

## COMPANY NAME: Medical Union Pharmaceuticals

Long-acting, broad-spectrum cephalosporin antibiotic for parenteral use

FORM: Vials containing dry substance equivalent to 500 mg and 1 g ceftriaxone

**COMPOSITION:** Ceftriaxone: (6R, 7R)-[7-(2-(2-amino-4-thiazolyl)-2-methylimidazo[5,1-d]-(2,5-dihydroxy-6-hydroxy-2-methyl-5-oxo-3-imidazolyl)amino)-3,4-dihydro-2H-pyridin-2-ylidene]-6-thio-1,2,4-triazine-3,5-dithione 1,1-dioxide sodium salt of the disodium salt. Xoraxon contains approximately 83 mg (0.83 MEq) of sodium per gram of ceftriaxone.

Each Xoraxon 500 mg vial for I.M. injection contains:

Active constituent: Ceftriaxone 0.5g (as sterile Ceftriaxone sodium 596.5 mg).

Diluent: 1% lidocaine hydrochloride injection.

Each 2 ml ampoule contains: Lidocaine hydrochloride 0.02 g

Each Xoraxon 500mg vial for I.V. injection contains:

Active constituent: Ceftriaxone 0.5 g (as sterile Ceftriaxone sodium 596.5 mg).

Diluent: sterile water for injection, volume = 5 ml.

Each Xoraxon 1g vial for I.M. injection contains:

Active constituent: Ceftriaxone 1 g (as sterile Ceftriaxone sodium 1193 mg).

Diluent: 1% lidocaine hydrochloride injection.

Each 4 ml ampoule contains: Lidocaine hydrochloride 0.04g

Each Xoraxon 1g vial for I.V. injection contains:

Active constituent: Ceftriaxone 1 g (as sterile Ceftriaxone sodium 1193 mg).

Diluent: sterile water for injection, volume = 10 ml.

**PROPERTIES, EFFECTS Microbiology:** The bactericidal effect of ceftriaxone results from inhibition of cell wall synthesis. Ceftriaxone shows no activity against a wide range of gram-negative and gram-positive microorganisms. Ceftriaxone is highly stable to most  $\beta$ -lactamases, both penicillinases and cephalosporinases, of gram-positive and gram-negative bacteria.

**PHARMACOKINETICS:** Ceftriaxone is characterized by unusually long elimination half-life of approximately eight hours in healthy adults. The area under the plasma concentration time curves after I.V. and I.M. administration is identical. This means that the bioavailability of ceftriaxone administered I.M. is 100%. On intravenous administration, ceftriaxone diffuses rapidly into the interstitial fluid, where bactericidal concentrations against susceptible organisms are maintained for 24 hours.

**Elimination:** The elimination half-life in healthy adults is about eight hours. In infants aged less than eight days and in persons over 75 years of age, the average elimination half-life is about twice as long. In children, 50-60% of ceftriaxone is excreted unchanged by the kidneys, while 40-50% is excreted unchanged by the bile. The elimination half-life of ceftriaxone in patients with renal impairment or neonates, renal elimination accounts for about 70% of the dose. In patients with renal impairment or hepatic dysfunction, the pharmacokinetics of ceftriaxone is only minimally altered and the elimination half-life is only slightly increased. If kidney function alone is impaired, biliary elimination of ceftriaxone is increased. If liver function alone is impaired, renal elimination is increased.

**Protein binding:** Ceftriaxone is reversibly bound to albumin, and the binding decreases with the increase in the concentration, e.g. from 95% binding at plasma concentrations of <100 mg/L to 85% binding at 300 mg/L. On the way to the lower albumin content, the proportion of free ceftriaxone in interstitial fluid is correspondingly higher. The elimination half-life of ceftriaxone in patients with penetration into the cerebrospinal fluid: Ceftriaxone penetrates the inflamed meninges of infants and children. The average extent of diffusion in the cerebrospinal fluid in bacterial meningitis is 17% of the plasma concentration, i.e. approximately four times that in aseptic meningitis. Ceftriaxone concentrations of  $\geq 1.4$  mg/L are found in CSF 24 hours after the injection of Xoraxon in doses of 50-100 mg/kg. In adult meningitis patients, administration of 50 mg/kg leads within 2-24 hours to CSF concentrations several times higher than the minimum inhibitory concentrations required for most common causative organisms of meningitis.

