

1. NAME OF THE MEDICINAL PRODUCT

Rifadin Intravenous 600mg Powder and Solvent for Concentrate for Solution for Infusion

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Rifampicin 600 mg.

Excipients : Sodium 16mg per vial.

For a full list of excipients, see section 6.1.

3. PHARMACEUTICAL FORM

Powder and solvent for concentrate for solution for infusion.

Red sterile lyophilised powder for reconstitution with accompanying ampoule of sterile solvent for dilution for use as an intravenous infusion.

4. CLINICAL PARTICULARS

4.1. Therapeutic Indications

Rifadin for Infusion is indicated in patients with all forms of tuberculosis who are unable to tolerate oral therapy, e.g, post operative or comatose patients in whom gastro-intestinal absorption is impaired.

Rifadin for Infusion is also indicated in patients with life threatening or severe infections due to rifampicin sensitive micro-organisms. In-vitro activity has been established against streptococci, staphylococci, enterococci, pneumococci, and in addition, N.gonorrhoea, Proteus spp., H.influenza, E.coli and other Gram-negative organisms.

4.2. Posology and Method of Administration

Treatment with Rifadin for Infusion should preferably include the concomitant use of other appropriate antibiotics to prevent the emergence of resistant strains of the causative organism. Rifadin for infusion is for intravenous infusion only and must not be administered by intramuscular or subcutaneous route (see 4.4 Special Warnings and Precautions for Use).

Adults: a single daily administration of 600mg (8 to 12 mg/kg b.w.) given in an intravenous infusion drip over 2 to 3 hours has been found to be effective and well tolerated for adult patients.

Serum concentrations following the dosage regimen are similar to those obtained after 600mg by mouth.

Lower doses are recommended for frail and elderly patients. A daily dose of 8mg/kg bodyweight should not be exceeded in patients with impaired liver function.

When patients are able to accept oral medication, they should be transferred to Rifadin Capsules or Syrup (for further information on these products see their separate data sheets).

In non-tuberculosis infection other than those due to Mycobacteria, divided daily dosing regimens should be used; for example, 450mg twice a day or 300mg three times a day for patients 50kg or above.

Children over 3 months: Paediatric usage has not yet been established. However, the following regimen is suggested.

In tuberculosis: a single daily dose of 15 (10-20) mg/kg bodyweight is recommended, although the total daily dose should not exceed 600mg.

In non-tuberculosis infections: other than those due to Mycobacteria, up to 20mg/kg bodyweight daily should be given in divided doses.

4.3. Contra-indications

Rifadin is contra-indicated in the presence of jaundice, and in patients who are hypersensitive to the rifamycins or any of the excipients.

Rifadin use is contra-indicated when given concurrently with the combination of saquinavir/ritonavir (See Section 4.5).

With medicines strongly affected by its potential to induce drug metabolizing enzymes and transporters such as: lurasidone, sofosbuvir, antiretrovirals: cabotegravir, fostemsavir and lenacapavir (see section 4.5)

4.4. Special Warnings and Precautions for Use

Rifadin for Infusion is for intravenous infusion only and must not be administered by intramuscular or subcutaneous route. Avoid extravasation during injection; local irritation and inflammation due to extravascular infiltration of the infusion have been observed. If these occur, the infusion should be discontinued and restarted at another site.

Patients with impaired liver function should only be given Rifadin in cases of necessity, and then with caution and under close medical supervision. In these patients, lower doses of rifampicin are recommended and 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 two to four weeks during therapy. If signs of hepatocellular damage occur, rifampicin should be discontinued.

Cases of mild to severe cholestasis have been reported with rifampicin therapy. Patients should be instructed to contact their physician immediately if they experience symptoms such as itching,

weakness, loss of appetite, nausea, vomiting, abdominal pain, yellowing of eyes or skin or dark urine. If cholestasis is confirmed, Rifadin should be discontinued

In some cases of hyperbilirubinaemia resulting from competition between Rifadin and bilirubin for excretory pathways of the liver at the cell level can occur in 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.

