on the severity of their illness and their creatinine clearance (see **DOSAGE AND ADMINISTRATION**: **Special Populations – Impaired Renal Function** for dose modification based on creatinine clearance or serum creatinine).

Pediatrics (< 18 years of age)
The safety and efficacy of ciprofloxacin in individuals less than 18 years of age has not been established. Ciprofloxacin is not recommended for children under the age of 18 years (see **WARNINGS AND PRECAUTIONS**: **Special Populations – Pediatrics (< 18 years of age)**).

CONTRAINDICATIONS

- CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose injection) is contraindicated in patients who have shown hypersensitivity to ciprofloxacin, or other quinolone antibacterial agents or any of the excipients. For a complete listing, see the **DOSAGE FORMS, COMPOSITION AND PACKAGING**.
- Concurrent administration of ciprofloxacin and agomelatine[a] is contraindicated since it may result in an undesirable increase in agomelatine exposure (see **DRUG INTERACTIONS**).
- Concurrent administration of ciprofloxacin and tizanidine is contraindicated since it may result in an undesirable increase in serum tizanidine concentrations. This can be associated with clinically relevant tizanidine-induced side effects (hypotension, somnolence, drowsiness) (see **DRUG INTERACTIONS**).

[a] Currently not marketed in Canada

WARNINGS AND PRECAUTIONS

Serious Warnings and Precautions

- Fluoroquinolones, including CIPROFLOXACIN INJECTION USP, have been associated with disabling and potentially persistent adverse reactions which to date include, but are not limited to: tendonitis, tendon rupture, peripheral neuropathy and neuropsychiatric effects.
- CIPROFLOXACIN INJECTION USP has been shown to prolong the QT interval of the electrocardiogram in some patients (see **WARNINGS AND PRECAUTIONS**: **Cardiovascular**).
- Serious hypersensitivity and/or anaphylactic reactions have been reported in patients receiving quinolone therapy, including CIPROFLOXACIN INJECTION USP (see **WARNINGS AND PRECAUTIONS**: **Immune**).
- Fluoroquinolones including CIPROFLOXACIN INJECTION USP are associated with an increased risk of tendinitis and tendon rupture in all ages. The risk is further increased in older patients usually over 60 years of age, in patients taking corticosteroid drugs, and in patients with kidney, heart or lung transplants (see **WARNINGS AND PRECAUTIONS**: **Musculoskeletal**).
- Fluroquinolones including CIPROFLOXACIN INJECTION USP may exacerbate muscle weakness in persons with myasthenia gravis. Avoid using CIPROFLOXACIN INJECTION USP in patients with a known history of myasthenia gravis (see **WARNINGS AND PRECAUTIONS**: **Musculoskeletal**).
- Seizures and toxic psychoses may occur with quinolone therapy. Convulsions, increased intracranial pressure (including pseudotumor cerebri) and toxic psychoses have been reported in patients receiving quinolones, including CIPROFLOXACIN INJECTION USP. CIPROFLOXACIN INJECTION USP should be used with caution in patients with known or suspected CNS disorders which may predispose them to seizures or lower the seizure threshold (see **WARNINGS AND PRECAUTIONS**: **Central Nervous System Effects**).
- Cases of hepatic necrosis and life-threatening hepatic failure have been reported with CIPROFLOXACIN INJECTION USP (see **WARNINGS AND PRECAUTIONS**: **Hepatic/Biliary/Pancreatic**).

General

The use of ciprofloxacin with other drugs may lead to drug-drug interactions. For established or potential drug interactions, see **DRUG INTERACTIONS**.

Prolonged use of ciprofloxacin may result in the overgrowth of nonsusceptible organisms. Careful observation of the patient is therefore essential, and if superinfection should occur during therapy, appropriate measures should be taken.

Ciprofloxacin is not recommended for treatment of pneumococcal infections due to inadequate efficacy against *Streptococcus pneumonia.*

As CIPROFLOXACIN INJECTION USP contains dextrose, it is unsuitable for patients with rare hereditary problems of fructose intolerance, glucose-galactose malabsorption or sucrase-isomaltase insufficiency (see **PHARMACEUTICAL INFORMATION**).

Cardiovascular

Ciprofloxacin has been shown to prolong the QT interval of the electrocardiogram in some patients. In general, elderly patients may be more susceptible to drug-associated effects on the QT interval. Precaution should be taken when using ciprofloxacin with concomitant drugs that can result in prolongation of the QT interval (eg, class IA or III antiarrhythmics) or in patients with risk factors for torsade de pointes (eg, known QT prolongation, uncorrected hypokalemia) (see **DRUG INTERACTIONS** and **ADVERSE REACTIONS**).

Aortic Aneurysm and Aortic Dissection

Epidemiologic studies report an increased risk of aortic aneurysm and dissection after intake of fluoroquinolones, particularly in the older population.

Therefore, fluoroquinolones should only be used after careful benefit-risk assessment and after consideration of other therapeutic options in patients with positive family history of aneurysm disease, or in patients diagnosed with pre-existing aortic aneurysm and/or aortic dissection, or in presence of other risk factors for aortic aneurysm and dissection (e.g., Marfan's syndrome, vascular Ehlers-Danlos syndrome, Takayasu's arteritis, giant cell arteritis, Behcet's disease, hypertension, atherosclerosis).

In case of sudden severe abdominal, chest or back pain, patients should be advised to immediately consult a physician in an emergency department.

Endocrine and Metabolism

Blood Glucose Disturbances

Fluoroquinolones, including ciprofloxacin, have been associated with disturbances of blood glucose, including symptomatic hyperglycemia and hypoglycemia, usually in diabetic patients receiving concomitant treatment with an oral hypoglycemic agent (e.g., glyburide) or with insulin. In these patients, careful monitoring of blood glucose is recommended. SEVERE CASES OF HYPOGLYCEMIA RESULTING IN COMA OR DEATH HAVE BEEN REPORTED. If a hypoglycemic reaction occurs, discontinue CIPROFLOXACIN INJECTION USP immediately and initiate appropriate therapy.

Central Nervous System Effects

Psychiatric Adverse Reactions

Fluoroquinolones, including ciprofloxacin, have been associated with an increased risk of psychiatric adverse reactions, including: toxic psychoses, hallucinations, or paranoia; depression, or suicidal thoughts; anxiety, agitation, restlessness, or nervousness; confusion, delirium,

disorientation, or disturbances in attention; insomnia or nightmares; and memory impairment. Cases of attempted or completed suicide have been reported, especially in patients with a medical history of depression, or an underlying risk factor for depression. These reactions may occur following the first dose. If these reactions occur in patients receiving CIPROFLOXACIN INJECTION USP, discontinue CIPROFLOXACIN INJECTION USP and institute appropriate measures.

Central Nervous System Adverse Reactions
Fluoroquinolones, including ciprofloxacin, have been associated with an increased risk of seizures (convulsions), increased intracranial pressure (including pseudotumor cerebri), tremors, and light-headedness. As with other fluoroquinolones, CIPROFLOXACIN INJECTION USP should be used with caution in patients with a known or suspected central nervous system (CNS) disorder that may predispose them to seizures or lower the seizure threshold (e.g., severe cerebral arteriosclerosis, epilepsy) or in the presence of other risk factors that may predispose them to seizures or lower the seizure threshold (e.g., certain drug therapy, renal dysfunction). If these reactions occur in patients receiving CIPROFLOXACIN INJECTION USP, discontinue CIPROFLOXACIN INJECTION USP immediately and institute appropriate measures.

Gastrointestinal

Clostridium difficile-associated disease
Clostridium difficile-associated disease (CDAD) has been reported with the use of many antibacterial agents, including ciprofloxacin. CDAD may range in severity from mild diarrhea to fatal colitis. It is important to consider this diagnosis in patients who present with diarrhea or symptoms of colitis, pseudomembranous colitis, toxic megacolon, or perforation of the colon subsequent to the administration of any antibacterial agent. CDAD has been reported to occur over 2 months after the administration of antibacterial agents.

Treatment with antibacterial agents may alter the normal flora of the colon and many permit overgrowth of *Clostridium difficile. C. difficile* produces toxins A and B, which contribute to the development of CDAD. CDAD may cause significant morbidity and mortality. CDAD can be refractory to antimicrobial therapy.

If the diagnosis of CDAD is suspected or confirmed, appropriate therapeutic measures should be initiated. Mild cases of CDAD usually respond to discontinuation of antibacterial agents not directed against *C. difficile.* In moderate to severe cases, consideration should be given to management with fluids and electrolytes, protein supplementation, and treatment with an antibacterial agent clinically effective against *C. difficile.* Drugs that inhibit peristalsis may delay clearance of *C. difficile* and its toxins, and therefore should not be used in the treatment of CDAD. Surgical evaluation should be instituted as clinically indicated since surgical intervention may be required in certain severe cases. (see **ADVERSE REACTIONS**).

Hepatic/Biliary/Pancreatic
Cases of hepatic necrosis and life-threatening hepatic failure have been reported with ciprofloxacin. In the event of any signs and symptoms of hepatic disease (such as anorexia, jaundice, dark urine, pruritus, or tender abdomen), treatment should be discontinued (see **ADVERSE REACTIONS**).

There can be an increase in transaminases, alkaline phosphatase, or cholestatic jaundice, especially in patients with previous liver damage, who are treated with ciprofloxacin (see **ADVERSE REACTIONS**).

Immune

Serious hypersensitivity and/or anaphylactic reactions have been reported in patients receiving quinolone therapy, including ciprofloxacin (see **ADVERSE REACTIONS**). These reactions may occur within the first 30 minutes following the first dose and may require epinephrine and other emergency measures. Some reactions have been accompanied by cardiovascular collapse, hypotension/shock, seizure, loss of consciousness, tingling, angioedema (including tongue, laryngeal, throat or facial edema/swelling), airway obstruction (including bronchospasm, shortness of breath and acute respiratory distress), dyspnea, urticaria, itching and other serious skin reactions.

CIPROFLOXACIN INJECTION USP should be discontinued at the first appearance of a skin rash or any other sign of hypersensitivity. Serious acute hypersensitivity reactions may require treatment with epinephrine and other resuscitative measures, including oxygen, intravenous fluids, antihistamines, corticosteroids, pressor amines and airway management, as clinically indicated.

Serious and sometimes fatal events, some due to hypersensitivity and some due to uncertain etiology, have been reported in patients receiving therapy with all antibiotics. These events may be severe and generally occur following the administration of multiple doses. Clinical manifestations may include one or more of the following: fever, rash or severe dermatologic reactions (e.g., toxic epidermal necrolysis, Stevens-Johnson Syndrome), vasculitis, arthralgia, myalgia, serum sickness, allergic pneumonitis, interstitial nephritis, acute renal insufficiency or failure, hepatitis, jaundice, acute hepatic necrosis or failure, hepatic necrosis with fatal outcome, anemia including hemolytic and aplastic, thrombocytopenia including thrombotic thrombocytopenic purpura, leukopenia, agranulocytosis, pancytopenia, and/or other hematologic abnormalities.

Musculoskeletal

Myasthenia Gravis

Fluoroquinolones, including CIPROFLOXACIN INJECTION USP, have neuromuscular blocking activity and may exacerbate muscle weakness in persons with myasthenia gravis. Postmarketing serious adverse events, including deaths and requirement for ventilatory support, have been associated with fluoroquinolone use in persons with myasthenia gravis. Avoid CIPROFLOXACIN INJECTION USP in patients with a known history of myasthenia gravis (see **ADVERSE REACTIONS**).

Tendinitis

Rupture of the shoulder, hand and Achilles tendons that required surgical repair or resulted in prolonged disability have been reported in patients receiving quinolones, including ciprofloxacin (see **ADVERSE REACTIONS**). CIPROFLOXACIN INJECTION USP should be discontinued if the patient experiences pain, inflammation, or rupture of a tendon. Patients should rest and refrain from exercise until the diagnosis of tendinitis or tendon rupture has been confidently excluded. The risk of developing fluoroquinolone-associated tendinitis and tendon rupture is further increased in older patients usually over 60 years of age, in patients taking corticosteroid drugs, and in patients with kidney, heart, or lung transplants. Factors, in addition to age and

corticosteroid use, that may independently increase the risk of tendon rupture include strenuous physical activity, renal failure, and previous tendon disorders such as rheumatoid arthritis. Tendinitis and tendon rupture have also occurred in patients taking fluoroquinolones who do not have the above risk factors. Tendon rupture can occur during or after completion of therapy; cases occurring up to several months after completion of therapy have been reported. CIPROFLOXACIN INJECTION USP should be discontinued if the patient experiences pain, swelling, inflammation, or rupture of a tendon. Patients should be advised to rest at the first sign of tendinitis or tendon rupture, and to contact their healthcare provider regarding changing to a non-quinolone antimicrobial drug.

