WARNING
Severe and sometimes fatal hepatitis associated with isoniazid therapy may occur and may develop even after many months of treatment. The risk of developing hepatitis is age related. Approximate case rates by age are: 0 per 1,000 for persons under 20 years of age, 3 per 1,000 for persons in the 20 to 34 year age group, 12 per 1,000 for persons in the 35 to 49 year age group, 23 per 1,000 for persons in the 50 to 64 year age group, and 8 per 1,000 for persons over 65 years of age. The risk of hepatitis is increased with daily consumption of alcohol. Precise data to provide a fatality rate for isoniazid-related hepatitis is not available; however, in a U.S. Public Health Service Surveillance Study of 13,838 persons taking isoniazid, there were 8 deaths among 174 cases of hepatitis.

Therefore, patients given isoniazid should be carefully monitored and interviewed at monthly intervals. Serum transaminase concentration becomes elevated in about 10% to 20% of patients, usually during the first few months of therapy, but it can occur at any time. Usually enzyme levels return to normal despite continued use of drug, but in some cases progressive liver dysfunction occurs. Patients should be instructed to report immediately any of the prodromal symptoms of hepatitis, such as fatigue, weakness, malaise, anorexia, nausea, or vomiting. If these symptoms appear or if signs suggestive of hepatitis damage are detected, isoniazid should be discontinued promptly, since continued use of the drug in these cases has been reported to cause a more severe form of liver damage.

Patients with tuberculosis should be given appropriate treatment with alternative drugs. If isoniazid must be reinstalled, it should be reinstalled only after symptoms and laboratory abnormalities have cleared. The drug should be restarted in very small and gradually increasing doses and should be withdrawn immediately if there is any indication of recurrent liver involvement. Treatment should be deferred in persons with acute hepatic diseases.

DESCRIPTION
RIFAMATE® is a combination capsule containing 300 mg rifampin and 150 mg isoniazid. The capsules also contain as inactive ingredients colloidal silicon dioxide, FD&C Blue No. 1, FD&C Red No. 40, gelatin, magnesium stearate, sodium starch glycolate, and titanium dioxide.

Rifampin
Rifampin is a semisynthetic antibiotic derivative of rifacin SV. Rifampin is a red-brown crystalline powder very slightly soluble in water at neutral pH, freely soluble in chloroform, soluble in ethyl acetate and methanol. Its molecular weight is 822.95 and its chemical formula is C₃₅H₄₆N₄O₂₀. The chemical name for rifampin is: 3-{[4-(methyl-1-piperazinyl) imino]-methyl}-rifamycin; or 5,6,9,17,19,21-hexahydroxy-23-methoxy-2,4,12,16,18,20,22 heptamethyl-8-[N-(4-methyl-1-piperazinyl)formimidoyl]-2,7-(epoxypentadeca [11,13] trieniminoc)naptho[2,1-furan-1,11(2H)-dione 21-acetate.

Its structural formula is:

![Chemical structure of rifampin](Image)

Isoniazid
Isoniazid is the hydrazide of isonicotinic acid. It is a colorless or white crystalline powder or white crystals. It is odorless and slowly affected by exposure to air and light. It is freely soluble in water, sparingly soluble in alcohol and slightly soluble in chloroform and in ether. Its molecular weight is 137.14 and its chemical formula is C₈H₈N₄O₂.

The chemical name for isoniazid is 4-pyridinecarboxylic acid, hydrazide and its structural formula is:

![Chemical structure of isoniazid](Image)

RIFAMATE® (rifampin and isoniazid capsules USP) Rx Only

In study of 14 normal human adult males, peak blood levels of rifampin occurred 1 1/2 to 3 hours following oral administration of two RIFAMATE capsules. The peaks ranged from 6.9 to 14 mcg/mL with an average of 10 mcg/mL.

In healthy adults, the biological half-life of rifampin in serum averages 3.35 ± 0.66 hours after a 600 mg oral dose, with increases up to 5.08 ± 2.45 hours reported after a 900 mg dose. With repeated administration, the half-life decreases and reaches average values of approximately 2 to 3 hours. The half-life does not differ in patients with renal failure at doses not exceeding 600 mg daily and, consequently, no dosage adjustment is required.

The half-life of isoniazid at a dose of 720 mg daily has not been established in patients with renal failure. Following a single 900 mg oral dose of isoniazid in patients with varying degrees of renal insufficiency, the mean half-life increased from 3.6 hours in healthy adults to 5.3 and 11.0 hours in patients with glomerular filtration rates of 30 to 50 mL/min, less than 30 mL/min, and in arunic patients, respectively. Refer to the WARNINGS section for information regarding patients with hepatic insufficiency.