Certain hypersensitivity phenomena affecting platelets and vascular tissue may occur as well as renal failure. Adequate surveillance should be maintained to permit early detection of these effects, particularly if there has been an interruption of treatment. Appearance of such effects should be an indication to discontinue use.

Because of the possibility of immunological reactions including anaphylaxis occurring (see 'Undesirable Effects' with intermittent therapy (less than 2 to 3 times a week) patients should be closely monitored. Patients should be cautioned against interruption of dosage regimens since these reactions may occur.

Interstitial lung disease (ILD)/Pneumonitis:

There have been reports of ILD or pneumonitis in patients receiving Rifadin for treatment of tuberculosis (see section 4.8). ILD/pneumonitis is a potentially fatal disorder. Careful assessment of all patients with an acute onset and/or unexplained worsening of pulmonary symptoms (dyspnoea accompanied by dry cough) and fever should be performed to confirm the diagnosis of ILD/pneumonitis. If ILD/pneumonitis is diagnosed, Rifadin should be permanently discontinued in case of severe manifestations (respiratory failure and acute respiratory distress syndrome) and appropriate treatment initiated as necessary.

DRESS

Severe, systemic hypersensitivity reactions, including fatal cases, such as Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS) syndrome have been observed during treatment with anti-tuberculosis therapy (See Section 4.8).

It is important to note that early 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 immediately their physician.

Rifadin should be discontinued if an alternative etiology for the signs and symptoms cannot be established.

Severe bullous reactions

Cases of severe bullous skin reactions such as Stevens Johnson syndrome (SJS), toxic epidermal necrolysis (TEN), and acute generalized exanthematous pustulosis (AGEP) have been reported with rifampicin. If symptoms or signs of AGEP, SJS or TEN are present, rifampicin treatment must immediately be discontinued.

Adults treated for tuberculosis with Rifadin should have baseline measurements of hepatic enzymes, bilirubin, serum creatinine, a complete blood count, and a platelet count or estimate.

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.

Rifadin has enzyme induction properties that can enhance the metabolism of endogenous substrates including adrenal hormones, thyroid hormones, and Vitamin D. Isolated reports have associated porphyria exacerbation with Rifadin administration as a result of induction of delta amino levulinic acid synthetase.

Rifadin may produce a discolouration (yellow, orange, red, brown) of the teeth, urine, sweat, sputum and tears and the patient should be forewarned of this. Soft contact lenses have been permanently stained.

Rifadin is a well characterized and potent inducer of drug metabolizing enzymes and transporters and might therefore decrease or increase concomitant drug exposure, safety and efficacy (see Section 4.5). Therefore patients should be advised not to take any other medication without medical advice.

Rifampicin may cause vitamin K dependent coagulopathy and severe bleeding (see Section 4.8). Monitoring of occurrence of coagulopathy is recommended for patients at particular bleeding risk. Supplemental vitamin K administration should be considered when appropriate (vitamin K deficiency, hypoprothrombinemia).

Paradoxical drug reaction

After initial improvement of tuberculosis under therapy with Rifadin, the symptoms may worsen again. In affected patients, clinical or radiological deterioration of existing tuberculous lesions or the development of new lesions have been detected. Such reactions have been observed within the first few weeks or months of initiation of tuberculosis therapy. Cultures are usually negative, and such reactions do not usually indicate treatment failure.

The cause of this paradoxical reaction is still unclear, but an exaggerated immune reaction is suspected as a possible cause. In case a paradoxical reaction is suspected, symptomatic therapy to suppress the exaggerated immune reaction should be initiated if necessary. Furthermore, continuation of the planned tuberculosis combination therapy is recommended.