CIPROFLOXACIN INJECTION USP should not be used in patients with a history of tendon disease/disorder related to previous quinolone treatment.

Neurologic

Seizures and toxic psychoses may occur with quinolone therapy. Convulsions, increased intracranial pressure (including pseudotumor cerebri), and toxic psychosis have been reported in patients receiving quinolones, including ciprofloxacin. Cases of status epilepticus have also been reported. Ciprofloxacin may also cause central nervous system (CNS) stimulation which may lead to dizziness, tremors, restlessness, light-headedness, confusion, hallucinations, depression, nervousness, agitation, insomnia, anxiety, paranoia, nightmares and rarely, suicidal thoughts or acts. In some cases, depression or psychotic reactions can progress to suicidal ideations/thoughts and self-injurious behaviour, such as attempted suicide or completed suicide. These reactions may occur even following the first dose of CIPROFLOXACIN INJECTION USP. If any of these reactions occur in patients receiving ciprofloxacin, the drug should be discontinued and appropriate measures instituted. CIPROFLOXACIN INJECTION USP should be used with caution in patients with known or suspected CNS disorders, which may predispose to seizures or lower the seizure threshold (eg, severe cerebral arteriosclerosis, epilepsy), or in the presence of other risk factors that may predispose to seizures or lower the seizure threshold (eg, certain drug therapy, renal dysfunction) (see **ADVERSE REACTIONS**).

Peripheral Neuropathy

Cases of sensory or sensorimotor axonal polyneuropathy affecting small and/or large axons resulting in paresthesias, hypoesthesias, dysesthesias and/or weakness have been reported in patients receiving quinolones, including ciprofloxacin.

CIPROFLOXACIN INJECTION USP should be discontinued if the patient experiences symptoms of neuropathy including pain, burning, tingling, numbness, and/or weakness, or is found to have deficits in light touch, pain, temperature, position sense, vibratory sensation, and/or motor strength in order to prevent the development of an irreversible condition (see **ADVERSE REACTIONS**).

Renal

Crystalluria related to ciprofloxacin has been reported only rarely in man because human urine is usually acidic. Crystals have been observed in the urine of laboratory animals, usually from alkaline urine. Patients receiving ciprofloxacin should be well hydrated and alkalinity of the urine should be avoided. The recommended daily dose should not be exceeded.

Since ciprofloxacin is eliminated primarily by the kidney, CIPROFLOXACIN INJECTION USP should be used with caution and at a reduced dosage in patients with impaired renal function (see **DOSAGE AND ADMINISTRATION** and **DETAILED PHARMACOLOGY**: **Human Pharmacology**).

Skin

Phototoxicity
Ciprofloxacin has been shown to produce photosensitivity reactions. Moderate to severe phototoxicity reactions have been observed in patients exposed to direct sunlight or ultraviolet light while receiving drugs in this class. Excessive exposure to sunlight or ultraviolet light should be avoided. Therapy should be discontinued if phototoxicity occurs (eg, sunburn-like skin reactions).

Susceptibility/Resistance

Development of Drug-Resistant bacteria
Prescribing CIPROFLOXACIN INJECTION USP in the absence of a proven or strongly suspected bacterial infection is unlikely to provide benefit to the patient and risks the development of drug-resistant bacteria.

Vision Disorders
If vision disorder occurs in association with the use of CIPROFLOXACIN INJECTION USP, consult an eye specialist immediately.

Special Populations

Pregnant Women
The safety of ciprofloxacin in pregnancy has not yet been established. CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose injection) should not be used in pregnant women unless the likely benefits outweigh the possible risk to the fetus. Ciprofloxacin has been shown to be non-embryotoxic and non-teratogenic in animal studies.

Nursing Women
The safety of ciprofloxacin in nursing women has not been established. Ciprofloxacin is excreted in human milk. Because of the potential for serious adverse reactions in infants nursing from women taking ciprofloxacin, a decision should be made to discontinue nursing or to discontinue the administration of CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose), taking into account the importance of the drug to the mother and the possible risk to the infant.

Pediatrics (<18 years of age)
The safety and efficacy of ciprofloxacin in the pediatric population less than 18 years of age have not been established. Quinolones, including CIPROFLOXACIN INJECTION USP, cause arthropathy and osteochondrosis in juvenile animals of several species. Damage to juvenile weight-bearing joints and lameness were observed both in rat and dog studies but not in weaned piglets

(see **TOXICOLOGY**). Histopathological examination of the weight-bearing joints in immature dogs revealed permanent lesions of the cartilage. CIPROFLOXACIN INJECTION USP is not recommended for use in pediatric patients and adolescents.

Geriatrics (≥ 65 years of age)
Ciprofloxacin is substantially excreted by the kidney, and the risk of adverse reactions may be greater in elderly patients with impaired renal function (see **DETAILED PHARMACOLOGY**: **Human Pharmacology**).

Monitoring and Laboratory Tests
Ciprofloxacin in vitro potency may interfere with the *Mycobacterium spp.* culture test by suppression of mycobacterial growth, causing false negative results in specimens from patients currently taking ciprofloxacin.

ADVERSE REACTIONS

Adverse Drug Reaction Overview
The following sections summarize the safety information derived from clinical trials and postmarket use of CIPROFLOXACIN INJECTION USP.

Clinical Trial Adverse Drug Reactions
Because clinical trials are conducted under very specific conditions the adverse reaction rates observed in the clinical trials may not reflect the rates observed in practice and should not be compared to the rates in the clinical trials of another drug. Adverse drug reaction information from clinical trials is useful for identifying drug-related adverse events and for approximating rates.

Ciprofloxacin is generally well tolerated. During worldwide clinical investigation (1991), 16 580 courses of ciprofloxacin treatment were evaluated for drug safety.

The incidence of adverse reactions was 8.0%. In orally treated patients enrolled in clinical trials, the most frequently reported events, possibly, probably drug-related were: nausea (1.3%), and diarrhea (1.0%).

Most of the adverse events reported were described as only mild or moderate in severity.

The adverse reactions according to treatment (oral, i.v., and sequential therapy) show that the incidence of adverse reactions was 8.0% for the group treated orally, 17% for the group treated with ciprofloxacin (i.v.) and 15.3% for the group treated sequentially. The difference between the oral and i.v. group relates to adverse vascular reactions which are known to be associated with i.v. administration.

In patients treated with ciprofloxacin (i.v.) the most frequently reported events, possibly, probably drug-related were: rash (1.8%), diarrhea (1.0%), and injection site pain (l.0%).

Local I.V. site reactions have been reported. These reactions are more frequent if the infusion time is 30 minutes or less. These may appear as local skin reactions which resolve rapidly upon

completion of the infusion. Subsequent I.V. administration is not contraindicated unless the reactions recur or worsen.

Events possibly or probably drug-related occurring at a frequency of less than 1% with ciprofloxacin i.v. treatment during clinical trials and subsequent post-marketing surveillance are as follows:

Body as a Whole: back pain, chest pain, pain, pain in extremities, moniliasis.

Cardiovascular System: palpitation, phlebitis, tachycardia, thrombophlebitis. The following has been reported rarely (≥0.01% <0.1%): hypotension. The following have been reported very rarely (<0.01%): angina pectoris, atrial fibrillation, cardiac arrest, cerebrovascular disorder, electrocardiogram abnormality, hot flashes, hypertension, kidney vasculitis, myocardial infarct, pericarditis, pulmonary embolus, substernal chest pain, syncope (fainting), vasodilation (hot flashes).

Digestive: abdominal pain, decreased appetite and food intake, dry mouth, dyspepsia, dysphagia, enlarged abdomen, flatulence, gastrointestinal moniliasis, jaundice, stomatitis, vomiting, abnormal liver function test. The following have been reported rarely: moniliasis (oral), cholestatic jaundice, and pseudomembranous colitis. The following have been reported very rarely: constipation, esophagitis, gastrointestinal hemorrhage, glossitis, hepatomegaly, ileus, increased appetite, intestinal perforation, life-threatening pseudomembranous colitis with possible fatal outcome, liver damage, melena, pancreatitis, tenesmus, tooth discoloration, toxic megacolon, ulcerative stomatitis.

Hemic and Lymphatic: agranulocytosis, anaemia, eosinophilia, granulocytopenia, leukocytopenia, leukocytosis, pancytopenia. The following have been reported rarely: abnormal prothrombin level, thrombocytopenia, thrombocytosis. The following have been reported very rarely: haemolytic anaemia, bone marrow depression (life-threatening), pancytopenia (life-threatening).

Hypersensitivity: rash. The following have been reported rarely: allergic reaction, anaphylactic/anaphylactoid reactions including facial, vascular and laryngeal edema, drug fever, haemorrhagic bullae and small nodules (papules) with crust formation showing vascular involvement (vasculitis), hepatitis, interstitial nephritis, petechiae (punctuate skin hemorrhages), pruritus, serum sickness-like reaction, Stevens-Johnson syndrome (potentially life-threatening) (see **WARNINGS AND PRECAUTIONS**: **Immune**). The following have been reported very rarely: shock (anaphylactic; life-threatening), pruritic rash, erythema multiforme (minor), erythema nodosum, major liver disorders including hepatic necrosis, (very rarely progressing to life threatening hepatic failures), toxic epidermal necrolysis (Lyell Syndrome, potentially life-threatening).

I.V. Infusion Site: thrombophlebitis, injection site reaction (e.g. edema / hypersensitivity / inflammation / pain). The following have been reported very rarely: burning, erythema, pain, paresthesia, and swelling.

Metabolic and Nutritional Disorder: creatinine increased. The following have been reported rarely: edema (face) hyperglycemia, hypoglycemia.

Musculoskeletal: The following have been reported rarely in patients of all ages: achiness, arthralgia (joint pain), joint disorder (joint swelling), pain in the extremities, partial or completed tendon rupture (shoulder, hand or Achilles tendon), tendonitis (predominantly achillotendonitis), myalgia (muscular pain). The following have been reported very rarely: myasthenia (exacerbation of symptoms of myasthenia gravis) (see **WARNINGS AND PRECAUTIONS**: **Musculoskeletal**).

Nervous System: agitation, confusion, convulsion, dizziness, hallucinations, headache, hypesthesia, increased sweating, insomnia, somnolence, tremor (trembling). The following has been reported rarely: paresthesia (peripheral paralgesia), abnormal dreams (nightmares), anxiety, seizures (including status epilepticus), depression (potentially culminating in self-injurious behavior, such as suicidal ideations/thoughts and attempted or completed suicide) (see **WARNINGS AND PRECAUTIONS**: **Neurologics**). The following have been reported very rarely: apathy, ataxia, depersonalization, diplopia, hemiplegia, hyperesthesia, hypertonia, increase of intracranial pressure, meningism, migraine, nervousness, neuritis, paresthesia, polyneuritis, sleep disorder, twitching, grand mal convulsions, abnormal (unsteady) gait, psychotic reactions (potentially culminating in self-injurious behavior, such as suicidal ideations / thoughts and attempted or completed suicide), intracranial hypertension (including pseudotumor cerebri). In some instances these reactions occurred after the first administration of ciprofloxacin. In these instances, ciprofloxacin has to be discontinued and the doctor should be informed immediately. Note: This product is not available for the oral route of administration.

Other: The following have been reported rarely: asthenia (general feeling of weakness, tiredness), death.

Respiratory System: dyspnea. The following have been reported very rarely: hiccup, hyperventilation, increased cough, larynx edema, lung edema, lung hemorrhage, pharyngitis, stridor, voice alteration.

Skin/Appendages: pruritus, urticaria, rash, maculopapular rash. The following has been reported rarely: photosensitivity reaction, blistering. The following have been reported very rarely: alopecia, angioedema, fixed eruption, photosensitive dermatitis, petechia.

Special Senses: abnormal vision (visual disturbances), taste perversion, tinnitus. The following have been reported rarely: transitory deafness (especially at higher frequencies), taste loss (impaired taste). The following have been reported very rarely: chromatopsia, colour blindness, conjunctivitis, corneal opacity, diplopia, ear pain, eye pain, parosmia (impaired smell), anosmia (usually reversible on discontinuation).

Urogenital System: albuminuria, hematuria. The following have been reported rarely: abnormal kidney function, acute kidney failure, dysuria, leukorrhea, nephritis interstitial, urinary retention, vaginitis, vaginal moniliasis.

Abnormal Hematologic and Clinical Chemistry Findings

Laboratory Values: increased alkaline phosphatase, ALT increased , AST increased, BUN (urea) increased, cholestatic parameters increased, Gamma - GT increased, lactic dehydrogenase increased, NPN increased, transaminases increased, decreased albuminuria, bilirubinemia, creatinine clearance

decreased, hypercholesteremia, hyperuricemia, increased sedimentation rate. The following have been reported rarely: acidosis, increased amylase, crystalluria, electrolyte abnormality, haematuria, hypercalcemia, hypocalcemia and lipase increased.