After absorption, rifampin is rapidly eliminated in the bile, and an enterohepatic circulation appears to occur. During this process, rifampin undergoes progressive deconjugation so that nearly all the drug in the bile is in this form in about 6 hours. This metabolite has 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 as unchanged drug. Rifampin is tightly distributed throughout the body. It is present in effective concentrations in many organs and body fluids, including cerebrospinal fluid. Rifampin is about 80% protein bound. Most of the unbound fraction is not ionized and therefore is diffused freely in tissues.

Pediatrics
In one study, pediatric patients 6 to 58 months old were given rifampin suspended in simple syrup or as dry powder mixed with applesauce at a dose of 10 mg/kg body weight. Peak serum concentrations of 10.7 ± 3.7 and 11.5 ± 5.1 mcg/mL were obtained 1 hour after preprandial ingestion of the drug suspension and the applesauce mixture, respectively. After the administration of either preparation, the T₁/₂ of rifampin averaged 2.9 hours. It should be noted that in other studies in pediatric populations, at doses of 10 mg/kg body weight, mean peak serum concentrations of 3.5 mcg/mL to 15 mcg/mL have been reported.

Isoniazid
After oral administration, isoniazid is readily absorbed from the GI tract and produces peak blood levels within 1 to 2 hours which decline to 50% or less within 6 hours. It diffuses readily into all body fluids (cerebrospinal, pleural, and ascitic fluids), tissues, organs, and excreta (salliva, sputum, and feces). Isoniazid is not substantially bound to plasma proteins. The drug also passes through the placental barrier and into milk in concentrations comparable to those in the plasma. The plasma half-life of isoniazid in patients with normal renal and hepatic function ranges from 1 to 4 hours, depending on the rate of metabolism. From 50% to 70% of a dose of isoniazid is excreted in the urine in 24 hours, mostly as metabolites.

Isoniazid is metabolized in the liver mainly by acetylation and dehydrogenation. The rate of acetylation is genetically determined. Approximately 50% of African Americans and Caucasians are “slow inactivators” and the rest are “rapid inactivators”; the majority of Eskimos and Asians are “rapid inactivators.”

The rate of acetylation does not significantly alter the effectiveness of isoniazid. However, slow acetylation may lead to higher blood levels of the drug, and thus an increase in toxic reactions.

Pyridoxine (B₆) deficiency is sometimes observed in adults with high doses of isoniazid and is probably due to its competition with pyridoxal phosphate for the enzyme apotransferrin.

Microbiology
Rifampin and isoniazid at therapeutic levels have demonstrated bactericidal activity against both intracellular and extracellular Mycobacterium tuberculosis organisms.

Mechanism of Action
Rifampin
Rifampin inhibits DNA-dependent RNA polymerase activity in susceptible Mycobacterium tuberculosis organisms. Specifically, it interacts with bacterial RNA polymerase, but does not inhibit the mammalian enzyme.

Isoniazid
Isoniazid inhibits the biosynthesis of mycolic acids which are major components of the cell wall of Mycobacterium tuberculosis.

Drug Resistance
Organisms resistant to rifampin are likely to be resistant to other rifamycins, β-lactamase production should have no effect on rifampin activity.

In the treatment of tuberculosis (See INDICATIONS AND USAGE), the small number of resistant cells present within large populations of susceptible cells can rapidly become predominant. In addition, resistance to rifampin has been determined to occur as single-step mutations of the DNA-dependent RNA polymerase. Since resistance can emerge rapidly, appropriate susceptibility tests should be performed in the event of persistent positive cultures.

Activity in vitro and in vivo
Rifampin has bactericidal activity against slow and intermittently growing Mycobacterium tuberculosis organisms.

Susceptibility Testing
Prior to initiation of therapy, appropriate specimens should be collected for identification of the infecting organism and in vitro tests.

In vitro testing for Mycobacterium tuberculosis isolates:

Two standardized in vitro susceptibility methods are available for testing isoniazid and rifampin against Mycobacterium tuberculosis organisms. The agar proportion method (CDC or CLSI M24-P) utilizes Middlebrook 7H10 medium impregnated with isoniazid at 0.2 and 4.0 mcg/mL and rifampin at various concentrations. After 8 days of incubation, drug concentrations that inhibit 90% of the test organism (D₉₀) are calculated by comparing the minimum drug concentrations required for growth with the control concentration (Dₐ₀).

The radiometric broth method employs the BACTEC 460 machine to compare the growth of test organisms with control vials in the presence of increasing concentrations of both rifampin and isoniazid. MICₙ₀ values are calculated by comparing the growth index from untreated control cultures to cultures grown in the presence of 0.2 and 1.0 mcg/mL of isoniazid and 2.0 mcg/mL of rifampin. Strict adherence to the manufacturer’s instructions for sample processing and data interpretation is required for this assay.
Sensitization test results obtained by the two different methods can only be compared if the appropriate rifampin or isoniazid concentrations are used for each test method as indicated above. Both test procedures require the use of Mycobacterium tuberculosis H37Rv, ATCC 27294, as a control organism. The clinical relevance of in vitro sensitization test results for mycobacterial species other than Mycobacterium tuberculosis using either the radiometric broth method or the proportion method has not been determined.