Patients should be advised to seek medical advice immediately if their symptoms worsen. The symptoms that occur are usually specific to the affected tissues. Possible general symptoms include cough, fever, tiredness, breathlessness, headache, loss of appetite, weight loss or weakness (see section 4.8).

Contraception in males and females

Due to the potential genotoxic effects of rifampicin (see section 5.3) and the interaction between rifampicin on hormonal contraceptives (see section 4.5), highly-effective non-hormonal contraceptive measures are required during and after treatment for males and females. For women of childbearing potential, pregnancy testing should be performed prior to treatment. See section 4.6 for details.

Rifadin contains less than 1 mmol sodium (23 mg) per vial, i.e. essentially 'sodium- free'.

4.5. Interactions with other Medicaments and other forms of Interaction

4.5.1 Pharmacodynamic Interactions:

Concomitant use of paracetamol with rifampicin may increase the risk of hepatotoxicity.

When Rifadin is given concomitantly with the combination saquinavir/ritonavir, the potential for hepatotoxicity is increased. Therefore, concomitant use of Rifadin with saquinavir/ritonavir is contra-indicated (See Section 4.3).

When Rifadin is given concomitantly with either halothane or isoniazid, the potential for hepatotoxicity is increased. The concomitant use of Rifadin and halothane should be avoided. Patients receiving both Rifadin and isoniazid should be monitored closely for hepatotoxicity.

The concomitant use of rifampicin with other antibiotics causing vitamin K dependent coagulopathy such as cefazolin (or other cephalosporins with N-methyl-thiotetrazole side chain) should be avoided as it may lead to severe coagulation disorders, which may result in fatal outcome (especially in high doses).

If *p*-aminosalicylic acid and rifampicin are both included in the treatment regimen, they should be given not less than eight hours apart to ensure satisfactory blood levels.

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 BSP and serum bilirubin have been reported. Therefore, these tests should be performed before the daily administration of Rifampicin.

Induction of Drug Metabolizing Enzymes and Transporters

Rifadin is a well characterized and potent inducer of drug metabolizing enzymes and transporters. Enzymes and transporters reported to be affected by Rifadin include cytochromes P450 (CYP) 1A2, 2B6, 2C8, 2C9, 2C19, and 3A4, UDP-glucuronyltransferases (UGT), sulfotransferases, carboxylesterases, and transporters including P-glycoprotein (P-gp) and multidrug resistance- associated protein 2 (MRP2). Most drugs are substrates for one or more of these enzyme or transporter pathways, and these pathways may be induced by Rifadin simultaneously. Therefore, Rifadin may accelerate the metabolism and decrease the activity of certain co-administered drugs or increase the activity of a coadministered pro-

drug (where metabolic activation is required), and has the potential to perpetuate clinically important drug-drug interactions against many drugs and across many drug classes (Table 1). To maintain optimum therapeutic blood levels, dosages of drugs may require adjustment when starting or stopping concomitantly administered Rifadin.

Rifampicin is contraindicated with medicines strongly affected by its potential to induce drug metabolizing enzymes and transporters such as: lurasidone, sofosbuvir, antiretrovirals: cabotegravir, fostemsavir and lenacapavir. Significant decrease in their plasma concentrations is observed because of potent induction of CYP 3A4, P-gp, UGT1A1 by rifampicin which is likely to result in loss of their therapeutic effectiveness.

