Rimycin
Rifampicin

PRODUCT INFORMATION

Composition

The active ingredient of Rimycin capsules is rifampicin.

The capsules also contain the following inactive excipients: lactose, ascorbic acid, purified talc, magnesium stearate, brilliant blue FCF (CI 42090), erythrosine (CI 45430), titanium dioxide (CI 77891), sodium lauryl sulfate, colloidal anhydrous silica, potable water and gelatin. Additionally, the 150 mg capsules contain iron oxide yellow (CI 77492) and iron oxide red (CI 77491).

Description

Rifampicin is a semisynthetic antibiotic derivative of rifamycin B. Specifically, rifampicin is the hydrazone, 3-(4-methylpiperazinyliminomethyl) rifamycin SV. It is slightly soluble in water and is rather unstable to light and moisture. The structural formula for rifampicin is:

![Rifampicin Structural Formula](image)

Pharmacology

Rifampicin is particularly active against rapidly growing extracellular organisms but it also has bactericidal activity intracellularly and against slow and intermittently growing Mycobacterium tuberculosis. Rifampicin inhibits DNA dependent RNA polymerase activity in susceptible cells. Specifically, it interacts with bacterial RNA polymerase, but does not inhibit the mammalian enzyme. Cross resistance to rifampicin has only been shown with other rifamycins.
Pharmacokinetics

Rifampicin is readily absorbed from the stomach and the duodenum. Peak serum concentrations of the order of 7 microgram/mL (range 6 to 32 microgram/mL) occur about 2 to 4 hours after an oral dose of 600 mg on an empty stomach.

In normal subjects the biological half-life of rifampicin in serum averages about 3 hours after a 600 mg dose. After absorption, rifampicin is rapidly eliminated in the bile, and an enterohepatic circulation ensues. During this process rifampicin undergoes progressive deacetylation, so that nearly all the drug in the bile is in this form in about 6 hours. This metabolite retains essentially complete antibacterial activity. Intestinal reabsorption is reduced by deacetylation, and elimination is facilitated. Up to 30% of a dose is excreted in the urine, with about half of this being unchanged drug. Absorption of rifampicin is reduced when the drug is ingested with food.

Rifampicin is widely distributed throughout the body. It is present in effective concentrations in many organs and body fluids, including cerebrospinal fluid. Rifampicin is about 80% protein bound. Most of the unbound fraction is not ionised and therefore is diffused freely in tissues.

Rifampicin crosses the placental barrier. Serum levels in the fetus equal 15 to 96% of the maternal serum levels. Rifampicin also appears in the milk of nursing mothers.

Indications

Tuberculosis. In the initial treatment and in retreatment of patients with tuberculosis, rifampicin must be used in conjunction with at least one other antituberculosis drug.

Leprosy.

(a) In the management of lepromatous leprosy and dimorphous leprosy to effect speedy conversion of the infectious state to the non-infectious state which may be expected to occur in three to four months of treatment.

(b) As an alternative drug in lepromatous, dimorphous, indeterminate and tuberculoid leprosy resistant to sulfones and other anti-leprosy drugs.

(c) As an alternative drug in all those patients having true drug allergy to the more commonly used anti-leprosy drugs.

Prophylaxis of meningococcal disease in close contacts of known cases and in carriers (rifampicin is not indicated for the treatment of meningococcal infections).

Prophylaxis of household contacts of patients with Haemophilus influenzae type B.

Contraindications

Known hypersensitivity to rifampicin or any of the rifamycins; jaundice.
Warnings

Rifampicin has been shown to produce liver dysfunction. There have been fatalities associated with jaundice in patients with liver disease or receiving rifampicin concomitantly with other hepatotoxic agents. Since an increased risk may exist for individuals with liver disease, benefits must be weighed carefully against the risk of further liver damage. Periodic liver function monitoring in these patients, especially ALT and AST should be carried out prior to therapy and then every 2 to 4 weeks during therapy. Dosage adjustment may be necessary. If signs of hepatocellular damage occur rifampicin should be withdrawn. Similar precautions are recommended for undernourished patients.

In some cases hyperbilirubinaemia resulting from competition between rifampicin and bilirubin for excretory pathways of the liver at the cell level can occur in the early days of treatment. An isolated report showing a moderate rise in bilirubin and/or transaminase level is not in itself an indication for interrupting treatment; rather, the decision should be made after repeating the tests, noting trends in the levels and considering them in conjunction with the patient’s clinical condition.