**INDICATIONS AND USAGE**

In the treatment of tuberculosis, the small number of resistant cells present within large populations of susceptible cells can rapidly become the predominant type. Since resistance can emerge rapidly, susceptibility tests should be performed in the event of persistent positive cultures during the course of treatment. Bacteriologic smears or cultures should be obtained before the start of therapy to confirm the susceptibility of the organism to rifampin and isoniazid, and they should be repeated throughout therapy to monitor response to the treatment. If test results show resistance to any of the components of RIFAMATE and the patient is not responding to therapy, the drug regimen should be modified.

RIFAMATE is indicated for pulmonary tuberculosis in which organisms are susceptible, and when the patient has been titrated on the individual components and it has therefore been established that this fixed dosage is therapeutically effective.

In the treatment of tuberculosis, the small number of resistant cells present within large populations of susceptible cells can rapidly become the predominant type. Since resistance can emerge rapidly, susceptibility tests should be performed in the event of persistent positive cultures during the course of treatment. Bacteriologic smears or cultures should be obtained before the start of therapy to confirm the susceptibility of the organism to rifampin and isoniazid, and they should be repeated throughout therapy to monitor response to the treatment. If test results show resistance to any of the components of RIFAMATE and the patient is not responding to therapy, the drug regimen should be modified.

RIFAMATE is indicated for pulmonary tuberculosis in which organisms are susceptible, and when the patient has been titrated on the individual components and it has therefore been established that this fixed dosage is therapeutically effective.

This fixed-dosage combination drug is not recommended for initial therapy of tuberculosis or for preventive therapy.

A three-drug regimen consisting of rifampin, isoniazid, and pyrazinamide (e.g., RIFATER®) is recommended in the initial phase of short-course therapy which is usually continued for 2 months. The Advisory Council for the Elimination of Tuberculosis, the American Thoracic Society, and Centers for Disease Control and Prevention recommend that either streptomycin or ethambutol be added as a fourth drug in a regimen containing isoniazid (INH), rifampin, and pyrazinamide for initial treatment of tuberculosis unless the likelihood of INH resistance is very low. The need for a fourth drug should be reassessed when the results of susceptibility testing are known. If community rates of INH resistance are less than 4%, an initial treatment regimen with less than four drugs may be considered. Following the initial phase, treatment should be continued with RIFAMATE for at least 4 months. Treatment should be continued for longer if the patient is still sputum or culture positive, if the patient is present, or if the patient is HIV positive. This drug is not indicated for the treatment of meningococcal infections or asymptomatic carriers of Neisseria meningitidis to eliminate meningococci from the nasopharynx.

**CONTRAINDICATIONS**

RIFAMATE is contraindicated in patients with a history of hypersensitivity to rifampin or isoniazid, or any of the components, or to any of the rifamycins.

**Rifampin**

Rifampin is contraindicated in patients who are also receiving ritonavir-boosted saquinavir due to an increased risk of severe hepatocellular toxicity. (See PRECAUTIONS, Drug Interactions.)

**Rifampin**

Rifampin is contraindicated in patients who are also receiving atazanavir, darunavir, fosamprenavir, or saquinavir due to the potential of rifampin to substantially decrease plasma concentrations of these antiviral drugs, which may result in loss of antiviral efficacy and/or development of viral resistance.

**Isoniazid**

Other contraindications include patients with severe hepatic damage; severe adverse reactions to isoniazid, such as drug fever, chills, and arthritis; patients with acute liver disease of any etiology; and patients with acute gout.

**WARNINGS**

RIFAMATE (rifampin and isoniazid capsules USP) is a combination of two drugs, each of which has been associated with liver dysfunction.

Severe, systemic hypersensitivity reactions, including fatal cases, such as Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS) syndrome have been observed during treatment with rifampin. The risk factors for the development of manifestations of hypersensitivity, such as fever, lymphadenopathy or biological abnormalities (including eosinophilia, liver abnormalities) may be present even though rash is not evident. If such signs or symptoms are present, the patient should be advised to consult their physician immediately. RIFAMATE should be discontinued if an alternative etiology for the signs and symptoms cannot be established.

**Rifampin**

Rifampin has been shown to produce liver dysfunction. There have been fatalities associated with jaundice in patients with liver disease or receiving rifampin concomitantly with other hepatotoxic agents. Because RIFAMATE contains both rifampin and isoniazid, it should only be given with caution and under strict medical supervision to patients with impaired liver function. In these patients, careful monitoring of liver function, especially serum glutamic pyruvic transaminase (SGPT) and serum glutamic oxaloacetic transaminase (SGOT) should be carried out prior to therapy and then every 2 to 4 weeks during therapy. If signs of hepatocellular damage occur, RIFAMATE should be withdrawn.