Table 1 Effect of Rifampicin Coadministration on Drugs or Drug Classes

Drug or Drug Class	Effect	Comment
antiretroviral drugs (e.g zidovudine, saquinavir, indinavir, efavirenz, cabotegravir, fostemsavir and lenacapavir)	↓antiretroviral exposure	Rifampicin 600mg daily reduced zidovudine exposure (AUC) by 47% via induction of zidovudine glucuronidation and amination metabolism pathways . Rifampicin 600mg daily reduced saquinavir exposure (AUC) by 70% in healthy volunteers and by 47% in HIV-infected patients most likely via induction of CYP3A4 and possibly P-gp pathways . Rifampicin 600mg daily reduced efavirenz exposure (AUC) by 60% primarily via induction of efavirenz CYP2B6-mediated 8-hydroxylation pathway (See Section 4.3: Contraindications). Rifampicin 600mg daily reduced cabotegravir exposure (AUC) by 59% most likely via induction of UGTs. Rifampicin 600mg daily reduced fostemsavir exposure (AUC) by 82% most likely via induction of CYP3A4. Rifampicin 600mg daily reduced lenacapavir exposure (AUC) by 84% most likely via induction of CYP3A4, UGT1A1 and P-gp.

hepatitis-C antiviral drugs (e.g, daclatasvir, simeprevir, sofosbuvir, telaprevir) ⁴	↓ exposure to hepatitis-C antiviral drug exposure	The hepatitis C antivirals are cleared by various drug metabolizing enzymes and transporters which are susceptible to induction by multiple dose rifampicin. Rifampicin 600 mg daily reduced the exposure (AUC) of daclatasvir by 79% , simeprevir by 48% , sofosbuvir by 77% and telaprevir by 92% compared to control subjects. Concurrent use of treatment of hepatitis-C antiviral drugs and rifampicin should be avoided.
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Drug or Drug Class	Effect	Comments
systemic hormonal contraceptives including estrogens and progestins	↓Contraceptive exposure	Rifampicin treatment reduces the systemic exposure of oral contraceptives Patients using systemic hormonal contraceptives should be advised to change to non-hormonal methods of birth control during and after completing rifampicin therapy (see section 4.4 and 4.6).
Enalapril	↓enalapril active metabolite exposure	Dosage adjustments should be made if indicated by the patient's clinical condition.
Anticonvulsants (e.g phenytoin)	↓ phenytoin exposure	Phenytoin is metabolized mainly by CYP2C9/2C19. Rifampicin 450 mg daily doubled the clearance of phenytoin and reduced the half-life by about 50% .
Antiarrhythmics (e.g disopyramide, mexiletine, quinidine, propafenone, tocainide)	↓ antiarrhythmic drug exposure	Rifampicin 600 mg daily reduced the exposure (AUC) of mexiltine by 41% , quinidine by about 80% , propafenone by 87% , and tocainide by 25% .
antiestrogens (e.g tamoxifen, toremifen)	↓ tamoxifen and toremifen exposure	Tamoxifen and toremifen are predominantly substrates of CYP3A4. Rifampicin 600 mg daily reduced the systemic exposure (AUC) of tamoxifen by 86% and of toremifen by 87% .

antipsychotics (e.g haloperidol)	↓ haloperidol exposure	Coadministration of rifampicin to schizophrenic patients receiving haloperidol decreased haloperidol trough concentrations up to 70% .
Lurasidone	↓ lurasidone exposure	Rifampicin 600mg was shown to markedly reduce exposure of lurasidone compared to the use of lurasidone alone. Lurasidone should not be given concomitantly with rifampicin (See section 4.3).
oral anticoagulants (e.g warfarin)	↓ warfarin exposure	S-Warfarin is a clinical index substrate for CYP2C9. Rifampicin 600 mg daily reduced the exposure (AUC) of S-warfarin by 74%.
Clopidogrel	↑active metabolite exposure	Rifadin strongly induces CYP2C19, resulting in both an increased level of clopidogrel active metabolite and platelet inhibition, which in particular might potentiate the risk of bleeding. As a precaution, concomitant use of clopidogrel and rifampicin should be discouraged.
antifungals (e.g fluconazole, itraconazole, ketoconazole)		Rifampicin 600 mg daily reduced fluconazole exposure (AUC) by approximately 23%, itraconazole by 88% and ketoconazole by about 80%.
Caspofungin	↓ antifungal exposure	After two weeks of repeated administration of rifampicin, trough levels of caspofungin were 30 % lower than in adult subjects who received caspofungin alone.