Both in the treatment of tuberculosis and in meningococcal prophylaxis, small numbers of resistant cells, present within large populations of susceptible cells, can rapidly become the predominating type. Since rapid emergence of resistance can occur, culture and susceptibility tests should be performed in the event of persistent positive cultures. Rifampicin should not be used for the treatment of meningococcal disease. In the treatment of asymptomatic carriers it should be reserved for situations where the risk of meningococcal meningitis is high.

The risks of drug resistance with rifampicin, when used in leprosy, has not been adequately evaluated and, therefore, a second drug should be added to the treatment regimen as is done in the case of tuberculosis.

Rifampicin is not recommended for intermittent therapy (less frequently than 2 to 3 times/week). The patient should be cautioned against intentional or accidental interruption of the daily dosage regimen since rare renal hypersensitivity reactions have been reported when therapy was resumed in such cases. If, as may happen in rare cases, a patient develops thrombocytopenia, purpura, haemolytic anaemia or renal failure, treatment with rifampicin should be stopped immediately and not reinstituted at any subsequent time.

It is necessary to exclude concomitant tuberculosis in any patient with leprosy who is to be given rifampicin. If tuberculosis exists concurrently, combined chemotherapy must be used.

Adults treated for tuberculosis with rifampicin should have baseline measurements of hepatic enzymes, bilirubin, serum creatinine, a complete blood count and a platelet count (or estimate). Baseline tests are unnecessary in children unless a complicating condition is known or clinically suspected.

Patients should be seen at least monthly during therapy and should be specifically questioned concerning symptoms associated with adverse reactions. All patients with abnormalities should have follow-up, including laboratory testing, if necessary. Routine laboratory monitoring for toxicity in people with normal baseline is generally not necessary.

Carcinogenicity, Mutagenicity, Impairment of Fertility

There are no known human data on the long term potential for carcinogenicity. A few cases of accelerated growth of lung carcinoma have been reported in humans, but a causal relationship with the drug has not been established.
Rifampicin was associated with an increased incidence of liver tumours in the females of one strain of mice at doses from two to ten times the recommended human therapeutic doses. In another strain of mice and in rats, no increase of tumours was found. All these studies were carried out during most of the animals' life span.

Rifampicin has been reported to have immunosuppressive potential in rabbits, mice, rats, guinea pigs, human lymphocytes in vitro, and humans.

Antibiotic associated pseudomembranous colitis has been reported with many antibiotics including rifampicin. A toxin produced with Clostridium difficile appears to be the primary cause. The severity of the colitis may range from mild to life threatening. It is important to consider this diagnosis in patients who develop diarrhoea or colitis in association with antibiotic use (this may occur up to several weeks after cessation of antibiotic therapy). Mild cases usually respond to drug discontinuation alone. However, in moderate to severe cases, appropriate therapy with a suitable oral antibacterial agent effective against Clostridium difficile should be considered. Fluids, electrolytes and protein replacement should be provided when indicated.

Drugs which delay peristalsis, e.g. opiates and diphenoxylate with atropine (Lomotil) may prolong and/or worsen the condition and should not be used.

Rifampicin has enzyme-inducing properties, that can enhance the metabolism of endogenous substrates including adrenal hormones, thyroid hormones and vitamin D. Isolated reports have associated porphyria exacerbation with rifampicin administration, as a result of the induction of delta amino levullinic acid synthetase.

Use in Pregnancy (Risk Category: C)

There are no well controlled studies with rifampicin in pregnant women. Therefore, rifampicin should be used in pregnant women, or in women with child bearing potential, only if the potential benefit justifies the risk to the fetus.

In animal experiments, rifampicin given during organ development has caused skeletal malformations. Although rifampicin has been reported to cross the placental barrier and appear in cord blood, the effect of rifampicin on the human fetus is unknown.

Bleeding attributable to hypoprothrombinaemia has been reported in newborn infants and in mothers after the use of rifampicin during late pregnancy. If rifampicin is used during the last few weeks of pregnancy, vitamin K should be given to the mother and the newborn infant.

Use in Lactation

Rifampicin is excreted in breast milk and infants should not be breastfed by a patient receiving rifampicin.

Use in Premature and Newborn Infants

As liver enzymes are not fully developed in this age group, treatment with rifampicin should be considered only in the most grave emergencies.