In some cases, hyperbilirubinemia resulting from competition between rifampin and bilirubin for albumin binding sites may be more common in the early days of treatment. An isolated report showing a moderate rise in bilirubin and/or transaminase levels 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.

Rifampin has enzyme-inducing properties, including induction of delta amino levulinic acid synthetase. Isolated reports have associated porphyria exacerbation with rifampin administration.

**Isoniazid**

(See the boxed WARNING.)

Since RIFAMATE contains isoniazid, ophthalmologic examinations (including ophthalmoscopy) should be done before treatment is started and periodically thereafter, even without occurrence of visual symptoms.

Capsule contents may produce a staining of the liver and urine. The possibility of skin discoloration of the urine, stools, and sweat due to the isoniazid component of RIFAMATE should be considered.

**NURSING**

Adults treated for tuberculosis with RIFAMATE should have baseline measurements of hepatic enzymes, bilirubin, serum creatinine, a complete blood count (CBC) and platelet count (or estimate), and blood uric acid. 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 measurements is generally not necessary.

**Drug Interactions**

Rifampin

Healthy subjects who received rifampin 600 mg once daily concomitantly with saquinavir 600 mg twice daily (ritonavir-boosted saquinavir) developed severe hepatocellular toxicity. Therefore, concomitant use of these medications is contraindicated. (See CONTRAINDICATIONS.)

Enzyme Induction

RIFAMATE, because it contains rifampin, with drugs that undergo biotransformation through these metabolic pathways may accelerate elimination. To maintain optimum therapeutic blood levels, dosages of drugs metabolized by these enzymes may require adjustment when starting or stopping concomitantly administered rifampin.

Rifampin has been reported to substantially decrease the plasma concentrations of the following antiviral drugs: atazanavir, darunavir, fosamprenavir, saquinavir, and tipranavir. These antiviral drugs must not be coadministered with rifampin. (See CONTRAINDICATIONS.)

Rifampin has been reported to accelerate the metabolism of the following drugs: anticonvulsants (e.g., phenytoin), digoxin, antitryramics (e.g., disopyramide, mexi-etine, quinidine, tocinamide), oral anticoagulants, antifungals (e.g., fluconazole, itracon- azole, ketoconazole), barbiturates, beta-blockers, calcium channel blockers (e.g., diz-olamide, verapamil), benzophenones, darvancil, divalproex, disopyramide, valproil, cortisol, corticosteroids, estradiol, estrogens, fludrocortisone, fluoxetine, levodopa, levonorgestrel, levonorgestrel, metoclopramide, metformin, omeprazole, oral contraceptives, oral contraceptives, oral hypoglycemic agents (sulfonylureas), levothyroxine, methadone, nortri-
analgesics, progestins, quinolone, theophylline tricyclic antidepressants (e.g., amitriptyline, nortriptyline) and zidovudine. It may be necessary to adjust dosages of these drugs if they are given concurrently with RIFAMATE since it contains rifampin. Patients using oral or other systemic hormonal contraceptives should be advised to change to nonhormonal methods of birth control during rifampin therapy. Rifampin binds to albumin which may increase the free drug concentrations for antibiotic drugs of the coumarin type. In patients receiving anticoagulants and RIFAMATE 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.

When the two drugs were taken concurrently, decreased concentrations of atovaquone and increased concentrations of rifampin were observed. Concurrent use of ketoconazole and rifampin has resulted in decreased serum concentration of both drugs. Concurrent use of rifampin and enalapril has resulted in decreased concentrations of enalapril, the active metabolite of enalapril. Since RIFAMATE contains rifampin, dosage adjustments should be made. Rifampin is concurrently administered with ketoconazole or enalapril if indicated by the patient’s clinical condition.

Other Interactions
Concomitant antacid administration may reduce the absorption of rifampin. Daily doses of RIFAMATE, because it contains rifampin, should be given at least 1 hour before the ingestion of antacids. Probenecid and cotrimoxazole have been reported to increase the blood level of rifampin. When rifampin is given concomitantly with either halothane or isoniazid the potential for hepatotoxicity is increased. The concomitant use of Rifampicin, because it contains both rifampin and isoniazid, and halothane should be avoided. Patients receiving both rifampin and isoniazid as in RIFAMATE should be monitored closely for hepatotoxicity. (See the boxed WARNING).