Drug or Drug Class	Effect	Comments
barbiturates	↓ barbiturate exposure	Rifampicin has been shown to increase hexobarbital metabolic clearance by 2- to 3-fold in healthy volunteers and patients, and to significantly decrease hexobarbital half-life
beta blockers	↓ beta blocker exposure	Rifampicin 600 mg daily reduced the exposure (AUC) of metoprolol by 33% and increased the clearance of propranolol by 169%
benzodiazepines (e.g diazepam)	↓ diazepam exposure	Rifampicin 600 and 1200 mg daily increased the clearance of diazepam by 60% and 98%, respectively .
benzodiazepine related drugs (e.g zopiclone, zolpidem),	↓ zopiclone and zolpidem exposure	Rifampicin 600 mg daily reduced the exposure (AUC) of zopiclone by 82% and of zolpidem by 27% .
calcium channel blockers (e.g diltiazem, nifedipine, verapamil),	↓ calcium channel blocker exposure	Calcium channel blockers are primarily substrates of CYP3A4. Rifampicin 1200 mg administered as a single oral dose 8 h before administering a single oral dose of nifedipine 10 mg reduced nifedipine exposure (AUC) by 64% . Rifampicin 600 mg daily reduced the exposure (AUC) of verapamil by 93% .
chloramphenicol	↓ chloramphenicol exposure	In two children treated concomitantly with intravenous chloramphenicol and rifampicin, peak chloramphenicol serum concentrations were reduced by 85.5% in one patient and by 63.8% in the other
clarithromycin	↓ clarithromycin exposure	Rifampicin 600 mg daily markedly reduced plasma concentrations of clarithromycin and increased clarithromycin metabolite concentrations .

Drug or Drug Class	Effect	Comments
corticosteroids	↓ corticosteroid exposure	Numerous cases appear in the literature describing a decrease in glucocorticoid effect when rifampicin is prescribed concurrently. The literature contains reports of acute adrenal crisis or adrenal insufficiency induced by the combination of rifampicin-isoniazid- ethambutol or rifampicin-isoniazid in patients with Addison's disease. In patients receiving concomitant rifampicin, prednisolone AUC was reduced by 48% to 66% and clearance was increased by 45% to 91%.
cardiac glycosides	↓ cardiac glycoside exposure	Digoxin is a clinical index substrate for P-gp activity. Rifampicin 600 mg daily reduced the bioavailability of oral digoxin by 30% and increased intestinal P-gp content 3.5-fold, which correlated with the AUC after oral digoxin. Several reports have been published regarding the interaction of digitoxin and rifampicin. Decreased serum digitoxin levels were observed during antituberculosis therapy with rifampicin-isoniazid- ethambutol or with rifampicin alone; serum digitoxin levels decreased by 53% and 54% respectively.
clofibrate	↓ clofibrate exposure	Rifampicin 600 mg daily significantly reduced steady-state plasma concentrations of clofibrate's main circulating metabolite, chlorophenoxyisobutyric acid (CPIB), from 50 µg/mL to 33 µg/mL. Although CPIB plasma half-life of individual subjects was decreased during rifampicin treatment, the change was not significant
dapsone	↓ dapsone exposure ↑ exposure to hydroxylamine metabolite, responsible for adverse effects that include methemoglobinemia, haemolytic anaemia, agranulocytosis, and haemolysis.	Dosage adjustment may be required for dapsone and necessitate monitoring of haematological adverse events.
doxycycline	↓ doxycycline exposure	In a group of hospitalized patients rifampicin (10 mg/kg daily) reduced the exposure (AUC) of doxycycline by about 50% .