Precautions

Rifampicin has been observed to increase the requirement for anticoagulant drugs of the coumarin type. The cause of this phenomenon is unknown.
In patients receiving anticoagulants and rifampicin concurrently, it is recommended that the prothrombin time be performed daily or as frequently as necessary to establish and maintain the required dose of anticoagulant.

Soft contact lenses may be permanently stained. Individuals treated should be made aware of this possibility in order to prevent undue anxiety.

Urine, faeces, saliva, sputum, sweat and tears may be coloured red-orange by rifampicin and its metabolites. Individuals to be treated should be made aware of these possibilities in order to prevent undue anxiety.

For the treatment of tuberculosis, rifampicin is usually administered on a daily basis. High doses of rifampicin (greater than 600 mg) given once or twice weekly have resulted in a high incidence of adverse reactions, including the “flu syndrome” (fever, chills and malaise), haematopoietic reactions (leucopenia, thrombocytopenia, or acute haemolytic anaemia), cutaneous, gastrointestinal and hepatic reactions, shortness of breath, shock and renal failure. Recent studies indicate that regimens using twice-weekly doses of rifampicin 600 mg plus isoniazid 15 mg/kg are much better tolerated. Intermittent therapy may be used if the patient cannot or will not self-administer drugs on a daily basis. Patients on intermittent therapy should be closely monitored for compliance and cautioned against intentional or accidental interruption of prescribed therapy because of the risk of serious adverse reactions (see Warnings and Interactions sections).

Rifampicin should be used very carefully in patients with a known history of porphyria cutanea tarda or acute intermittent porphyria.

Rifampicin may precipitate acute renal crisis in patients with adrenal insufficiency. It may be necessary to increase the dose of adrenal steroids in patients with impaired adrenal function who are to receive rifampicin.

**Interactions**

Concomitant antacid administration may reduce the absorption of rifampicin. Daily doses of rifampicin should be given at least one hour before the ingestion of antacids.

Rifampicin, a potent inducer of certain cytochrome P450 enzymes, has liver enzyme inducing properties and may accelerate the metabolism and reduce the activity of a number of drugs including anticoagulants (e.g. warfarin), corticosteroids, cyclosporin, digitalis preparations, quinidine, systemic hormonal contraceptives, oral hypoglycaemic agents (e.g. sulfonylureas), dapsone, narcotics, analgesics, tocainide, propafenone, antipsychotics (e.g. haloperidol), antifungals (e.g. fluconazole, itraconazole, ketoconazole), calcium channel blockers (e.g. diltiazem, nifedipine), clarithromycin, cardiac glycoside preparations, doxycycline, fluoroquinolones, levothyroixine, quinine, tacrolimus, tricyclic antidepressants (e.g. amitriptyline, nortriptyline) and antiretroviral drugs (e.g. zidovudine, saquinavir, indinavir) and losartan. It may be necessary to adjust the dosage of these drugs if they are given concurrently with rifampicin.

Rifampicin has also been reported to diminish the effects of concurrently administered methadone, barbiturates, benzodiazepines (e.g. diazepam), verapamil, beta-adrenergic blockers, clofibrate, oestrogens, progestins, disopyramide, mexiletine, theophylline, chloramphenicol and anticonvulsants (e.g. phenytoin). It may be necessary to adjust the dosage of these drugs if they are given concurrently with rifampicin.

Halothane, when given concomitantly with rifampicin, has been reported to increase the hepatotoxicity of both drugs. The combined use of halothane and rifampicin should be avoided.
Female patients using oral contraceptives during therapy should be advised to change to nonhormonal methods of birth control.

Also, diabetes may become more difficult to control.

Concurrent daily use of alcohol may result in increased incidence of rifampicin induced hepatotoxicity and increased metabolism of rifampicin; dosage adjustments of rifampicin may be necessary and patient monitoring for hepatotoxicity.

When rifampicin is taken with p-aminosalicylic acid (PAS), rifampicin levels in the serum may decrease. Therefore, the drugs should be taken at least 4 hours apart.

Combined administration of isoniazid and rifampicin may give rise to more frequent and marked disorders of liver function than treatment with rifampicin alone. Concurrent use of isoniazid with rifampicin may increase the risk of hepatotoxicity, especially with pre-existing hepatic function impairment and/or fast acetylators of isoniazid; patients should be monitored closely for signs of hepatotoxicity during the first 3 months of therapy.