Post-Market Adverse Drug Reactions

The following additional adverse events, in alphabetical order, regardless of incidence or relationship to drug, have been reported during clinical trials and/or from worldwide postmarketing experience in patients given ciprofloxacin (includes all formulations, all dosages, all drug-therapy durations, and in all indications): acute generalized exanthematous pustulosis (AGEP), arrhythmia, atrial flutter, bleeding diathesis, bronchospasm, C. difficile associated diarrhea, candiduria, cardiac murmur, cardiopulmonary arrest, cardiovascular collapse, cerebral thrombosis, chills, delirium, drowsiness, dysphasia, edema (conjunctivae, hands, lips, lower extremities, neck), epistaxis, exfoliative dermatitis, fever, gastrointestinal bleeding, gout (flare up), gynecomastia, hearing loss, hemoptysis, hemorrhagic cystitis, hyperpigmentation, joint stiffness, lightheadedness, lymphadenopathy, manic reaction, myoclonus, nystagmus, pain (arm, breast, epigastric, foot, jaw, neck, oral mucosa), paranoia, peripheral neuropathy, phobia, pleural effusion, polyneuropathy, polyuria, postural hypotension, pulmonary embolism, purpura, QT prolongation, renal calculi, respiratory arrest, respiratory distress, restlessness, rhabdomyolysis, torsades de pointes, toxic psychosis, unresponsiveness, urethral bleeding, urination (frequent), ventricular ectopy, ventricular fibrillation, ventricular tachycardia, vesicles, visual acuity (decreased) and visual disturbances (flashing lights, change in colour perception, overbrightness of lights).

The following has been reported at an unknown frequency: international normalized ratio (INR) increased (in patients treated with Vitamin K antagonists).

DRUG INTERACTIONS

Overview

SERIOUS AND FATAL REACTIONS HAVE BEEN REPORTED IN PATIENTS RECEIVING CONCURRENT ADMINISTRATION OF CIPROFLOXACIN AND THEOPHYLLINE. These reactions include cardiac arrest, seizure, status epilepticus and respiratory failure. Similar serious adverse events have been reported in patients receiving theophylline alone; the possibility that ciprofloxacin may potentiate these reactions cannot be eliminated. If concomitant use cannot be avoided, serum levels of theophylline should be monitored and dosage adjustments should be made as appropriate.

Cytochrome P450

Ciprofloxacin is contraindicated in patients receiving concomitant treatment with agomelatine[a] or tizanidine as this may lead to an undesirable increase in exposure to these drugs.

Ciprofloxacin is known to be a moderate inhibitor of the CYP450 1A2 enzymes. Care should be taken when other drugs are administered concomitantly which are metabolized via the same enzymatic pathway (e.g., theophylline, methylxanthines, caffeine, duloxetine, clozapine, zolpidem).

Increased plasma concentrations associated with drug specific side effects may be observed due to inhibition of their metabolic clearance by ciprofloxacin.

[a] Currently not marketed in Canada

Drug-Drug Interactions

The drugs listed in this table are based on either drug interaction case reports or studies, or potential interactions due to the expected magnitude and seriousness of the interaction (ie, those identified as contraindicated).

Table 2 - Established or Potential Drug-drug Interactions

Proper Name	Ref	Effect	Clinical Comment
Agomelatine[a]	T	No clinical data are available for interaction with ciprofloxacin. Fluvoxamine, a CYP1A2 inhibitor, markedly inhibits the metabolism of agomelatine resulting in a 60-fold (range 12 to 412) increase of agomelatine exposure (AUC). Similar effects can be expected upon concurrent ciprofloxacin administration.	Agomelatine must not be administered concurrently with ciprofloxacin since it may result in an undesirable increase in agomelatine exposure and associated risk of hepatotoxicity (see **CONTRAINDICATIONS**).
Antidiabetic Agents	C	Disturbances of blood glucose, including symptomatic hyperglycemia and hypoglycemia, have been reported with quinolones, including ciprofloxacin, usually in diabetic patients receiving concomitant treatment with an oral antidiabetic agent (mainly sulfonylureas such as glyburide/glibenclamide, glimepiride) or with insulin.	In diabetic patients, careful monitoring of blood glucose is recommended. If a hypoglycemic reaction occurs in a patient receiving ciprofloxacin, discontinue the drug immediately and an appropriate therapy should be instituted (see **ADVERSE REACTIONS**).
Caffeine and Other Xanthine Derivatives	CT	Caffeine has been shown to interfere with the metabolism and pharmacokinetics of ciprofloxacin. Excessive caffeine intake should be avoided. Ciprofloxacin decreases caffeine clearance and inhibits the formation of paraxanthine after caffeine administration. Upon concurrent administration of ciprofloxacin and pentoxifylline (oxpentifylline)-containing products, raised serum concentrations of this xanthine derivative were reported.	Caution and careful monitoring of patients on concomitant therapy of ciprofloxacin and caffeine or pentoxifylline (oxpentifylline) containing products is recommended
Class IA or III Antiarrhythmics	C	Ciprofloxacin may have an additive effect on the QT interval (see **WARNINGS AND PRECAUTIONS**).	Like other fluoroquinolones, precaution should be taken when using ciprofloxacin together with class IA (eg, quinidine, procainamide) or III (eg, amiodarone, sotalol) antiarrhythmics.
Clozapine	C	Following concomitant administration of 250 mg ciprofloxacin for 7 days, serum concentrations of clozapine and n-desmethylclozapine were increased by 29% and 31%, respectively (see **WARNINGS AND PRECAUTIONS**).	Clinical surveillance and appropriate adjustment of clozapine dosage during and shortly after co-administration with ciprofloxacin is advised.
Cyclosporine	CT	Some quinolones, including ciprofloxacin, have been associated with transient increases in serum creatinine levels in patients who are concomitantly receiving cyclosporine.	It is necessary to monitor the serum creatinine concentrations in these patients (twice a week).

Table 2 - Established or Potential Drug-drug Interactions

Proper Name	Ref	Effect	Clinical Comment
Duloxetine	C	In clinical studies it was demonstrated that concomitant use of duloxetine with inhibitors of the CYP450 1A2 isozyme such as fluvoxamine, may result in an increase of AUC and C_{max} of duloxetine. Although no clinical data are available on a possible interaction with ciprofloxacin, similar effects can be expected upon concomitant administration.	Caution and careful monitoring of patients on concomitant therapy is recommended.
Ferrous Sulfate	CT	Oral ferrous sulfate at therapeutic doses decreases the bioavailability of oral ciprofloxacin. Note: This product is not available for the oral route of administration	Ciprofloxacin should be administered at least 2 hours before or 6 hours after this preparation.
Calcium-Fortified Products (including Food and Dairy Products)	CT	Although, ciprofloxacin may be taken with meals that include milk, simultaneous administration with dairy products, alone, or with calcium-fortified products should be avoided, since decreased absorption is possible.	It is recommended that ciprofloxacin be administered at least 2 hours before or 6 hours after substantial calcium intake (>800 mg) (see **DOSAGE AND ADMINISTRATION**).
Histamine H_2-receptor Antagonists	CT	Histamine H_2-receptor antagonists appear to have no significant effect on the bioavailability of ciprofloxacin.	No dosage adjustment is required.
Lidocaine	CT	It was demonstrated in healthy subjects that concomitant use of lidocaine with ciprofloxacin, an inhibitor of CYP450 1A2 isozyme, reduces clearance of intravenous lidocaine by 22%. Ciprofloxacin may increase the systemic toxicity of lidocaine.	Caution and careful monitoring of patients on concomitant therapy is recommended.
Methotrexate	C	Renal tubular transport of methotrexate may be inhibited by concomitant administration of ciprofloxacin, potentially leading to increased plasma levels of methotrexate. This might increase the risk of methotrexate associated toxic reactions.	Patients under methotrexate therapy should be carefully monitored when concomitant ciprofloxacin therapy is indicated.
Metoclopramide	CT	Metoclopramide accelerates the absorption of ciprofloxacin (oral), resulting in a shorter time to reach maximum plasma concentrations. No effect was seen on the bioavailability of ciprofloxacin. Note: This product is not available for the oral route of administration.	No dosage adjustment required.

Table 2 - Established or Potential Drug-drug Interactions

Proper Name	Ref	Effect	Clinical Comment
Multivalent Cations	CT	Concurrent administration of a quinolone, including ciprofloxacin, with multivalent cation-containing products such as magnesium/aluminum antacids, polymeric phosphate binders such as sevelamer, lanthanum carbonate, sucralfate, VIDEX® (didanosine) chewable/buffered tablets or pediatric powder, mineral supplements or products containing calcium, iron, or zinc may substantially interfere with the absorption of the quinolone, resulting in serum and urine levels considerably lower than desired. Absorption of ciprofloxacin is significantly reduced by concomitant administration of multivalent cation-containing products. Note: This product is not available for the oral route of administration.	Ciprofloxacin should be administered at least 2 hours before or 6 hours after these preparations.
Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)	CT	Concomitant administration of a nonsteroidal anti-inflammatory drug (fenbufen) with a quinolone (enoxacin) has been reported to increase the risk of CNS stimulation and convulsive seizures.	Caution and careful monitoring of patients on concomitant therapy is recommended.
Omeprazole	CT	Concomitant administration of ciprofloxacin and omeprazole containing medicinal products results in a slight reduction of C_{max} and AUC of ciprofloxacin.	No dosage adjustment needed
Oral Anticoagulants	CT	Simultaneous administration of ciprofloxacin with an oral anticoagulant (eg, vitamin K antagonist) may augment its anticoagulant effects. There have been many reports of increases in oral anticoagulant activity in patients receiving antibacterial agents, including quinolones. The risk may vary with the underlying infection, age, and general status of the patient so that the contribution of ciprofloxacin to the increase in INR (international normalized ratio) is difficult to assess.	INR and/or prothrombin time should be monitored frequently during and shortly after co-administration of ciprofloxacin with an oral anticoagulant (eg, warfarin, acenocoumarol).

Table 2 - Established or Potential Drug-drug Interactions

Proper Name	Ref	Effect	Clinical Comment
Phenytoin	CT	Altered (decreased or increased) serum levels of phenytoin were observed in patients receiving ciprofloxacin and phenytoin simultaneously.	Monitoring of phenytoin therapy is recommended, including phenytoin serum concentration measurements, during and shortly after co-administration of ciprofloxacin with phenytoin to avoid the loss of seizure control associated with decreased phenytoin levels and to prevent phenytoin overdose-related undesirable effects.
Probenecid	CT	Probenecid blocks renal tubular secretion of ciprofloxacin and has been shown to produce an increase in the level of ciprofloxacin in the serum. Co-administration of probenecid (1000 mg) with ciprofloxacin (500 mg) orally resulted in about 50% reduction in the ciprofloxacin renal clearance and a 50% increase in its concentration in the systemic circulation.	Caution and careful monitoring of patients on concomitant therapy is recommended.
Ropinirole	CT	In a clinical study it was shown that concomitant use of ropinirole with ciprofloxacin, an inhibitor of the CYP450 1A2 isozyme, resulted in increases in the C_{max} and AUC of ropinirole of 60% and 84%, respectively. Ciprofloxacin may increase the systemic toxicity of ropinirole.	Monitoring ropinirole-related undesirable effects, dose adjustment as appropriate is recommended during and shortly after co-administration with ciprofloxacin
Sildenafil	CT	C_{max} and AUC of sildenafil were increased approximately two-fold in healthy subjects after an oral dose of 50 mg was given concomitantly with 500 mg ciprofloxacin. Note: This product is not available for the oral route of administration.	Caution should be used when prescribing ciprofloxacin concomitantly with sildenafil, taking into consideration the risks and the benefits.

Table 2 - Established or Potential Drug-drug Interactions

Proper Name	Ref	Effect	Clinical Comment
Theophylline	CT	Concurrent administration of ciprofloxacin with theophylline may lead to elevated serum concentrations of theophylline and prolongation of its elimination half-life. This may result in increased risk of theophylline-related adverse reactions. Studies with immediate-release ciprofloxacin have shown that concomitant administration of ciprofloxacin with theophylline decreases the clearance of theophylline, resulting in elevated serum theophylline levels and increased risk of a patient developing CNS or other adverse reactions.	If concomitant use cannot be avoided, serum levels of theophylline should be monitored and dosage adjustments made as appropriate.
Tizanidine	CT	In a clinical study in healthy subjects there was an increase in tizanidine serum concentrations (C_{max} increase: 7-fold, range: 4- to 21-fold; AUC increase: 10-fold, range: 6- to 24-fold) when given concomitantly with ciprofloxacin. Associated with the increased serum concentrations was a potentiated hypotensive and sedative effect.	Tizanidine must not be administered together with ciprofloxacin (see **CONTRAINDICATIONS**).
Zolpidem	CT	Zolpidem exposure (AUC) increased by 46% after a single 5 mg dose when administered together with a 500 mg oral ciprofloxacin dose to healthy volunteers pretreated with ciprofloxacin (300.2 ± 115.5 vs. 438.1 ± 142.6 ng h/ml)	Concurrent use with ciprofloxacin is not recommended.