**INDICATIONS AND USAGE**

Xoraxon is indicated for the treatment of the following infections when caused by susceptible organisms:

**LOWER RESPIRATORY TRACT INFECTIONS:** caused by *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Haemophilus influenzae*, *Haemophilus parainfluenzae*, *Klebsiella pneumoniae*, *Escherichia coli*, *Enterobacteriaceae* (including *Serratia marcescens*).

**ACUTE BACTERIAL OTITIS MEDIA:** caused by *Streptococcus pneumoniae*, *Haemophilus influenzae* (including beta-lactamase producing strains) or *Moraxella catarrhalis* (including beta-lactamase producing strains).

**SKIN AND SOFT TISSUE INFECTIONS:** caused by *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus pyogenes*, *Wittmann group streptococci*, *Escherichia coli*, *Enterobacteriaceae*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Morganella morganii*, *Morganella morganii*, *Pseudomonas aeruginosa*, *Serratia marcescens*, *Acinetobacter calcoaceticus*, *Acinetobacter baumannii*, *Stenotrophomonas maltophilia*.

**URINARY TRACT INFECTIONS:** (complicated and uncomplicated) caused by *Escherichia coli*, *Proteus mirabilis*, *Proteus vulgaris*, *Morganella morganii* or *Klebsiella pneumoniae*.

**UNCOMPLICATED GONORRHEA:** (cervical/urethral and rectal) caused by *Neisseria gonorrhoeae*, including both penicillinase- and nonpenicillinase-producing strains, and pharyngeal gonorrhoea caused by nonpenicillinase-producing strains of *Neisseria gonorrhoeae*.

**PELVIC INFLAMMATORY DISEASE:** caused by *Neisseria gonorrhoeae*. Xoraxon, like other cephalosporins, has no activity against *Chlamydia trachomatis*. Therefore, when cephalosporins are used in the treatment of patients with pelvic inflammatory disease and *Chlamydia trachomatis* is one of the suspected organisms, appropriate antibiotic coverage should be given.

**BACTERIAL SEPTICEMIA:** caused by *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Escherichia coli*, *Haemophilus influenzae* or *Klebsiella pneumoniae*.

**BONE AND JOINT INFECTIONS:** caused by *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* or *Serratia marcescens*.

**INTRA-ABDOMINAL INFECTIONS:** caused by *Escherichia coli*, *Klebsiella pneumoniae*, *Bacteroides fragilis*, *Clostridium species* (Note: most strains of *Clostridium difficile* are resistant) or *Peptostreptococcus species*.

**MENINGITIS:** caused by *Haemophilus influenzae*, *Neisseria meningitidis* or *Streptococcus pneumoniae*. Xoraxon has been used successfully in a limited number of cases of meningitis and shunt infection caused by *Staphylococcus epidermidis* and *Escherichia coli*.

**SURGICAL PROPHYLAXIS:** The prophylactic administration of a single 1 gm dose of Xoraxon may reduce the incidence of postoperative wound infections. Endocarditis prophylaxis procedures classified as contaminated or potentially contaminated (e.g. vaginal or anal/dorsal hysterectomy or cholecystectomy for chronic calculous cholecystitis in high-risk patients, such as those over 70 years of age, with acute cholecystitis not requiring therapeutic antibiotics, obstructive jaundice) or common duct bile duct surgery in patients with cholelithiasis or cholelithiasis would present serious risk (e.g., during coronary artery bypass surgery). Although Xoraxon has been shown to have been as effective as oxazolin in the prevention of infection following coronary artery bypass surgery, no placebo-controlled trials have been conducted to evaluate any cephalosporin antibiotic in the prevention of infection following coronary artery bypass surgery.

When administered prior to surgical procedures for which it is indicated, a single 1 gm dose of Xoraxon provides protection from most infections due to susceptible organisms throughout the course of the procedure.