Pharmacodynamic Interactions
Coadministration of isoniazid with drugs that undergo biotransformation through these metabolic pathways may decrease elimination. Consequently, dosages of drugs metabo- lized by these enzymes may require adjustment when stopping or stopping concomitantly administered RIFAMATE, because it contains isoniazid, to maintain optimum therapeutic blood levels. Isoniazid has been reported to inhibit the metabolism of the following drugs: anticonvuls- ants (e.g., carbamazepine, phenytoin, primidone, valproic acid), benzodiazepines (e.g., diazepam), haloperidol, ketoconazole, theophylline, and warfarin. It may be necessary to adjust the dosages of these drugs if they are given concurrently with RIFAMATE because it contains isoniazid. The impact of the competing effects of rifampin and isoniazid on the metabolism of these drugs is unknown.

Other Interactions
Concomitant antacid administration may reduce the absorption of isoniazid. Ingestion with food may also reduce the absorption of isoniazid. Daily doses of RIFAMATE, because it contains isoniazid, should be given on an empty stomach at least 1 hour before the ingestion of antacids or food.

Corticosteroids (e.g., prednisolone) may decrease the serum concentration of isoniazid by increasing acetylation rate and/or renal clearance. Para-aminosalicylic acid may increase the plasma concentration and elimination half-life of isoniazid by competition of acetylating enzymes.

Pharmacokinetic Interactions
Daily ingestion of alcohol may be associated with a higher incidence of isoniazid hepatitis. Isoniazid, when given concomitantly with rifampin, has been reported to increase the hepatotoxicity of rifampin. Patients receiving both rifampin and isoniazid as in RIFAMATE should be monitored closely for hepatotoxicity. The CNS effects of meperidine (drowsiness), cycloserine (dizziness, drowsiness), and disulfiram (acute behavioral and coordination changes) may be exaggerated when concomitantly administered. RIFAMATE, because it contains isoniazid, is given. Concurrent RIFAMATE, because it contains isoniazid, and levodopa administration may produce symptoms of excess catecholamine stimulation (agitation, flushing, palpitations) or lack of levodopa effect.

Isoniazid may produce hyperglycemia and lead to loss of glucose control in patients on oral hypoglycemics. Fast acetylation of isoniazid may produce high concentrations of hydrazine that facilitate duodenal ulceration. Renal function should be monitored in patients receiving both Rifampicin and enalapril.

Food Interactions
Because isoniazid has some monoamine oxidase inhibiting activity, an interaction with tyramine-containing foods (cheese, red wine) may occur. Diamine oxide may also be inhibited. Cross-reactivity (e.g., headache, flushing, hypotension) to foods containing histamine (e.g., skipjack, tuna, other tropical fish). Tyramine- and histamine-containing foods should be avoided by patients receiving RIFAMATE.

Drug/Microbiological Test Interactions
Rifampin
Cross-reactivity and false-positive urine screening tests for opiates have been reported in patients receiving rifampin when using the KIMS (Kinetic Interaction of Microorganisms in Solution) Opiates On-line opiate assay. Roche Diagnostic Systems. Confirmatory tests, such as gas chromatography/mass spectrometry, will distinguish rifampin from opiates. Therapeutic levels of rifampin have been shown to inhibit standard microbiological assays for serum toluate and vitamin B6. Therefore, alternative assay methods should be considered when screening patients in normal flora in urine tests (e.g., elevation in serum bilirubin, alkaline phosphate and serum transaminases), and reduced bilirubin excretion of contrast media used for visualization of the gallbladder have also been observed. These tests should be performed before the morning dose of RIFAMATE.

Rifampin and isoniazid have been reported to alter vitamin D metabolism. In some cases, reduced levels of circulating 25-hydroxy vitamin D and 1,25-dihydroxy vitamin D have been accompanied by reduced serum calcium and phosphate, and elevated parathyroid hormone.

Carcinogenesis, Mutagenesis, Impairment of Fertility
Increased frequency of chromosomal aberrations was observed in vitro in lymphocytes obtained from patients treated with combinations of rifampin, isoniazid, and pyrazinamide and combinations of streptomycin, rifampin, isoniazid, and pyrazinamide. Rifampin
Some cases of accelerated growth of lung carcinoma have been reported in man, but a causal relationship with the drug has not been established. Hepatomas were increased in female C3Hf/Dp) mice dosed for 60 weeks with rifampicin following an observation period of 46 weeks, at 20 to 120 mg/kg (equivalent to 0.1 to 0.5 times the maximum dosage used clinically, based on body surface area comparisons). There was no evidence of tumorigenicity in male C3Hf/Dp) mice or, in similar studies in BALB/c mice, or in two year studies in Wistar rats. There was no evidence of mutagenicity in both prokaryotic (Salmonella typhimurium, Escherichia coli) or eukaryotic (Saccharomyces cerevisiae) bacteria. Drug-induced tumors in mice (e.g., Drosophila melanogaster, or CRHa Swiss mice. An increase in chromotid breaks was noted when whole blood cell cultures were treated with rifampin.