Legend: C=Case Study; CT=Clinical Trial; T=Theoretical

[a] Currently not marketed in Canada

Serum Protein Binding

Serum protein binding of ciprofloxacin is between 19% to 40%, which is not likely to be high enough to cause significant protein binding interactions with other drugs.

Drug-Food Interactions

Although ciprofloxacin may be taken with meals that include milk, simultaneous administration with dairy products alone (calcium intake >800 mg), with calcium-fortified products, or mineral-fortified drinks, should be avoided since decreased absorption is possible. It is recommended that ciprofloxacin be administered at least 2 hours before or 6 hours after these preparations (see **DRUG INTERACTIONS**: **Drug-Drug Interactions**, and **DOSAGE AND ADMINISTRATION**: **Dosing Considerations**).

Drug-Herb Interactions

Interactions with herbal products have not been established.

Drug-Laboratory Test Interactions

Ciprofloxacin in vitro potency may interfere with the *Mycobacterium spp.* culture test by suppression of mycobacterial growth, causing false negative results in specimens from patients currently taking CIPROFLOXACIN INJECTION USP.

Drug-Lifestyle Interactions

Ability to Drive and Operate Machinery

Fluoroquinolones including ciprofloxacin may result in an impairment of the patient's ability to drive or operate machinery due to CNS reactions. This applies particularly in combination with alcohol (see **ADVERSE REACTIONS**).

DOSAGE AND ADMINISTRATION

Dosing Considerations

The determination of dosage for any particular patient must take into consideration the severity and nature of the infection, the susceptibility of the causative organism, the integrity of the patient's host-defence mechanisms, and the status of renal function.

Intravenous Administration

CIPROFLOXACIN INJECTION USP should be administered by I.V. infusion over a period of 60 minutes. Slow infusion into a large vein will minimize patient discomfort and reduce the risk of venous irritation.

Recommended Dose and Dosage Adjustment

Adults

The recommended adult dosages of CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose) are:

Table 3: Recommended Adult Dosages

Location of Infection	Type/Severity	Unit Dose	Frequency	Daily Dose
Urinary Tract	Moderate/Severe/ Complicated	200 mg to 400 mg	q12h	400 mg to 800 mg
Respiratory Tract	Moderate/ Severe	400 mg	q8h to q12h	800 mg to 1200 mg
Skin or Skin Structure Blood Bone	Moderate	400 mg	q12h	800 mg
Intra-abdominal	Complicated	400 mg	q12h	400 mg q12h only when used in combination with metronidazole 500 mg IV q6h*
Empiric Therapy in Febrile Neutropenic Patients	Severe Ciprofloxacin + Piperacillin Sodium	400 mg 50 mg/kg	q8h q4h	1200 mg Not to exceed 24 g/day

*1) Clinical success was demonstrated with a limited number of patients switched to oral therapy: (ciprofloxacin (oral) 500 mg PO q12h plus metronidazole 500 mg PO q6h) during day 3, 4 or 5 of therapy when able to take oral medication

and having shown an initial clinical response to the intravenous therapy. Note: This product is not available for the oral route of administration.

2) See Metronidazole Product Monograph for Prescribing Information including cautionary statements.

3) For information on ciprofloxacin plus metronidazole combination therapy, see **DETAILED PHARMACOLOGY: Human Pharmacology,** and **ADVERSE REACTION** sections of the CIPROFLOXACIN INJECTION USP Product Monograph.

Intermittent Intravenous Infusion

CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose injection) should be administered only by intravenous infusion over a period of 60 minutes. The drug should not be given by rapid injection. Slow infusion of a dilute solution into a large vein will minimize patient discomfort and reduce the risk of venous irritation. [34]

If CIPROFLOXACIN INJECTION USP is to be given concomitantly with another drug, each drug should be given separately in accordance with the recommended dosage and route of administration for each drug. CIPROFLOXACIN INJECTION USP contains ciprofloxacin at 2.0 mg/mL and should be administered "as is".

As with all parenteral drug products, intravenous admixtures should be inspected visually for clarity, particulate matter, precipitate, discoloration and leakage prior to administration, whenever solution and container permits.

Dextrose load for intravenous solution formulation

Ciprofloxacin infusion solution (bags) contain glucose. This should be taken into account in patients with diabetes mellitus. Glucose content is 5 g for the 100 mL bag and 10 g for the 200 mL bag (see **PHARMACEUTICAL INFORMATION**).

Definitive clinical studies have not been completed for severe infections other than in the respiratory tract.

The duration of treatment depends upon the severity of infection. Generally ciprofloxacin should be continued for at least 3 days after the signs and symptoms of infection have disappeared. The usual duration is 7 to 14 days. However for severe and complicated infections more prolonged therapy may be required. Bone and joint infections may require treatment for 4 to 6 weeks or longer.

Sequential I.V./P.O. Therapy

In patients receiving intravenous ciprofloxacin, oral ciprofloxacin may be considered when clinically indicated at the discretion of the physician. Clinical studies evaluating the use of sequential I.V./P.O. therapy in septicemia, however, have not been completed. Note: This product is not available for the oral route of administration.

Special Populations

Impaired Renal Function

Ciprofloxacin is eliminated primarily by renal excretion. However, the drug is also metabolized and partially cleared through the biliary system of the liver and through the intestine (see **HUMAN PHARMACOLOGY**). This alternate pathway of drug elimination appears to compensate for the

reduced renal excretion of patients with renal impairment. Nonetheless, some modification of dosage is recommended, particularly for patients with severe renal dysfunction. The following table provides a guideline for dosage adjustment. However, monitoring of serum drug levels provides the most reliable basis for dosage adjustments.

Table 4: Maximum Daily Dose with Stated Creatinine Clearance or Serum Creatinine

Creatinine Clearance mL/min/1.73m^2	**Maximum Daily Dose** (I.V.)	**Serum Creatinine Concentration mg/100mL**
31-60	800 mg	1.4-1.9
≤ 30	400 mg	≥ 2.0

Maximum daily doses are not to be exceeded when either creatinine clearance or serum creatinine are in the ranges stated.

Hemodialysis
Only a small amount of ciprofloxacin (< l0%) is removed from the body after hemodialysis or peritoneal dialysis. For hemodialysis patients, please follow dosing recommendations as described in Table 4. On dialysis days, the dose should be administered after dialysis.

When only the serum creatinine concentration is available, the following formula (based on sex, weight and age of the patient) may be used to convert this value into creatinine clearance. The serum creatinine should represent a steady state of renal function:

Creatinine Clearance mL/sec =

Males: $\frac{\text{Weight (kg) x (140 - age)}}{\text{49 x serum creatinine (mcmol/L)}}$

Females: 0.85 x the above value

In traditional units mL/min =

Males: $\frac{\text{Weight (kg) x (140 - age)}}{\text{72 x serum creatinine (mg/100 mL)}}$

Females: 0.85 x the above value

Impaired Hepatic Function
No dosage adjustment is required.

Pediatric Use
The safety and efficacy of ciprofloxacin in individuals less than 18 years of age has not been established. CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose injection) should not be used in pediatric patients and adolescents (see **WARNINGS AND PRECAUTIONS**).

Missed Dose
Take the normal dose as soon as possible and then continue as prescribed. However, if it is almost time for your next dose, do not take the missed dose and continue as usual. Do not take a double dose to make up for a forgotten dose. Be sure to complete your course of treatment.

OVERDOSAGE

For management of a suspected drug overdose, contact your regional Poison Control Centre.

In the event of acute, excessive oral overdosage, reversible renal toxicity, arthralgia, myalgia and CNS symptoms have been reported. Therefore, apart from routine emergency measures, it is recommended to monitor renal function and to administer magnesium- or calcium-containing antacids which reduce the absorption of ciprofloxacin and to maintain adequate hydration. Based on information obtained from subjects with chronic renal failure, only a small amount of ciprofloxacin (< 10%) is removed from the body after hemodialysis or peritoneal dialysis.

The administration of activated charcoal as soon as possible after oral overdose may prevent excessive increase of systemic ciprofloxacin exposure.

ACTION AND CLINICAL PHARMACOLOGY

Mechanism of Action
Ciprofloxacin, a synthetic fluoroquinolone, has *in vitro* activity against a wide range of gram-negative and gram-positive microorganisms. Its bactericidal action is achieved through inhibition of topoisomerase II (DNA gyrase) and topoisomerase IV (both Type II topoisomerases), which are required for bacterial DNA replication, transcription, repair, and recombination.

Ciprofloxacin retained some of its bactericidal activity after inhibition of RNA and protein synthesis by rifampin and chloramphenicol, respectively. These observations suggest ciprofloxacin may possess two bactericidal mechanisms, one mechanism resulting from the inhibition of DNA gyrase and a second mechanism which may be independent of RNA and protein synthesis.

The mechanism of action of fluoroquinolones, including ciprofloxacin, is different from that of penicillins, cephalosporins, aminoglycosides, macrolides, and tetracyclines. Therefore, microorganisms resistant to these classes of drugs may be susceptible to ciprofloxacin. Conversely, microorganisms resistant to fluoroquinolones may be susceptible to these other classes of antimicrobial agents (see **MICROBIOLOGY**). There is no cross-resistance between ciprofloxacin and the mentioned classes of antibiotics.

Pharmacokinetics
(See **DETAILED PHARMACOLOGY: Human Pharmacology**)

General
Ciprofloxacin and metronidazole have been studied in combination and serum levels of ciprofloxacin are not significantly altered by metronidazole at the doses studied. Serum levels of

metronidazole when administered intravenously at a dose of 500 mg IV q6h in combination with ciprofloxacin 400 mg IV q12h are: AUC_{0-6} 153.0 mg.h/L, C_{max} 33.6 mg/L and t_{max} 1.0 hours. (See **DETAILED PHARMACOLOGY**: **Human Pharmacology**)

Following infusion of 400 mg IV Ciprofloxacin every eight hours in combination with 50 mg/kg IV piperacillin sodium every 4 hours, mean serum ciprofloxacin concentrations were 3.02 mcg/mL at 30 minutes and 1.18 mcg/mL between 6-8 hours after the end of infusion. The mean serum ciprofloxacin concentration given alone at 400 mg IV every eight hours was 3.67 mcg/mL at 30 minutes and 1.16 mcg/mL at 6 hours after the end of infusion.

Absorption
Following an intravenous infusion of ciprofloxacin the mean maximum serum concentrations were achieved at the end of infusion. Pharmacokinetics of ciprofloxacin were linear over the dose range up to 400 mg administered intravenously.

Comparison of the pharmacokinetic parameters for a bid and tid i.v. dose regimen indicated no evidence of drug accumulation for ciprofloxacin and its metabolites.

A 60-minute i.v. infusion of 200 mg ciprofloxacin or the oral administration of 250 mg ciprofloxacin both given every 12 hours produced an equivalent area under the serum concentration time curve (AUC).

A 60-minute infusion of 400 mg ciprofloxacin every 12 hours was bioequivalent to a 500 mg oral dose every 12 hours with regard to AUC.

The 400 mg i.v. dose administered over 60 minutes every 12 hours resulted in a C_{max} similar to that observed with a 750 mg oral dose.

A 60-minute infusion of 400 mg ciprofloxacin every 8 hours is equivalent with respect to AUC to 750 mg oral regimen given every 12 hours.

Note: This product is not available for the oral route of administration.

Distribution
The protein binding of ciprofloxacin is low (20-30%), and the substance is present in plasma largely in a non-ionized form. Ciprofloxacin can diffuse freely into the extravascular space. The large steady-state volume of distribution of 2-3 L/kg body weight shows that ciprofloxacin penetrates in tissues resulting in concentrations which clearly exceed the corresponding serum levels.

Metabolism
Small concentrations of four metabolites have been reported. They were identified as desethyleneciprofloxacin (M1), sulphociprofloxacin (M2), oxociprofloxacin (M3) and formylciprofloxacin (M4). M1 to M3 display antibacterial activity comparable to or inferior to that of nalidixic acid. M4, with the smallest quantity, is largely equivalent to norfloxacin in its antimicrobial activity.