Ketoconazole, when given concomitantly with rifampicin, has been reported to diminish the serum concentrations of both drugs. When both isoniazid and rifampicin were used concurrently with ketoconazole, serum concentrations of ketoconazole and rifampicin were reported to be undetectable. Because of the similarities among imidazole derivatives, concurrent use of isoniazid or rifampicin, alone or in combination, with ketoconazole or possibly parenteral miconazole, is not recommended.

Probenecid may increase rifampicin serum concentration and/or toxicity due to competition for hepatic uptake, however the effect on blood levels is inconsistent and concurrent use of probenecid to increase rifampicin serum concentration is not recommended.

When the two drugs were taken concomitantly, decreased concentrations of atovaquone and increased concentrations of rifampicin were observed. Concurrent use of rifampicin and enalapril has resulted in decreased concentrations of enalaprilat, the active metabolite of enalapril. Dosage adjustments should be made if indicated by the patients clinical condition.

**Laboratory Interactions**

Cross-reactivity and false-positive urine screening tests for opiates have been reported in patients receiving rifampicin when using the KIMS (Kinetic Interaction of Microparticles in Solution) method (eg, Abuscreen On-Line opiates assay; Roche Diagnostic Systems). Confirmatory tests, such as gas chromatography / mass spectrometry, will distinguish rifampicin from opiates.

Positive direct Coombs’ test may show a false positive during rifampicin therapy.

In the metyrapone test, rifampicin, by hepatic enzyme induction, may decrease the response to metyrapone.

Therapeutic levels of rifampicin have been shown to inhibit standard microbiological assays for serum folate and vitamin B₁₂. Thus, alternate assay methods should be considered.

Transient elevation of bromsulfophthalein and serum bilirubin have been reported. Therefore, these tests should be performed before the morning dose of rifampicin.

Rifampicin may interfere with urinalysis based on spectrophotometry or colour reaction due to discoloration of the urine.
Adverse Reactions

Gastrointestinal disturbances such as heartburn, epigastric distress, anorexia, nausea, vomiting, gas, cramps and diarrhoea have been noted in some patients. Pseudomembranous colitis has been reported. Headache, drowsiness, fatigue, menstrual disturbances, ataxia, dizziness, inability to concentrate, mental confusion, visual disturbances, muscular weakness, fever, pains in the extremities and generalised numbness have also been noted. Psychoses have been reported rarely.

Hypersensitivity reactions have been reported. Erythema multiforme, including Stevens-Johnson syndrome, toxic epidermal necrolysis and vasculitis have been reported rarely.

Encountered occasionally have been flushing, pruritus, urticarial rash, pemphigus, acneform lesions, sore mouth, sore tongue and exudative conjunctivitis. Rarely, hepatitis or a shocklike syndrome with hepatic involvement and abnormal liver function tests (eg. elevations in serum bilirubin, bromsulfophthalein, alkaline phosphatase, serum transaminases) have also been observed.

Thrombocytopenia with or without purpura may occur, usually associated with intermittent therapy, but is reversible if the drug is discontinued as soon as purpura occurs. Cerebral haemorrhage and fatalities have been reported when rifampicin administration has been continued or resumed after the appearance of purpura. Eosinophilia, leucopenia, oedema, muscle weakness and myopathy have been reported to occur in a small percentage of patients treated with rifampicin. Disseminated intravascular coagulation has been reported rarely.

Porphyria characterised by classical bullous subepidermal skin lesions has been associated with the use of rifampicin (see Precautions).

Elevations in BUN (blood urea nitrogen), serum urea and serum uric acid have occurred. Rarely, haemolysis, haemoglobinuria, haematuria, renal insufficiency or acute renal failure have been reported and are generally considered to be hypersensitivity reactions. These have usually occurred during intermittent therapy or when treatment was resumed following intentional or accidental interruption of a daily dosage regimen and were reversible when rifampicin was discontinued and appropriate therapy instituted. Rare reports of adrenal insufficiency have been observed in patients with compromised adrenal function.

Reactions usually occurring with intermittent dosage regimens and most probably of immunological origin include:

"Flu syndrome" consisting of episodes of fever, chills, headache, dizziness, and bone pain appearing most commonly during the third to the sixth month of therapy. The frequency of the syndrome varies but may occur in up to 50% of patients given once weekly regimens with a dose of rifampicin of 25 mg/kg or more. These symptoms may be a prelude to more serious complications such as renal hypersensitivity reactions. It is preferable in such cases to change to daily medication.

Shortness of breath and wheezing.

Anaphylaxis.