**CONTRAINDICATIONS:** Xoraxon is contraindicated in patients with known hypersensitivity to ceftriaxone, other cephalosporins or to any of the other ingredients of the formulation. Previous immediate and/or severe hypersensitivity reaction to penicillin or to any other beta-lactam medicinal products.

Ceftriaxone must not be mixed or administered simultaneously with calcium containing solution or products, e.g. intravenous infusion line, intravenous drip chamber or other infusion products must not be administered within 48 hours of the last Ceftriaxone administration, as a small number of cases of fatal cases in which a crystalline material of calcium-ceftriaxone precipitates in the lungs and kidneys.

Neonates (28 days) hyperbilirubinemia neonates, especially premature, should not be treated with ceftriaxone. In no studies have shown that ceftriaxone can displace bilirubin from its binding to serum albumin, leading to a possible risk of bilirubin encephalopathy in these patients.

Ceftriaxone is contraindicated in neonates if they require (or are expected to require) treatment with calcium-containing IV solutions, including continuous calcium-containing infusions such as central venous catheters of the type of calcium-glucose-calcium (see CLINICAL PHARMACOLOGY, WARNINGS AND DOSAGE AND ADMINISTRATION). A small number of cases of fatal outcomes in which a crystalline material was observed in the lungs and kidneys in adults have been reported in neonates receiving ceftriaxone and calcium-containing fluids. In some of these cases for both neonates and adults, the crystalline material was observed in calcium-containing fluids and in some a precipitate was observed in the intravenous infusion line. At least one fatality has been reported in a neonate in whom ceftriaxone and calcium-containing fluids were administered at different time points via different intravenous lines; no crystalline material was observed at autopsy in this neonate. There have been no similar reports in patients other than neonates.

**WARNINGS:**

**Hypersensitivity:**

BEFORE THERAPY WITH CEFTRIAZONE IS INITIATED, CAREFUL INQUIRY SHOULD BE MADE TO DETERMINE WHETHER THE PATIENT HAS HAD PREVIOUS HYPERSENSITIVITY REACTIONS TO CEPHALOSPORINS, PENICILLINS OR OTHER DRUGS.

THIS PRODUCT SHOULD BE GIVEN CAUTIOUSLY TO PENICILLIN-SENSITIVE PATIENTS. ANTIBIOTICS SHOULD BE ADMINISTERED WITH CAUTION TO ANY PATIENT WHO HAS DEMONSTRATED SOME FORM OF ALLERGY, PARTICULARLY TO DRUGS.

ACUTE HYPERSENSITIVITY REACTIONS MAY REQUIRE THE USE OF SUBCUTANEOUS EPINEPHRINE AND OTHER EMERGENCY MEASURES.

Special caution is required to determine any of the other type of previous hypersensitivity reactions to penicillin or to other beta-lactam medicinal products because patients hypersensitive to these medicines may be hypersensitive to ceftriaxone as well (cross allergy).

As with other cephalosporins, anaphylactic reactions with fatal outcome have been reported, even if a patient is not known to be allergic or previously exposed.

Interaction with Calcium-Containing Products: Do not use diluents containing calcium, such as Hartmann's solution or other buffer-lactam medicinal products because patients hypersensitive to a reconstituted vial for I.V. administration because a precipitate can form. Precipitation of a calcium-ceftriaxone complex can also occur when Xoraxon is mixed with calcium-containing solutions in the same IV administration line. Xoraxon must not be administered simultaneously with calcium-containing IV solutions, including continuous calcium-containing infusions such as parenteral nutrition via a Y-site. However, in patients other than neonates, Xoraxon and calcium-containing solutions may be administered sequentially of one another if the infusion lines are thoroughly flushed between infusions with a compatible fluid. In vitro studies using adult and neonatal plasma from clinical blood donors demonstrated that needles have an increased risk of precipitation of ceftriaxone-calcium (see CLINICAL PHARMACOLOGY, CONTRAINDICATIONS AND DOSAGE AND ADMINISTRATION).

**Clostridium difficile associated diarrhea (CDAD)** has been reported with use of nearly all antibiomatic agents, including Xoraxon, and may range in severity from mild diarrhea to fatal colitis. Treatment with antibiomatic agents alters the normal flora of the colon leading to overgrowth of *C. difficile*.