Excretion
Ciprofloxacin is largely excreted unchanged both renally and to a smaller extent non-renally. Renal clearance is between 0.18-0.3 L/h/kg and the total body clearance between 0.48-0.60 L/h/kg. Ciprofloxacin undergoes both glomerular filtration and tubular secretion.

Non-renal clearance of ciprofloxacin is mainly due to active transintestinal secretion as well as metabolization. 1% of the dose is excreted via the biliary route. Ciprofloxacin is present in the bile in high concentrations.

Special Populations and Conditions

Geriatrics (≥ 65 years of age)

No dosage adjustment based on age alone is necessary for elderly patients. Compromised renal function may lead to increased drug exposure in this population group as ciprofloxacin is substantially excreted by the kidney (see **DETAILED PHARMACOLOGY**: **Human Pharmacology**).

Hepatic Impairment
In preliminary studies in patients with stable chronic liver cirrhosis (with mild to moderate hepatic impairment), no significant changes in ciprofloxacin pharmacokinetics were observed. The kinetics of ciprofloxacin in patients with acute hepatic insufficiency and stable chronic cirrhosis (with severe hepatic impairment), however, have not been fully elucidated. An increased incidence of nausea, vomiting, headache and diarrhea were observed in this patient population (see **DETAILED PHARMACOLOGY**: **Human Pharmacology).**

Renal Impairment
Ciprofloxacin is eliminated primarily by renal excretion. Patients with renal insufficiency had significantly increased AUCs, prolonged (about 2-fold) elimination half-lives, and decreased renal clearances (see **DETAILED PHARMACOLOGY**: **Human Pharmacology**).

Some modification of dosage is recommended, particularly for patients with severe renal dysfunction. Only a small amount of ciprofloxacin (< l0%) is removed from the body after hemodialysis or peritoneal dialysis (see **DETAILED PHARMACOLOGY**: **Human Pharmacology**).

STORAGE AND STABILITY

CIPROFLOXACIN INJECTION USP (2 mg/mL in 5% dextrose injection) contains 2.0 mg/mL in 5% dextrose, and should be administered "as is". Protect from light, excessive heat and freezing. Store at controlled room temperature (20°C to 25°C). Use promptly when container is opened. Single use, discard unused portion.

DOSAGE FORMS, COMPOSITION AND PACKAGING

Minibags - each mL contains 2 mg of ciprofloxacin in ready-to-use minibags of 100 mL and 200 mL.

COMPOSITION

Minibags	**Ciprofloxacin, 2 mg/mL in 5% Dextrose Injection**
Ciprofloxacin	2.00 mg/mL
Dextrose (hydrous)	50.0 mg/mL
Lactic Acid (90%)	0.711 mg/mL
Hydrochloric Acid	pH to 3.5-4.6
Water for Injection USP	qs to 1.00 mL

PART II: SCIENTIFIC INFORMATION

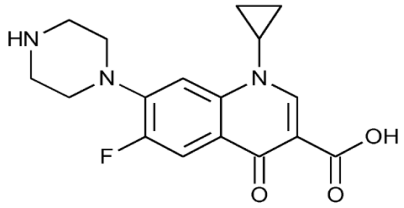
PHARMACEUTICAL INFORMATION

DRUG SUBSTANCE – Ciprofloxacin

Proper Name: Ciprofloxacin

Chemical Name: 1-cyclopropyl-6-fluoro-1,4-dihydro-4-oxo-7-(1-piperazinyl)-3-quinolinecarboxylic acid

Structural Formula:



Molecular Formula: $C_{17}H_{18}FN_3O_3$

Molecular Weight: 331.34 g/mol.

Description: Ciprofloxacin is a pale yellow to white crystalline powder. It is practically insoluble in water, very slightly soluble in ethyl alcohol and methylene chloride, soluble in diluted acetic acid and sparingly soluble in diluted ammonia. Ciprofloxacin melts at about 255°C, with decomposition. It has a pK_a of 6.09.

DETAILED PHARMACOLOGY

Animal Pharmacology

Effects on Histamine Release
Ciprofloxacin was administered intravenously to 9 anaesthetized dogs (initially with thiopental sodium at 25 mg/kg i.v., followed by continuous infusion of a mixture of fentanyl 0.04 mg/kg/hr and dehydrobenzperidol 0.25 mg/kg/hr) at a single dose of 3, 10 or 30 mg/kg. Ciprofloxacin treatment resulted in circulatory changes similar to those caused by histamine release. These were reductions in blood pressure, cardiac output and maximum rate of pressure increase in the left ventricle (dp/dt_{max}), and increase in heart rate. This histamine-liberating effect was counteracted by the simultaneous intravenous administration of 0.01 mg/kg pyrilamine maleate. No signs of histamine liberation were observed on conscious animals.

In vitro experiments on isolated rat mast cells also indicate that ciprofloxacin at concentrations of 0.1 to 100 mg/L has histamine liberating properties.

Bronchodilatory Effects
Ciprofloxacin was tested on isolated guinea-pig trachea at concentrations of 0.0001 to 10 mg/L. It produced a dose-related small but significant relaxation of respiratory airway smooth muscle. It has, however, no effect on leukotriene D4 and histamine-induced contractions at these doses.

Central Nervous System (CNS) Effects
Ciprofloxacin was administered orally to 4 groups of 1 cat each under chloralose-urethane anaesthesia at doses of 0, 10, 20 and 100 mg/kg. No effects were observed on neuromuscular transmission, flexor reflex, or blood pressure.

Gastrointestinal Effects
Ciprofloxacin was administered orally to 4 groups of 20 mice each at doses of 0, 10, 30, and 100 mg/kg, 40 minutes prior to a 15% charcoal suspension. No effect was observed in intestinal charcoal transit time. When given to 3 groups of 20 rats each at doses of 0, 30 or 100 mg/kg, no gastric lesions were observed on sacrificing the animals after 5 hours.

When given intraduodenally to 3 groups of 8 rats each at doses of 0, 10 and 100 mg/kg, no increase in basal gastric acid secretion was observed on perfusion of the stomach.

Effect on Blood Glucose and Serum Triglycerides
Four groups of six fasting rats each were given intravenous injections of 0, 3, 10, and 30 mg/kg respectively. A slight but significant increase in blood glucose concentrations 60 minutes and 240 minutes post dose was observed in the 3 and 10 mg/kg groups but not in the 30 mg/kg group in comparison to controls.

At 60 minutes post dose, the serum triglyceride concentrations were slightly but significantly reduced in all three groups. This effect was not dose-related. At 120 minutes, the concentration was slightly elevated in the 30 mg/kg group.

Human Pharmacology

Pharmacokinetics

The relative bioavailability of oral ciprofloxacin, given as a tablet, is between 70 and 80 per cent compared to an equivalent dose of IV ciprofloxacin. Note: This product is not available for the oral route of administration.

Maximum serum concentrations (C_{max}) increased dose-proportionally and were attained 1 to 2 hours after oral dosing. The total areas under the serum concentration-time curves (AUC) were also increased in proportion to dose. Mean concentrations 12 hours after dosing with 250 mg, 500 mg, or 750 mg were 0.1, 0.2, and 0.4 mg/L, respectively. The serum elimination half-lives($t_{½}$) were between 4 and 6 hours (See Table 5 and Figure 1)

Table 5: Pharmacokinetic Parameters Of Ciprofloxacin Following Single Doses In Healthy Volunteers IV

Dose	200 mg IV*	400 mg IV*
C_{max} (mg/L)	2.14	4.60
$t_{1/2}$ (hr)	3.4	3.5
$AUC_{0-\infty}$ (mg•h/L)	5.24	11.69
t_{max} (hr)	0.95	1.00

* IV parameters following a 60-minute infusion period

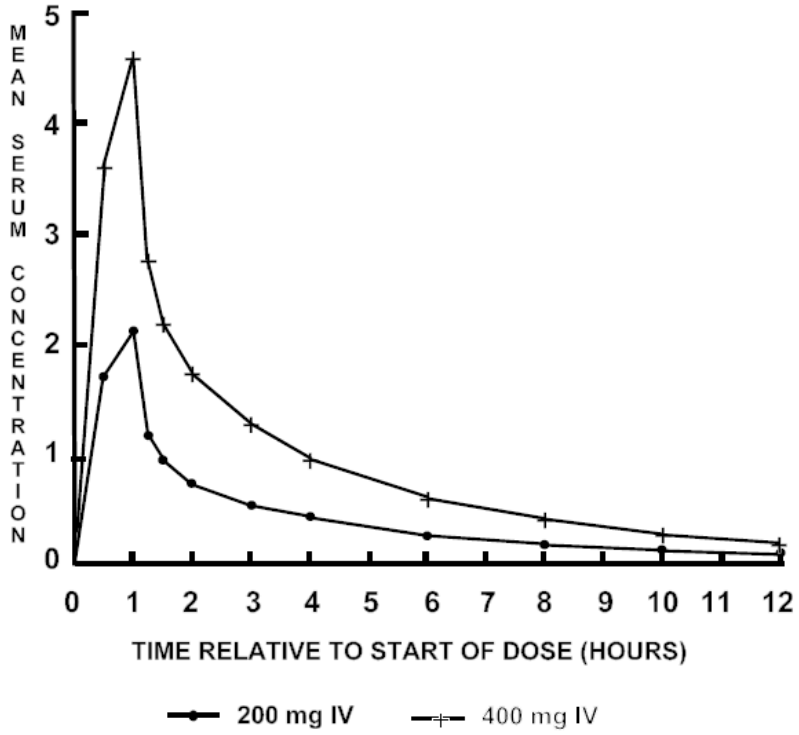
Similar values were obtained following the oral administration of multiple doses every 12 hours for 7 days. Note: This product is not available for the oral route of administration.

Table 6: Mean Pharmacokinetic Parameters of Ciprofloxacin and Metronidazole at Steady State in Healthy Volunteers

Regimen	AUC (mg•h/L)	C_{max} (mg/L)	t_{max} (h)
(i) When administered alone			
Ciprofloxacin 400 mg IV q12h	12.7 (AUC_{0-12})	4.56	1.0
(ii) When administered as Ciprofloxacin 400 mg IV q12h in combination with Metronidazole 500 mg IV q6h			
Ciprofloxacin	15.9 (AUC_{0-12})	5.21	1.0
Metronidazole	153.0 (AUC_{0-6})	33.6	1.0

Note: Following the repeated dosing of metronidazole 500 mg IV tid, the peak and minimum mean plasma metronidazole concentrations, at steady-state, were 26 mcg/mL and 12 mcg/mL respectively.[36]

<u>Figure 1:</u> Mean Serum Ciprofloxacin Serum Concentration (mg/L) vs Time after A Single Intravenous Dose Administered over 60 Minutes



Following a 60-minute intravenous infusion of 200 mg and 400 mg ciprofloxacin to 13 healthy male volunteers (18-40 years), the mean maximum serum concentrations achieved were 2.14 and 4.60 mg/L respectively; the concentrations at 12.0 hours were 0.11, 0.23 mg/L respectively (see figure 1).

The pharmacokinetics of ciprofloxacin were linear over the dose range of 200 mg and 400 mg administered intravenously (see Table 5). At steady-state, the serum elimination half-life was approximately 5-6 hours and the total clearance around 35 L/hr was observed. Comparison of the pharmacokinetic parameters following the 1st and 5th iv dose on a 12h regimen indicated no evidence of drug accumulation.

An intravenous infusion of 400 mg ciprofloxacin given over 60 minutes every 12 hours, for 6 doses, to 12 healthy male volunteers (18-40 years) has been shown to produce an area under the serum concentration time curve (AUC) equivalent to that produced by a 500 mg oral dose given every 12 hours. The 400 mg iv dose administered over 60 minutes every 12 hours resulted in a C_{max} similar to that observed with a 750 mg oral dose. Note: This product is not available for the oral route of administration.

An infusion of 200 mg ciprofloxacin given every 12 hours produces an AUC equivalent to that produced by a 250 mg oral dose every 12 hours.

Pharmacokinetics were dose proportioned with no significant changes in clearance or half-life occurring over this dose range (see below).

Metabolism and Excretion
Ciprofloxacin is largely excreted unchanged both renally and, to a small extent, extra-renally. Small concentrations of 4 metabolites have been reported: Desethyleneciprofloxacin (M1) (1.8%), sulphociprofloxacin (M2) (5.0%), oxociprofloxacin (M3) (9.6%) and formylciprofloxacin (M4) (0.1%).

Following the intravenous administration of a single 107 mg dose of ^{14}C-labelled ciprofloxacin to six healthy male volunteers (age: 23.7 ± 1.89 years, weight: 80.2 ± 3.45 kg), 15% of unchanged ciprofloxacin was recovered in the feces, suggesting that hepatic extraction and biliary excretion is an extra-renal clearance pathway for ciprofloxacin. Direct evidence of biliary excretion of ciprofloxacin was obtained in 12 patients (age 28-58) with T-tube drainage.