Isoniazid has been reported to induce pulmonary tumors in a number of strains of mice.

Pregnancy
Teratogenic Effects
Category C
Although animal reproduction studies have not been conducted with RIFAMATE terato- genic effects (including cleft palate and spina bifida) have been observed in rodents treated with rifampin at doses 0.2 to 2 times the maximum recommended human dose, based on body surface area comparisons. There are no adequate and well-controlled studies of RIFAMATE in pregnant women. RIFAMATE should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Rifampin
Congenital malformations, primarily spina bifida were increased in the offspring of pregnant rats given rifampin during organogenesis at oral doses of 150 to 250 mg/kg/day (about 1 to 2 times the maximum recommended human dose based on body surface area comparisons). Cleft palate was increased in a dose-dependent fashion in fetuses of pregnant mice treated at oral doses of 50 to 200 mg/kg (about 0.2 to 0.8 times the maximum recommended human dose based on body surface area comparisons). Imperfect osteogenesis and embryotoxicity were also reported in pregnant rabbits given rifampin at oral doses up to 200 mg/kg/day (about 3 times the maximum recommended human dose based on body surface area comparisons). Although there are limited adequate and well-controlled studies in pregnant women, rifampin has been reported to cross the placental barrier and appear in cord blood.

Isoniazid
Isoniazid has been reported that in both rats and rabbits, isoniazid may exert an embryocidal effect when administered orally during pregnancy, although no isoniazid-related congenital anomalies have been found in reproduction studies in mammalian species (mice, rats, and rabbits).

Pregnancy
Non-Teratogenic Effects
When administered during the last few weeks of pregnancy, rifampin can cause postnatal hemorrhages in the mother and infant for which treatment with vitamin K may be indicated. Rifampin
When administered during the last few weeks of pregnancy, rifampin can cause postnatal hemorrhages in the mother and infant. In this case, treatment with vitamin K may be indicated for postnatal hemorrhage.

Nursing Mothers
Rifampin
Because of the potential for tumorigenicity shown for rifampin in animal studies, and since rifampin and isoniazid are known to cross the placental barrier and to pass into maternal breast milk, a decision should be made whether to discontinue nursing or to discontinue RIFAMATE, taking into account the importance of the drug to the mother.

Pediatric Use
Safety and effectiveness in pediatric patients under the age of 15 have not been established. (See CLINICAL PHARMACOLOGY, General; See also DOSAGE AND ADMINISTRATION).

Geriatric Use
Clinical studies of RIFAMATE did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. Other reported clinical experience has not identified differences in responses between elderly and younger patients. Caution should therefore be observed in using rifampin and isoniazid in elderly patients. (See WARNINGS).

ADVERSE REACTIONS
Rifampin
Gastrointestinal: heartburn, epigastric distress, anorexia, nausea, vomiting, jaundice, flatulence, cramps, and diarrhea have been noted in some patients. Although Clostridium difficile has been shown in vitro to be sensitive to rifampin, pseudomembranous colitis has been reported with the use of rifampin (and other broad spectrum antibiotics). Therefore, it is important to consider this diagnosis in patients who develop diarrhea in association with antibiotic use.

Hepatic: transient abnormalities in liver function tests (e.g., elevations in serum bilirubin, alkaline phosphatase, serum transaminases) have been observed. Rare cases of acute necrotizing hepatitis or a shock-like syndrome with hepatic involvement and abnormal liver function tests has been reported.

Hematologic: thrombocytopenia has occurred primarily with high dose intermittent therapy, but has also been noted after resumption of interrupted treatment. It rarely occurs during well-supervised daily therapy. This effect is reversible if the drug is discontinued as soon as purpura occurs. Cerebral hemorrhage and fatalities have been reported when rifampin administration has been continued or resumed after the appearance of purpura. Rare reports of disseminated intravascular coagulation have been observed.
Leukopenia, hemolytic anemia, and decreased hemoglobin have been observed.

Agranulocytosis has been reported rarely.

Central Nervous System: headache, fever, drowsiness, fatigue, ataxia, dizziness, inability to concentrate, mental confusion, behavioral changes, muscular weakness, pain in extremities, and generalized numbness have been observed.

Psychoses have been rarely reported. Rare reports of myopathy have also been observed.

Ocular: visual disturbances have been observed.

Endocrine: menstrual disturbances have been observed.

Rare reports of adrenocortical insufficiency in patients with compromised adrenal function have been observed.

Renal: elevations in BUN and serum uric acid have been reported. Rarely, hemolysis, hemoglobinuria, hematuria, intrarenal nephritis, acute tubular necrosis, renal insufficiency, and acute renal failure have been noted. These are generally considered to be hypersensitivity reactions. They usually occur during intermittent therapy or when treatment is resumed following intentional or accidental interruption of a daily dosages regimen, and are reversible when rifampin is discontinued and appropriate therapy instituted.