*C. difficile* produces toxins A and B which contribute to the development of CDAD. Hypertoxin producing strains of *C. difficile* cause increased morbidity and mortality, as these infections can be refractory to antimicrobial therapy and may require colectomy. CDAD must be considered in all patients who present with diarrhea following antibiotic use. Careful medical history is necessary since CDAD has been reported to occur over two months after the administration of antibiomatic agents. If CDAD is suspected or confirmed, ongoing antibiotic use not directed against *C. difficile* may need to be discontinued. Appropriate fluid and electrolyte management, protein supplementation, antibiotic treatment of colitis and surgical intervention should be instituted as clinically indicated. Hemolytic Anemia An immune mediated hemolytic anemia has been observed in patients receiving cephalosporin class antibiomatic including Xoraxon. Severe cases of hemolytic anemia, including fatalities, have been reported during treatment in both adults and children. If a patient develops anemia while on ceftriaxone, the diagnosis of a cephalosporin associated anemia should be considered and ceftriaxone stopped until the etiology is determined.

**PRECAUTIONS:**

General Prescribing Xoraxon in the absence of a proven or strongly suspected bacterial infection or a clinical indication is unlikely to benefit these patients and increases the risk of the

not be necessary in patients with hepatic dysfunction. However, in patients with both hepatic dysfunction and significant renal disease, caution should be exercised and the Xoraxon dosage should not exceed 2 gm daily. Alterations in prothrombin time have occurred rarely in patients treated with Xoraxon. Patients with impaired vitamin K synthesis or low vitamin K stores (e.g., chronic hepatic disease and malnutrition) may require monitoring of prothrombin time during Xoraxon treatment. Vitamin K administration (10 mg weekly) may be necessary if the prothrombin time is prolonged before or during therapy. Prolonged use of Xoraxon may result in overgrowth of nonsusceptible organisms. Careful observation of the patient is essential. If superinfection occurs during therapy, appropriate measures should be taken.

Xoraxon should be prescribed with caution in individuals with a history of gastrointestinal disease, superior colitis and/or colitis. There have been reports of serographic abnormalities in the gallbladder of patients treated with Ceftriaxone (Xoraxon); some of these patients also had symptoms of gallbladder disease. These abnormalities appear on sonography as an echo without acoustical shadowing suggesting sludge or as an echo with acoustical shadowing which may be misinterpreted as cholelithiasis. The chemical nature of the sonographically detected material has been determined to be predominantly a ceftriaxone-calcium salt. The condition appears to be transient and reversible upon discontinuation of Ceftriaxone (Xoraxon) and institution of conservative management. Therefore, Xoraxon should be discontinued in patients who develop signs and symptoms suggestive of gallbladder disease and/or the serographic findings described above. Cases of pancreatitis, possibly secondary to biliary obstruction, have been reported rarely in patients treated with Ceftriaxone (Xoraxon). Most patients presented with risk factors for biliary stasis and biliary sludge (preceding major therapy, severe illness, and total parenteral nutrition).

A caution: risk of Ceftriaxone-related biliary precipitation cannot be ruled out. Information for Patients should be counselled that antibiomatic drugs including Xoraxon should only be used to treat bacterial infections. They do not treat viral infections (e.g., common cold). When Xoraxon is prescribed to treat a bacterial infection, patients should be told that although it is common to feel better early in the course of therapy, the medication should be continued as directed to complete the course of therapy. The chemical nature of the sonographically detected material has been determined to be predominantly a ceftriaxone-calcium salt. The condition appears to be transient and reversible upon discontinuation of Ceftriaxone (Xoraxon) and institution of conservative management. Therefore, Xoraxon should be discontinued in patients who develop signs and symptoms suggestive of gallbladder disease and/or the serographic findings described above. Cases of pancreatitis, possibly secondary to biliary obstruction, have been reported rarely in patients treated with Ceftriaxone (Xoraxon). Most patients presented with risk factors for biliary stasis and biliary sludge (preceding major therapy, severe illness, and total parenteral nutrition).

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