After intravenous administration to a group of 9 healthy male volunteers (age: 26.8 ± 9.7 yrs, weight: 63.9 ± 6 .4 kg), approximately 50% to 70% of the dose is excreted in the urine as unchanged drug. After a 200 mg IV dose, urine concentrations of ciprofloxacin usually exceed 200 mcg/mL during the first two hours after dosing, and are generally greater than 10 mcg/mL at 8 to 12 hours after dosing. The urinary excretion of ciprofloxacin is virtually complete by 24 hours after dosing. Approximately 15% of an IV dose is recovered from the feces within 5 days after dosing, which may arise from either biliary clearance or transintestinal elimination. Following intravenous administration, approximately 10% of the dose is recovered in the urine in the form of metabolites.

Tissue Concentrations
The distribution of ciprofloxacin was observed to be rapid in healthy volunteers receiving various single and multiple intravenous doses. Fitting the serum profile to a two-compartment model provides a distribution phase with a half-life between 0.2 and 0.4 hours. The volume of distribution at steady state (V_{dss}) and V_{darea} were between 1.7 and 2.7 L/kg respectively. The volume of the central compartment was between 0.16 and 0.63 L/kg, which approximates the total volume of extracellular water.

Single intravenous doses of 100, 150 and 200 mg ciprofloxacin were administered to nine healthy volunteers to determine the excretion and distribution of ciprofloxacin following intravenous administration and to assess the effect of dose size on pharmacokinetic parameters.

Analysis with a three-compartmental pharmacokinetic model quantified approximate sizes and kinetics of distribution into two peripheral compartments. A rapidly equilibrating compartment (V_2) with a high intercompartmental clearance rate, accounting for the rapid decline in ciprofloxacin concentrations in serum immediately following drug infusion, and a second, slowly equilibrating tissue compartment with relatively slow intercompartmental clearance. This would contribute to the prolonged terminal half-life (4 to 5 h) of ciprofloxacin IV.

The results of this study were as follows: Volume of distribution at steady state (V_{ss}) was determined to be between 2.0 and 2.9 L/kg. Volumes in each compartment were determined to be as follows: central compartment 0.2 - 0.4, peripheral V2 0.6 - 0.8 and peripheral V3 1.2 - 1.6 L/kg.

Table 7 summarizes the results of tissue and fluid penetration of ciprofloxacin in man.

Table 7: Distribution of Ciprofloxacin in Human Tissue/Fluid

Tissue/Fluid	No. of Patients	Single Dose of Ciprofloxacin	Peak Concentration (mg/kg or mg/L)	Mean Serum Concentration (mg/L)	Time After Dose (hr)
Skin Blister Fluid	6	500 mg PO	1.4 ± 0.36	2.3 ± 0.7	1 - 6
Bone	4	750 mg PO	1.4 ± 1.0	2.9 ± 2.2	2 - 4
Gynecological Tissue	18	500 mg PO	1.3 ± 0.66 to 1.6 ± 0.97	1.4 ± 0.87	2 - 4
Prostatic Tissue	1	500 mg PO	3.76	1.84	2.5
Muscle	4	250 mg PO	2.4 ± 1.0	2.9 ± 2.2	2 - 4
Nasal Secretions	20	500 mg PO	1.4 ± 0.81	1.8 ± 0.48	1 - 3
Bronchial Tissues	10	200 mg IV	3.94 ± 2.5	1.62 ± 0.7	0.97
Vagina	18	100 mg IV	1.13 ± 0.2	0.61 ± 0.12	0.5
Ovary	18	100 mg IV	1.00 ± 0.23	0.61 ±0.12	0.5

Special Populations

Geriatrics

In 4 females and 6 males, (age: 67 ±4 years, weight: 65 ±6 kg) with normal renal function for their age, given a single oral dose of 250 mg, maximum ciprofloxacin serum concentrations and areas under the serum concentration time curves were significantly higher than in 10 male younger volunteers (age: 24 ±3 years, weight: 72 ±9 kg). The time to peak serum concentrations, overall elimination half-life and urinary recovery of ciprofloxacin were similar in both age groups.

Table 8: Comparison of Pharmacokinetic Parameters Between Healthy Elderly and Healthy Younger Volunteers Following Oral Administration of a Single 250 mg Tablet

Parameter	Elderly Volunteers (Mean ± S.D.)	Younger Volunteers (Mean ± S.D.)
C_{max} (mg/L) t_{max} (h)	1.8 ± 0.5 1.2 ± 0.3	1.3 ± 0.4 1.2 ± 0.1
$t_{½}$ (h)	3.7 ± 0.9	3.3 ± 0.6
Total AUC (mg•h/L)	7.25 ± 2.45	5.29 ± 1.21
% Dose Urinary Recovery after 24 hours	43	43

Renal Impairment

Ciprofloxacin is eliminated primarily by renal excretion. However, the drug is also metabolized and partially cleared through the biliary system of the liver and through the intestine. This alternate pathway of drug elimination appears to compensate for the reduced renal excretion of patients with renal impairment. Nonetheless, some modification of dosage is recommended, particularly for patients with severe renal dysfunction.

The pharmacokinetics of ciprofloxacin following multiple IV doses were compared in subjects with normal renal function and in subjects with various degrees of renal impairment (see Table 8, Groups 1-4). Patients with renal insufficiency had significantly increased concentrations of ciprofloxacin, M1 and M2 metabolites and decreased renal clearances.

Results of studies in patients on peritoneal dialysis and on hemodialysis show that very little ciprofloxacin is removed by dialysis.

An open-label crossover study was conducted in eight peritoneal dialysis patients. Patients received a single dose of i.v. ciprofloxacin on two separate occasions, once with frequent dialysis (fluid exchange done at 4, 8, 12 and 24 hours) and once with delayed dialysis (fluid exchange at 12 and 24 hours). Pharmacokinetic parameters for ciprofloxacin, M1 and M2 metabolites were not significantly different for frequent versus delayed dialysis, except that dialysate clearances for ciprofloxacin and M2 were higher when dialysis was done frequently. Group 5 in Table 8 shows the pharmacokinetic results for the frequent dialysis group.

In an open-label crossover study, seven hemodialysis patients received a single dose of i.v. ciprofloxacin on two separate occasions, once immediately after hemodialysis, and once two hours before hemodialysis. The results demonstrated that the pharmacokinetic parameters were not significantly different between the two treatments for ciprofloxacin, M1 and M2 metabolites.

Group 6 in Table 9 shows the pharmacokinetic results for the group dosed two hours before hemodialysis.

Table 9: Mean Pharmacokinetic Parameters for Ciprofloxacin and Metabolites M1 and M2 Following IV Dosing in Healthy Volunteers, Patients with Renal Insufficiency, Peritoneal Dialysis Patients, and Hemodialysis Patients

Group	Creatinine Clearance mL/min/1.73m^2	IV Ciprofloxacin Dose	Parameter								
			Ciprofloxacin			M1 (desethylene ciprofloxacin)			M2 (sulfociprofloxacin)		
			$AUC_{0-\infty}$ (mg•hr/L)	Cl_r (L/hr)	$T^{1/2}$ (hr)	$AUC_{0-\infty}$ (mg.hr/L)	Cl_r (L/hr)	$T^{1/2}$ (hr)	$AUC_{0-\infty}$ (mg•hr/L)	Cl_r (L/hr)	$T^{1/2}$ (hr)
1	>90	400 mg q8h x 11	10.2	20.3	4.59	0.19	19.9	5.04	0.98	19.5	2.33
2	61-90	400 mg q8h x 11	15.4	10.9	5.23	0.34	10.8	8.14	1.50	10.7	3.12
3	31-60	400 mg q12h x 8	21.5	6.91	5.72	0.57	7.1	9.10	4.21	6.52	5.25
4	≤30	300 mg q12h x 8	30.1	1.36	8.33	1.09	1.7	15.2	13.0	1.09	13.8
5	chronic renal failure patients on peritoneal dialysis	400 mg single dose	38.7	0.098	8.39	4.49	0.074	28.6	54.8	0.08	22.6
6	chronic renal failure patients on hemodialysis	400 mg single dose	38.4	0.11	11.4	2.05	0.087	11.6	29.9	0.073	13.1

Hepatic Impairment
In studies in patients with stable chronic cirrhosis (with mild to moderate hepatic impairment), no significant changes in ciprofloxacin pharmacokinetics have been observed. In a study of 7 cirrhotic patients and healthy volunteers given ciprofloxacin (oral) 750 mg every 12 hours for a total of nine doses followed by a 1 week washout and then a 30 minute infusion of ciprofloxacin (intravenous) 200 mg, there was no difference in pharmacokinetics between patients with stable chronic cirrhosis (with mild to moderate hepatic impairment) and healthy volunteers.

MICROBIOLOGY

Mechanism of Action
The bactericidal action of ciprofloxacin results from inhibition of enzymes topoisomerase II (DNA gyrase) and topoisomerase IV, which are required for bacterial DNA replication, transcription, repair, and recombination.

Drug resistance
The mechanism of action of fluoroquinolones, including ciprofloxacin, is different from that of penicillins, cephalosporins, aminoglycosides, macrolides, and tetracyclines. Therefore, microorganisms resistant to these classes of drugs may be susceptible to ciprofloxacin and other fluoroquinolones. There is no known cross-resistance between ciprofloxacin and other classes of antimicrobials. In vitro resistance to ciprofloxacin develops slowly by multiple step mutations. Resistance to ciprofloxacin due to spontaneous mutations occurs at a general frequency of between $<10^{-9}$ to $1x10^{-6}$.

Activity in vitro and in vivo
Ciprofloxacin has in vitro activity against a wide range of gram-positive and gram-negative microorganisms. Ciprofloxacin is slightly less active when tested at acidic pH. The inoculum size has little effect when tested in vitro. The minimal bactericidal concentration (MBC) generally does not exceed the minimal inhibitory concentration (MIC) by more than a factor of 2. Ciprofloxacin has been shown to be active against most strains of the following microorganisms, both in vitro and in clinical infections:

Aerobic gram-positive microorganisms
Enterococcus faecalis (Many strains are only moderately susceptible.)
Staphylococcus aureus (methicillin-susceptible strains only)
Staphylococcus epidermidis (methicillin-susceptible strains only)
Staphylococcus saprophyticus
Streptococcus pyogenes

Aerobic gram-negative microorganisms
Campylobacter jejuni
Citrobacter diversus
Citrobacter freundii
Enterobacter cloacae
Escherichia coli
Proteus mirabilis
Proteus vulgaris
Providencia rettgeri
Providencia stuartii
Pseudomonas aeruginosa

Haemophilus influenzae
Haemophilus parainfluenzae
Klebsiella pneumoniae
Moraxella catarrhalis
Morganella morganii
Neisseria gonorrhoeae
Salmonella typhi
Serratia marcescens
Shigella boydii
Shigella dysenteriae
Shigella flexneri
Shigella sonnei

The following in vitro data are available, **but their clinical significance is unknown**.

Ciprofloxacin exhibits in vitro minimum inhibitory concentrations (MICs) of 1 µg/mL or less against most (≥90%) strains of the following microorganisms; however, the safety and effectiveness of ciprofloxacin in treating clinical infections due to these microorganisms have not been established in adequate and well-controlled clinical trials.

Aerobic gram-positive microorganisms
Staphylococcuc haemolyticus
Staphylococcus hominis

Aerobic gram-negative microorganisms
Acetinobacter iwoffii
Aeromonas hydrophila
Edwardsiella tarda
Enterobacter aerogenes
Legionella pneumophila
Pasteurella multocida
Salmonella enteritidis
Vibrio cholerae
Vibrio parahaemolyticus
Vibrio vulnificus
Yersinia enterocolitica

Most strains *of Burkholderia cepacia* and some strains of *Stenotrophomonas maltophilia* are resistant to ciprofloxacin as are most anaerobic bacteria, including *Bacteroides fragilis* and *Clostridium difficile*.

Susceptibility Tests
Dilution Techniques: Quantitative methods are used to determine antimicrobial minimal inhibitory concentrations (MICs). These MICs provide estimates of the susceptibility of bacteria to antimicrobial compounds. The MICs should be determined using a standardized procedure. Standardized procedures are based on a dilution method (1) (broth or agar) or equivalent with standardized inoculum concentrations and standardized concentrations of ciprofloxacin powder. The MIC values should be interpreted according to the criteria outlined in table 9.

Diffusion Techniques: Quantitative methods that require measurement of zone diameters also provide reproducible estimates of the susceptibility of bacteria to antimicrobial compounds. One such standardized procedure (2) requires the use of standardized inoculum concentrations. This procedure uses paper disks impregnated with 5 µg ciprofloxacin to test the susceptibility of microorganisms to ciprofloxacin.