Dermatologic: cutaneous reactions are mild and self-limiting and do not appear to be hypersensitivity reactions. Typically, they consist of flushing and itching with or without a rash. More serious cutaneous reactions which may be due to hypersensitivity occur but are uncommon.

Hypersensitivity reactions: occasionally, pruritus, urticaria, rash, pemphigoid reaction, erythema multiforme including Stevens-Johnson syndrome, toxic epidermal necrolysis, Drug Reaction with Eosinophilia and Systemic Symptoms syndrome (see WARNINGS), vasculitis, eosinophilia, sore mouth, sore tongue, and conjunctivitis have been observed. Anaphylaxis has been reported rarely.

Miscellaneous: edema of the face and extremities has been reported. Other reactions which have occurred with intermittent dosage regimens include "flu" syndrome (such as episodes of fever, chills, headache, dizziness, and bone pain), shortness of breath, wheezing, cyanosis, urticaria, rash, and shock. "Flu" syndrome may also appear if rifampin is taken irregularly by the patient or if daily administration is resumed after a drug free interval.

Isoniazid: The most frequent reactions are those affecting the nervous system and the liver. (See the boxed WARNING).

Nervous system: peripheral neuropathy is the most common toxic effect. It is dose-related, occurs most often in the malarious and in those predisposed to neuritis (e.g., alcoholics and diabetics), and is usually preceded by paresthesia of the feet and hands. The incidence is higher in "slow inactivators."

Other neurotoxic effects, which are uncommon with conventional doses, are convulsions, optic encephalopathy, optic neuritis and atrophy, memory impairment, and toxic psychosis.

Gastrointestinal: pancreatitis, nausea, vomiting, and epigastric distress.

Hepatic: elevated serum transaminases (SGOT, SGPT), bilirubinemia, bilirubinuria, jaundice, and occasionally severe and sometimes fatal hepatitis. The common prodromal symptoms are malaise, nausea, vomiting, fatigue, malaise, and weakness. Mild and transient elevation of serum transaminase levels occurs in 10 to 20% of persons taking isoniazid. The abnormality usually occurs in the first 4 to 6 months of treatment but can occur at any time during therapy. In most instances, enzyme levels return to normal with no necessity to discontinue medication. In occasional instances, progressive liver damage occurs, with accompanying symptoms. In these cases, the drug should be discontinued immediately. The frequency of progressive liver damage increases with age. It is rare in persons under 20, but occurs in up to 2.3% of those over 50 years of age.

Hematologic: agranulocytosis, hemolytic sideroblastic or aplastic anemia, thrombocytopenia, and eosinophilia.

Hypersensitivity reactions: fever, skin eruptions (morbilliform, maculopapular, purpuric, or exfoliative), lymphadenopathy, anaphylactic reactions, Stevens-Johnson syndrome, toxic epidermal necrolysis (see WARNINGS, Isoniazid), Drug Reaction with Eosinophilia and Systemic Symptoms syndrome (see WARNINGS), and vasculitis.

Metabolic and endocrine: pyridoxine deficiency, pellagra, hyperglycemia, metabolic acidosis, and gynecomastia.

Miscellaneous: rheumatic syndrome and systemic lupus erythematosus-like syndrome.

OVERDOSAGE

Signs and Symptoms

Rifampin

Nausea, vomiting, abdominal pain, pruritus, headache, and increasing lethargy will probably occur within a short time after ingestion; actual unconsciousness may occur with severe hepatic involvement. Transient increases in liver enzymes and/or bilirubin may occur. Brownish-red or orange discoloration of the skin, urine, sweat, saliva, tears, and feces is probably due to a large ingestion. Liver enlargement, possibly with tenderness, can develop within a few hours after severe overdosage, bilirubin levels may increase 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. A direct effect upon the hematopoietic system, electrolyte levels, or acid-base balance is unlikely.

Facial or peripheral edema has also been reported in pediatric patients. Hypotension, sinus tachycardia, ventricular arrhythmias, seizures and cardiac arrest were reported in some fatal cases.

Isoniazid

Isoniazid overdosage produces signs and symptoms within 30 minutes to 3 hours. Nausea, vomiting, dizziness, slurring of speech, blurring of vision, visual hallucinations (including bright colors and strange designs), are among the early manifestations. With marked overdosage, respiratory distress and CNS depression progressing rapidly from stupor to profound coma, are to be expected, along with severe, intractable seizures. Severe metabolic acidosis, acetonuria, and hyperglycemia are typical laboratory findings.