Decrease in blood pressure, and shock.

Acute haemolytic anaemia.

Acute renal failure usually due to acute tubular necrosis or acute interstitial nephritis, but cortical necrosis has been reported.
During the treatment of leprosy with rifampicin a lepromatous reaction may occur. Mild reactions do not require a cessation of rifampicin therapy; in other cases corticosteroid therapy may be required and withdrawal of rifampicin considered.

**Dosage and Administration**

It is recommended that rifampicin be administered once daily, either 30 minutes before or two hours after a meal.

*Pulmonary tuberculosis.*

Adults: 600 mg in a single daily administration.

Children: 10 to 20 mg/kg not to exceed 600 mg/day.

*Leprosy.* Adults: 450 to 600 mg in a single daily administration.

Data are not available for determination of dosage for children under 5 years.

In the treatment of pulmonary tuberculosis, rifampicin must be used in conjunction with at least one other antituberculous agent. Similarly, in the treatment of leprosy, rifampicin should always be used in conjunction with at least one other antileprosy drug.

In general, therapy should be continued until bacterial conversion and maximal improvement have occurred.

*Prophylaxis of meningococcal disease.*

Dosage for contacts and carriers.

Adults: 600 mg daily for 4 days.

Children over 5 years: 10 mg/kg daily for 4 days, not to exceed 600 mg/day.

Prophylaxis of household contacts of patients with *H. influenzae* type B infection. The NH & MRC recommend that in any household in which a case of *H. influenzae* type B infection has occurred and in which another child less than 4 years resides, all members of the family, including adults, should receive rifampicin in a dose of:

20 mg/kg per dose once daily (maximum 600 mg per day) for 4 days;

Neonates (less than one month): 10 mg/kg once daily for 4 days.

Continuous daily treatment with rifampicin is usually better tolerated than intermittent medication (see Warnings). The termination of long-term therapy with rifampicin and a subsequent resumption of medication may lead to immunopathological effects (see Adverse Reactions). Intermittent therapy should be avoided but if this alternative is not possible therapy should be initiated with small incremental (150 mg/day) doses.

Renal function should be monitored and corticosteroids may be useful.
Overdosage

Symptoms. Nausea, vomiting, abdominal pain, pruritis, headache and increasing lethargy will probably occur within a short time after ingestion; actual unconsciousness may occur with severe hepatic involvement. Transient increases in hepatic enzymes and/or bilirubin may occur, brownish-red or orange discolouration of the skin, urine, sweat, saliva, tears and faeces is proportional to amount ingested. Facial or periorbital oedema has also been reported in paediatric patients. Hypotension, sinus tachycardia, ventricular arrhythmias, seizures and cardiac arrest were reported in some fatal cases.

Liver enlargement, possibly with tenderness, can develop within a few hours after severe overdosage and jaundice may develop rapidly. Hepatic involvement may be more marked in patients with prior impairment of hepatic function. Other physical findings remain essentially normal. Direct and total bilirubin levels may increase rapidly with severe overdosage; hepatic enzyme levels may be affected, especially with prior impairment of hepatic function. A direct effect upon the haematopoietic system, electrolyte levels, or acid-base balance is unlikely.

Although it has not been observed in humans, animal studies suggest a possible neurodepressant action associated with very high doses of rifampicin. Where overdoses of other drugs, including such potentially hepatotoxic substances as isoniazid, pyrazinamide or ethionamide have occurred simultaneously, the signs and symptoms of acute poisoning may be aggravated and/or modified.

Treatment. Intensive supportive and symptomatic measures should be instituted.

Since nausea and vomiting are likely present, gastric lavage is probably preferable to induction of emesis. Activated charcoal slurry instilled into the stomach following evacuation of gastric contents could help absorb any remaining drug in the gastrointestinal tract. Antiemetic medication may be required to control severe nausea/vomiting.

Active diuresis (with measured intake and output) will help promote excretion of the drug. Bile drainage may be indicated in the presence of serious impairment of hepatic function lasting more than 24 to 48 hours; under these circumstances, extracorporeal haemodialysis may be required. In patients with previously adequate hepatic function, reversal of liver enlargement and impaired hepatic excretory function probably will be noted within 72 hours, with rapid return toward normal thereafter.

Presentation

Rimycin 150, 150 mg capsule: black and maroon; 10's, 100's.

Rimycin 300, 300 mg capsule: maroon; 10's, 100's.

Poison Schedule

S4
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