Reports from the laboratory providing results of the standard single-disk susceptibility test with a 5 µg ciprofloxacin disk should be interpreted according to the criteria outlined in table 9.

Interpretation involves correlation of the diameter obtained in the disk test with the MIC for ciprofloxacin.

Table 10: Susceptibility Interpretative Criteria for Ciprofloxacin

	MIC (µg/mL)			Zone Diameter (mm)		
Species	**S**	**I**	**R**	**S**	**I**	**R**
Enterobacteriacae	≤1	2	≥4	≥21	16-20	≤15
Enterococcus faecalis	≤1	2	≥4	≥21	16-20	≤15
Methicillin susceptible *Staphylococcus Species*	≤1	2	≥4	≥21	16-20	≤15
Pseudomonas aeruginosa	≤1	2	≥4	≥21	16-20	≤15
Haemophilus influenza	≤1[a]	[g]	[g]	≥21[b]	[g]	[g]
Haemophilus parainfluenzae	≤1[a]	[g]	[g]	≥21[b]	[g]	[g]
Streptococcus pyogenes	≤1[c]	2[c]	≥4[c]	≥21[d]	16-20[d]	≤15[d]
Neisseria gonorrhoeae	≤0.06[e]	0.12 - 0.5[e]	≥1[e]	≥41[f]	28-40[f]	≤27[f]

Abbreviations: I = Intermediate; MIC = minimum inhibitory concentration; µg = microgram; mL = milliliter; mm = millimiter; R = Resistant; S = Susceptible

[a] This interpretive standard is applicable only to broth microdilution susceptibility tests with *Haemophilus influenzae* and *Haemophilus parainfluenzae* using *Haemophilus* Test Medium (HTM). (1)

[b] This zone diameter standard is applicable only to tests with *Haemophilus* influenzae and *Haemophilus parainfluenzae* using Haemophilus Test Medium (HTM). (2)

[c] These interpretive standards are applicable only to broth microdilution susceptibility tests with streptococci using cation-adjusted Mueller-Hinton broth with 2-5% lysed horse blood.

[d] These zone diameter standards are applicable only to tests performed for streptococci using Mueller-Hinton agar supplemented with 5% sheep blood incubated in 5% CO_2.

[e] This interpretive standard is applicable only to agar dilution test with GC agar base and 1% defined growth supplement.

[f] This zone diameter standard is applicable only to disk diffusion tests with GC agar base and 1% defined growth supplement.

[g] The current absence of data on resistant strains precludes defining any results other than "Susceptible". Strains yielding MIC results suggestive of a "nonsusceptible" category should be submitted to a reference laboratory for further testing.

A report of "Susceptible" indicates that the pathogen is likely to be inhibited if the antimicrobial compound in the blood reaches the concentrations usually achievable. A report of "Intermediate" indicates that the result should be considered equivocal, and, if the microorganism is not fully susceptible to alternative, clinically feasible drugs, the test should be repeated. This category implies possible clinical applicability in body sites where the drug is physiologically concentrated or in situations where high dosage of drug can be used. This category also provides a buffer zone which prevents small uncontrolled technical factors from causing major discrepancies in interpretation.

A report of "Resistant" indicates that the pathogen is not likely to be inhibited if the antimicrobial compound in the blood reaches the concentrations usually achievable; other therapy should be selected.

Quality Control: Standardized susceptibility test procedures require the use of laboratory control microorganisms to control the technical aspects of the laboratory procedures. For dilution technique, standard ciprofloxacin powder should provide the MIC values according to criteria outlined in table 10. For diffusion technique, the 5 µg ciprofloxacin disk should provide the zone diameters outlined in table 10.

Table 11: Quality Control for Susceptibility Testing		
Strains	**MIC range (µg/mL)**	**Zone Diameter (mm)**
Enterococcus faecalis ATCC 29212	0.25 – 2	-
Escherichia coli ATCC 25922	0.004 - 0.015	30 – 40
Haemophilus influenzae ATCC 49247	0.004 - 0.03[a]	34 – 42[d]
Pseudomonas aeruginosa ATCC 27853	0.25 – 1	25 – 33
Staphylococcus aureus ATCC 29213	0.12 – 0.5	-
Staphylococcus aureus ATCC 25923	-	22 – 30
Neisseria gonorrhoeae ATCC 49226	0.001 – 0.008[b]	48 – 58[e]
C. jejuni ATCC 33560	0.06 – 0.25 and 0.03 – 0.12[c]	-

Abbreviations: ATCC = American Type Culture Collection; MIC = minimum inhibitory concentration; µg = microgram; mL = milliliter; mm = millimiter

[a] This quality control range is applicable to only *H. influenzae* ATCC 49247 tested by a broth microdilution procedure using *Haemophilus* Test Medium (HTM). (1)

[b] *N. gonorrhoeae* ATCC 49226 tested by agar dilution procedure using GC agar and 1% defined growth supplement in a 5% CO2 environment at 35-37°C for 20-24 hours.(2)

[c] *C. jejuni* ATCC 33560 tested by broth microdilution procedure using cation adjusted Mueller Hinton broth with 2.5-5% lysed horse blood in a microaerophilic environment at 36-37°C for 48 hours and for 42°C at 24 hours, respectively.

[d] These quality control limits are applicable to only *H. influenzae* ATCC 49247 testing using *Haemophilus* Test Medium (HTM). (2)

[e] These quality control limits are applicable only to tests conducted with *N. gonorrhoeae* ATCC 49226 performed by disk diffusion using GC agar base and 1% defined growth supplement.

TOXICOLOGY

Acute Toxicity

Table 12: LD_{50} (mg/kg) across species

Species	Mode of administration	LD_{50} (mg/kg)
Mouse	**i.v.**	approx. 290
Rat	**i.v.**	approx. 145
Rabbit	**i.v.**	approx. 125
Dog	**i.v.**	approx. 250

Chronic Toxicity

Subacute Tolerability Studies over 4 Weeks

Parenteral administration: In the highest-dose group in each case (rats 80 mg/kg and monkeys 30 mg/kg), crystals containing ciprofloxacin were found in the urine sediment. There were also changes in individual renal tubules, with typical foreign-body reactions due to crystal-like precipitates. These changes are considered secondary inflammatory foreign-body reactions due to the precipitation of a crystalline complex in the distal renal tubule system.

Subchronic Tolerability Studies over 3 Months

Parenteral administration: Although the changes in the renal tubules observed in rats were in some cases very slight, they were present in every dose group. In monkeys they were found only in the

highest-dose group (18 mg/kg) and were associated with slightly reduced erythrocyte counts and hemoglobin values.

Chronic Tolerability Studies over 6 Months
Parenteral administration: In monkeys slightly elevated urea and creatinine concentrations and changes in the distal renal tubules were recorded in the highest-dose group (20 mg/kg).

Carcinogenicity
In carcinogenicity studies in mice (21 months) and rats (24 months) with doses up to approximately 1000 mg/kg bw/day in mice and 125 mg/kg bw/day in rats (increased to 250 mg/kg bw/day after 22 weeks), there was no evidence of a carcinogenic potential at any dose level.

Reproduction Toxicology
Fertility studies in rats: Fertility, the intrauterine and postnatal development of the young, and the fertility of F1 generation were not affected by ciprofloxacin.

Embryotoxicity studies: These yielded no evidence of any embryotoxic or teratogenic action of ciprofloxacin.

Perinatal and postnatal development in rats: No effects on the perinatal or postnatal development of the animals were detected. At the end of the rearing period histological investigations did not bring to light any sign of articular damage in the young.

Mutagenesis
Eight *in vitro* mutagenicity tests have been conducted with ciprofloxacin. Test results are listed below:

Salmonella: Microsome Test (Negative)
E. coli: DNA Repair Assay (Negative)
Mouse Lymphoma Cell Forward Mutation Assay (Positive)
Chinese Hamster V79 Cell HGPRT Test (Negative)
Syrian Hamster Embryo Cell Transformation Assay (Negative)
Saccharomyces cerevisiae: Point Mutation Assay (Negative)
Mitotic Crossover and Gene Conversion Assay (Negative)
Rat Hepatocyte Primary Culture DNA Repair Assay (LIDS) (Positive)

Two of the eight tests were positive, but results of the following four *in vivo* test systems gave negative results:

Rat Hepatocyte DNA Repair Assay
Micronucleus Test (Mice)
Dominant Lethal Test (Mice)
Chinese Hamster Bone Marrow

Special Tolerability Studies

It is known from comparative studies in animals, both with the older gyrase inhibitors and the more recent ones, that this substance class produces a characteristic damage pattern. Kidney damage, cartilage damage in weight-bearing joints of immature animals, and eye damage may be encountered.

Renal Tolerability Studies

The crystallization observed in the animal studies occurred preferentially under pH conditions that do not apply in man.

Compared to rapid infusion, a slow infusion of ciprofloxacin reduces the danger of crystal precipitation.

The precipitation of crystals in renal tubules does not immediately and automatically lead to kidney damage. In the animal studies, damage occured only after high doses, with correspondingly high. levels of crystalluria. For example, although they always caused crystalluria, even high doses were tolerated over 6 months without damage and without foreign-body reactions occurring in individual distal renal tubules.

Damage to the kidneys without the presence of crystalluria has not been observed. The renal damage observed in animal studies must not, therefore, be regarded as a primary toxic action of ciprofloxacin on the kidney tissue, but as typical secondary inflammatory foreign-body reactions due to the precipitation of a crystalline complex of ciprofloxacin, magnesium, and protein.

Articular tolerability studies

As it is also known for other gyrase inhibitors, ciprofloxacin causes damage to the large, weight-bearing joints in immature animals.

The extent of the cartilage damage varies according to age, species, and dose; the damage can be reduced by taking the weight off the joints. Studies with mature animals (rat, dog) revealed no evidence of cartilage lesions.

Retina tolerability studies

Ciprofloxacin binds to the melanin containing structures including the retina. Potential effects of ciprofloxacin on the retina were assessed in various pigmented animal species. Ciprofloxacin treatment had no effect on the morphological structures of the retina and on electroretinographic findings.

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READ THIS FOR SAFE AND EFFECTIVE USE OF YOUR MEDICATION

PATIENT MEDICATION INFORMATION

Pr CIPROFLOXACIN INJECTION USP
2 mg/mL in 5% dextrose injection

Read this carefully before you start taking CIPROFLOXACIN INJECTION USP and each time you get a refill. This leaflet is a summary and will not tell you everything about this drug. Talk to your healthcare professional about your medical condition and treatment and ask if there is any new information about CIPROFLOXACIN INJECTION USP.

Serious Warnings and Precautions

- Quinolone antibiotics, like CIPROFLOXACIN INJECTION USP, are related to disabling and possibly long lasting effects such as:
  - inflamed tendon (tendonitis), tendon rupture.
  - nerve damage (peripheral neuropathy).
  - problems in the brain such as:
    - convulsions
    - nervous breakdown
    - confusion
    - and other symptoms
- Quinolone antibiotics, like CIPROFLOXACIN INJECTION USP:
  - have lengthened the heartbeat (QT prolongation)
  - have led to serious allergic reactions, including death
  - may be related to increased tendonitis (inflamed tendon)
  - may worsen myasthenia gravis (a muscle disease)
  - may lead to seizures and nervous breakdowns. Tell your doctor if you have brain or spinal cord problems (such as epilepsy)
  - may cause liver injury which may lead to death
- For further information and symptoms see:
  - the "To help avoid side effects and ensure proper use, …" section
  - the "What are possible side effects from using CIPROFLOXACIN INJECTION USP?" section

Talk to your doctor to see if CIPROFLOXACIN INJECTION USP is right for you.

What is CIPROFLOXACIN INJECTION USP used for?

CIPROFLOXACIN INJECTION USP is used to treat certain types of bacterial infections in patients over 18 years of age and is administered by the healthcare professional. Antibacterial drugs like CIPROFLOXACIN INJECTION USP treat only bacterial infections. They do not treat viral infections such as the common cold. Although you may feel better early in treatment, CIPROFLOXACIN INJECTION USP should be taken exactly as directed. Misuse or overuse of CIPROFLOXACIN INJECTION USP could lead to the growth of bacteria that will not be killed by CIPROFLOXACIN INJECTION USP (resistance). This means that CIPROFLOXACIN INJECTION USP may not work for you in the future. Do not share your medicine.

How does CIPROFLOXACIN INJECTION USP work?

CIPROFLOXACIN INJECTION USP is an antibiotic that kills bacteria causing infection. You should contact your doctor if your condition has not improved or if it has worsened while taking CIPROFLOXACIN INJECTION USP.