Acute toxicity

Rifampin

The minimum acute lethal or toxic dose is not well established. However, nonfatal acute overdoses in adults have been reported with doses ranging from 9 to 12 gm rifampin. Fatal acute overdoses in adults have been reported with doses ranging from 14 to 60 gm.

Alcohol or a history of alcohol abuse was involved in some of the fatal and nonfatal reports. Nonfatal overdoses in pediatric patients ages 1 to 4 years old of 100 mg/kg for one to two doses has been reported.

Isoniazid

Untreated or inadequately treated cases of gross isoniazid overdosage can be fatal, but good response has been reported in most patients treated within the first few hours after drug ingestion.

Ingested acutely, as little as 1.5 g isoniazid may cause toxicity in adults. Doses of 35 to 40 mg/kg have resulted in seizures. Ingestion of 80 to 150 mg/kg isoniazid has been associated with severe toxicity and, if untreated, significant mortality.

Treatment

The airway should be secured and adequate respiratory exchange established. Only then should gastric emptying (lavage-aspiration) be attempted; this may be difficult because of seizures. Since nausea and vomiting are likely to be present, gastric lavage is probably preferable to induction of emesis.

Blood samples should be obtained for immediate determination of gases, electrolytes, BUN, glucose, etc. Blood should be typed and cross-matched in preparation for possible hemodialysis.

Gastric lavage within the first 2 to 3 hours after ingestion should not be attempted until convulsions are under control. To treat convulsions, administer IV diazepam or short-acting barbiturates, and IV pyridoxine (usually 1 mg/1 mg isoniazid ingested). Activated charcoal slurry instilled into the stomach following evacuation of gastric contents can help absorb any remaining drug in the GI tract. Antimetic medication may be required to control severe nausea and vomiting.

RAPID CONTROL OF METABOLIC ACIDOSIS IS FUNDAMENTAL TO MANAGEMENT. Intravenous sodium bicarbonate should be given at once and repeated as needed, adjusting subsequent dosage on the basis of laboratory findings (i.e., serum sodium, pH, etc.).

 Forced osmotic diuresis must be started early and should be continued for some hours after clinical improvement to hasten renal clearance of drug and help prevent relapse. Fluid intake and output should be monitored.

Bile drainage may be indicated in presence of serious impairment of hepatic function lasting more than 24–48 hours. Under these circumstances and for severe cases, extracorporeal hemodialysis may be required; if this is not available, peritoneal dialysis can be used along with forced diuresis.

Along with measures based on initial and repeated determination of blood gases and other laboratory tests as needed, meticulous respiratory and other intensive care should be utilized to protect against hypoxia, hypotension, aspiration, pneumonitis, etc.

Untreated or inadequately treated cases of gross isoniazid overdosage can terminate fatally, but good response has been reported in most patients brought under adequate treatment within the first few hours after drug ingestion.

DOSAGE AND ADMINISTRATION

A three-drug regimen consisting of rifampin, isoniazid, and pyrazinamide (e.g., Rifater®) is recommended in the initial phase of short-course therapy which is usually continued for 2 months. The Advisory Council for the Elimination of Tuberculosis, the American Thoracic Society, and Centers for Disease Control and Prevention recommend that either streptomycin or ethambutol be added as a fourth drug in a regimen containing isoniazid (INH), rifampin, and pyrazinamide for initial treatment of tuberculosis unless the likelihood of INH or rifampin resistance is very low. The need for a fourth drug should be reassessed when the results of susceptibility testing are known. If community rates of INH resistance are currently less than 4%, an initial treatment regimen with less than four drugs may be considered.

Following the initial phase, treatment should be continued with Rifamate® for at least 4 months. Treatment should be continued for longer if the patient is still sputum or culture positive, if resistant organisms are present, or if the patient is HIV positive.

Concomitant administration of pyridoxine (B6) is recommended in the malarious, in those predisposed to neuropathy (e.g., alcoholics and diabetics), and in adolescents. See CLINICAL PHARMACOLOGY, General, for dosing information in patients with renal failure.

Adults

Two RIFAMATE (rifampin and isoniazid capsules USP) capsules (600 mg rifampin, 300 mg isoniazid) once daily, administered one hour before or two hours after a meal.

Pediatric Patients

The ratio of the drugs in RIFAMATE may not be appropriate in pediatric patients under the age of 15 (e.g., higher mg/kg doses of isoniazid are usually given in pediatric patients than adults).

HOW SUPPLIED

Capsules (opaque red), imprinted “RIFAMATE” on both ends of the capsule, containing 300 mg rifampin and 150 mg isoniazid; bottles of 60 (NDC 0068-5509-60).

Storage

Store at 25°C (77°F); excursions permitted to 15–30°C (59–86°F) [see USP Controlled Room Temperature]. Protect from excessive humidity.

Manufactured for: sanofi-aventis U.S. LLC

Bridgewater, NJ 08807

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