What are the ingredients in CIPROFLOXACIN INJECTION USP?

Each mL of CIPROFLOXACIN INJECTION USP contains 2 mg of ciprofloxacin. The other ingredients are dextrose monohydrate, lactic acid solution, hydrochloric acid to adjust pH and water for injection.

CIPROFLOXACIN INJECTION USP comes in the following dosage forms:

CIPROFLOXACIN INJECTION USP is available in ready-to–use minibags of 100 mL or 200 mL, Each mL contains 2 mg of ciprofloxacin.

Do not use CIPROFLOXACIN INJECTION USP if:

- you are allergic to any other ingredient in these products (see "What are the ingredients in CIPROFLOXACIN INJECTION USP?").
- you have ever had a severe reaction to any of the ingredients contained within this medication or to the group of antibiotics known as "quinolones." Before taking this medication, tell your doctor if you have a history of seizures.
- you are taking tizanidine for the management of spasticity. Tizanidine concentrations may increase and cause further side effects such as drowsiness, sleepiness and low blood pressure.
- you are currently taking agomelatine[a]. Agomelatine concentrations may increase and may cause further side effects such as liver toxicity.

[a] Currently not marketed in Canada

To help avoid side effects and ensure proper use, talk to your healthcare professional before you take **CIPROFLOXACIN INJECTION USP**. Talk about any health conditions or problems you may have, including if you:

- have a family history of fructose intolerance, glucose-galactose malabsorption or sucrose-isomaltase deficiency as CIPROFLOXACIN INJECTION USP contains sucrose.
- have a history of seizures or epilepsy.

- have an irregular heart rhythm (such as QT prolongation).
- have low potassium blood levels.
- have liver or kidney disease or damage.
- are pregnant, planning to become pregnant, breast feeding or planning to breast feed.
- are less than 18 years of age.
- have a history of tendon problems (such as pain, swelling or rupture of a tendon) related to the use of quinolone antibiotics.
- have myasthenia gravis (a muscle disease).
- have an aortic aneurysm which is an abnormal bulge in a large blood vessel called the aorta.
- have or if anyone in your family has a condition called aneurysm disease which is an abnormal bulge in any large blood vessel in the body.
- have an aortic dissection which is a tear in the wall of the aorta.
- have any of the following conditions: Marfan syndrome, vascular Ehlers-Danlos syndrome, Takayasu arteritis, giant cell arteritis or Behcet's disease.
- have high blood pressure.
- have atherosclerosis, which is a hardening of your blood vessels.

Other warnings you should know about:

While taking CIPROFLOXACIN INJECTION USP:

- Avoid too much sunlight or artificial ultraviolet light (such as sunlamps).
  - Contact your doctor if a sunburn or rash occurs.
- Do not drive or use machinery if you feel dizzy or lightheaded.
- Blood Sugar Changes:
  - Medicines like CIPROFLOXACIN INJECTION USP can cause blood sugar levels to rise and drop in patients with diabetes. Serious cases of hypoglycemia (low blood sugar levels) that caused coma or death have been seen with medicines like CIPROFLOXACIN INJECTION USP. If you have diabetes, check your blood sugar levels often while taking CIPROFLOXACIN INJECTION USP.
- Quinolones, including CIPROFLOXACIN INJECTION USP have been associated with an enlargement or "bulge" of a large blood vessel (aortic aneurysm or large vessel peripheral aneurysm) and aortic dissection (a tear in the aorta wall)
  - The risk of these problems is higher if you:
    - are elderly
    - have or anyone in your family has had aneurysm disease
    - have an aortic aneurysm or an aortic dissection
    - have any of the following conditions: Marfan syndrome, vascular Ehlers-Danlos syndrome, Takayasu arteritis or giant cell arteritis or Behcet's disease
    - have high blood pressure or atherosclerosis
  - If you experience sudden, severe pain in your abdomen, chest or back, a pulsating sensation in your abdomen, dizziness or loss of consciousness, get immediate medical help.

Tell your healthcare professional about all the medicines you take, including any drugs, vitamins, minerals, natural supplements or alternative medicines.

The following may interact with CIPROFLOXACIN INJECTION USP:

- Theophylline or didanosine chewable/buffered tablets or pediatric powder. **Serious and fatal reactions have been reported in patients receiving ciprofloxacin, including CIPROFLOXACIN INJECTION USP, and theophylline.**
- Antacids, multivitamins, and other dietary supplements containing magnesium, calcium, aluminum, iron or zinc (see "How to take CIPROFLOXACIN INJECTION USP:").
- Antidiabetic agents (such as glyburide, glibenclamide, glimepiride, insulin); the combination of any of these agents with ciprofloxacin may cause lower blood sugar.
- Nonsteroidal Anti-Inflammatory Drugs (NSAIDS).
- Caffeine (such as coffee) and other xanthine derivatives (such as pentoxifylline).
- Certain heart medications known as antiarrhythmics (such as quinidine, procainamide, amiodarone, sotalol).
- Foods fortified with calcium and dairy products
- Other medications including:
    - oral anticoagulants (like warfarin and acenocoumarol),
    - phenytoin, duloxetine, methylxanthines, caffeine, sevelamer,
    - sucralfate, clozapine, ropinirole, lidocaine, sildenafil, pentoxifylline, probenecid,
    - methotrexate, metoclopramide, cyclosporine, lanthanum carbonate, zolpidem.

How to take CIPROFLOXACIN INJECTION USP:

CIPROFLOXACIN INJECTION USP can be prescribed only by a licensed physician. Your doctor has prescribed CIPROFLOXACIN INJECTION USP only for you. Your healthcare professional will give you CIPROFLOXACIN INJECTION USP by injection into a vein.

Usual dose:

CIPROFLOXACIN INJECTION USP will be administered according to your doctor's instructions, usually for 7-14 days, depending on the infection.

Stopping an antibiotic too early may result in failure to cure your infection.

This information does not take the place of discussions with your doctor or health care professional about your medication or treatment.

Overdose:

If you think you have taken too much CIPROFLOXACIN INJECTION USP, contact your healthcare professional, hospital emergency department or regional Poison Control Centre immediately, even if there are no symptoms

Missed Dose:

Should you forget to take it at the usual time, you may take your dose later in the day. Do not take more than two doses of CIPROFLOXACIN INJECTION USP per day, even if you missed a dose.

What are possible side effects from using CIPROFLOXACIN INJECTION USP?

- All medicines, including CIPROFLOXACIN INJECTION USP, can cause side effects, although not everyone gets them. These are not all the possible side effects you may feel when taking CIPROFLOXACIN INJECTION USP. CIPROFLOXACIN INJECTION USP is generally well-tolerated. The most common side effects, which are usually mild, include nausea and diarrhea. Antibiotics of the quinolone class may also cause vomiting, rash, and abdominal pain/discomfort. If these symptoms persist, call your health care professional. If you have any side effects not listed here or if conditions worsen or do not improve then:contact your healthcare professional.
- see the "To help avoid side effects and ensure proper use,…" section.

Stop taking CIPROFLOXACIN INJECTION USP and contact your doctor if:

a) you have symptoms of an allergic reaction such as:
    - rash, hives, blistering or other skin reaction
    - swelling of the face, lips, tongue or throat
    - difficulty breathing
    - irregular or rapid heartbeat, or fainting spells
b) you have sunburn-like skin reaction when exposed to sunlight or ultraviolet light.
c) you have pain, swelling or rupture of a tendon. You should:
    - rest
    - avoid physical exercise
d) you have neuropathy (damage to the nerves) with symptoms such as:
    - pain, burning, tingling, numbness or weakness
e) you have severe diarrhea (bloody or watery) with or without:
    - fever
    - stomach pain or tenderness

    You may have Clostridium difficile colitis (bowel inflammation). See your doctor right away.
f) you have mental problems such as:
    - confusion, headache, shaking
    - hallucinations, depression, agitation
    - difficulty sleeping, anxiety, nervousness and suicidal thoughts

    Contact your doctor if you have suicidal thoughts.

Other side effects include:

- your eyesight worsens or changes. See your doctor or eye specialist right away.
- nausea, dizziness, unsteady walk
- gas, cramping, feeling unwell,
- loss of hearing, problems of smell and taste, loss of appetite
- migraine, sweating
- injection site pain/reaction
- worsening of myasthenia gravis (a muscle disease) with symptoms such as:
    - weakness
    - difficulty walking, swallowing, drooping eyelids.

  Do not use CIPROFLOXACIN INJECTION USP if you have this condition.

Self-Limiting Side Effects:

- Feeling lightheaded
- Insomnia (difficulty sleeping)
- Nightmares

Neuropathy (problems in the nerves) has been reported in patients receiving quinolones, including CIPROFLOXACIN INJECTION USP.

If neuropathy symptoms occur such as pain, burning, tingling, numbness, or weakness, you should:

- stop taking CIPROFLOXACIN INJECTION USP.
- contact your doctor immediately.

If any of these affect you severely, tell your doctor or pharmacist.

Serious Side Effects and What to do About Them			
Symptom/ Effect	**Talk to your healthcare professional**		**Stop taking drug and get immediate medical help**
	Only if severe	**In all cases**	
Rare			
Allergic Reaction: • rash • hives (skin eruptions) • swelling of the face, lips, tongue or throat • difficulty swallowing or breathing • rapid heartbeat			✓

Serious Side Effects and What to do About Them			
Symptom/ Effect	**Talk to your healthcare professional**		**Stop taking drug and get immediate medical help**
	Only if severe	**In all cases**	
Central Nervous System Disorders: • seizures/convulsions • confusion • tremors • hallucinations • depression • suicidal thoughts or psychotic reactions			✓
Photosensitivity Reaction: Sensitivity to light, blistering of skin			✓
Tendon pain, inflammation, or rupture			✓
Increased Blood Sugar: • frequent urination • thirst • hunger • tiredness • blurred vision • headache • trouble concentrating	✓		
Hypoglycemia (Low Blood Sugar): • change in mood • change in vision • confusion • dizziness • fast heartbeat • feeling faint • headache • hunger • shaking • sweating • weakness		✓	

Serious Side Effects and What to do About Them			
Symptom/ Effect	**Talk to your healthcare professional**		**Stop taking drug and get immediate medical help**
	Only if severe	**In all cases**	
Unknown			
Severe Bowel Disorder (Clostridium difficile colitis): • persistent diarrhea • bloody or watery diarrhea • abdominal or stomach pain/cramping • blood/mucus in stool			✓
Nerve Disorder (Neuropathy): Pain, burning, tingling, numbness, weakness			✓
Liver Disorder: Yellowing of the skin or eyes, dark urine, abdominal pain, nausea, vomiting, loss of appetite, pale stools		✓	
Heart Disorder (QT Prolongation): Irregular heartbeat		✓	
Mental Health Problems: Anxiety, confusion, depression, feeling agitated, restless or nervous, suicidal thoughts or actions, hallucinations, inability to think clearly or pay attention, memory loss, paranoia or loss of touch with reality		✓	
Neurological Problems: Seizures (convulsions), tremors			✓
Rise in the pressure within your skull: Blurred or double vision, headaches, nausea		✓	

Serious Side Effects and What to do About Them			
Symptom/ Effect	**Talk to your healthcare professional**		**Stop taking drug and get immediate medical help**
	Only if severe	**In all cases**	
Aortic aneurysm (abnormal bulge in a large blood vessel called the aorta) / Aortic dissection (tear in the wall of the aorta): dizziness, loss of consciousness, pulsating sensation in the abdomen, sudden, severe pain in abdomen, chest or back			✓

If you have a troublesome symptom or side effect that is not listed here or becomes bad enough to interfere with your daily activities, talk to your healthcare professional.

Reporting Suspected Side Effects

You can report any suspected side effects associated with the use of health products to Health
Canada by:

- Visiting the Web page on Adverse Reaction Reporting (https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/adverse-reaction-reporting.html) for information on how to report online, by mail or by fax; or
- Calling toll-free at 1-866-234-2345.

NOTE: Contact your health professional if you need information about how to manage your side effects. The Canada Vigilance Program does not provide medical advice.

Storage:

Keep out of reach and sight of children.

Protect from light, excessive heat and freezing. Store at 20°C to 25°C. Use promptly when container is opened. Single use, discard unused portion.

As with all parenteral drug products, intravenous admixtures should be inspected visually for clarity, particulate matter, precipitate, discoloration and leakage prior to administration, whenever solution and container permits.

If you want more information about CIPROFLOXACIN INJECTION USP:

- Talk to your healthcare professional
- Find the full product monograph that is prepared for healthcare professionals and includes this Patient Medication Information by visiting the Health Canada website (https://health-products.canada.ca/dpd-bdpp/index-eng.jsp); the manufacturer's website www.pfizer.ca or by calling **1-800-463-6001**.

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