Drug or Drug Class	Effect	Comments
fluoroquinolones	↓ fluoroquinolone exposure	Rifampicin 900 mg daily modestly reduced the AUC of perfloxacin by about 35%. Rifampicin 450 mg to 600 mg daily has been shown to reduce the exposure (AUC) of moxifloxacin by about 30%.
oral hypoglycemic agents (sulfonylureas)	↓ sulfonylurea exposure	Sulfonylureas are primarily substrates of CYP2C9. Rifampicin 600 mg daily reduced the exposure (AUC) of glyburide by 39% and of glipizide by 22%, and reduced the half-life of both drugs. It is probable that the blood glucose-lowering effect of glyburide is reduced during concomitant treatment with rifampicin.
immunosuppressive agents (e.g, cyclosporine, tacrolimus)	↓ cyclosporine, tacrolimus exposure	Cyclosporine and tacrolimus are substrates of CYP3A4 and P-gp. In 6 healthy volunteers oral bioavailability of cyclosporine was reduced from 33% to 9% with coadministration of rifampicin 600 mg daily . In 4 kidney transplant patients coadministration of rifampicin 600 mg daily reduced the exposure of cyclosporine (AUC) by approximately 60% . In 6 healthy volunteers oral bioavailability of tacrolimus was reduced by 51% with coadministration of rifampicin 600 mg daily via induction of CYP3A4 and P-gp .
irinotecan	↓ irinotecan active metabolite exposure	Irinotecan is extensively metabolized by various enzyme systems, including carboxyl esterases, UGT, and CYP3A4. Rifampicin 450mg/day was administered to a patient as part of an antibiotic regimen including isoniazid (300 mg/day) and streptomycin (0.5 g/day im). Although there was no change in irinotecan exposure (AUC), irinotecan active metabolite exposure (AUC) decreased by 20% and its glucuronide metabolite decreased by 58.8%, possibly via induction of CYP3A4 .

Drug or Drug Class	Effect	Comments
levothyroxine	↓ levothyroxine exposure	Rifampicin 600 mg daily was administered to a patient previously treated with levothyroxine. Approximately 2 weeks after initiation of rifampicin, thyroid stimulating hormone (TSH) concentration increased by 202% compared to the pretreatment concentration. TSH concentration returned to normal 9 days after discontinuance of rifampicin .
Losartan	↓ losartan and active metabolite exposure	Losartan is metabolized by CYP2C9 and CYP3A4 to an active metabolite, E3174, which has greater antihypertensive activity than the parent compound. Rifampicin 600 mg daily reduced the exposure (AUC) of losartan by 35% and E3174 by 40%. Losartan oral clearance was increased by 44%. The half-life values of both compounds were decreased by 50% .
narcotic analgesics	↓ narcotic analgesics exposure	Various studies and case reports have been reviewed between rifampicin and both opioid analgesics. Rifampicin 600 mg daily decreased the mean AUC for IV and oral oxycodone by 53% and 86%, respectively, while oral oxycodone's mean bioavailability decreased by 70%. Rifampicin 600 mg daily reduced morphine Cmax by 41% and AUC by 28%. The analgesic effect of morphine should be monitored and doses of morphine adjusted during and after treatment with rifampicin.
methadone	↓ methadone exposure	Methadone is predominantly metabolized by CYP2B6 and CYP3A4. Rifampicin 600 mg daily reduced the oral bioavailability of methadone from 70% to 50% .

Drug or Drug Class	Effect	Comments
praziquantel	↓ praziquantel exposure	Praziquantel is extensively metabolized by CYP enzymes. Rifampicin 600 mg daily reduced plasma concentrations of praziquantel to below detectable levels in 7 of 10 subjects administered single dose praziquantel; of the 3 subjects with detectable concentrations, praziquantel exposure (AUC) was reduced by 85%. In the same study, rifampicin reduced multiple dose praziquantel concentrations below detectable levels in 5 of 10 subject; of the 5 subjects with detectable concentrations, praziquantel exposure was reduced by 80% .
Quinine	↓ quinine exposure	Quinine is mainly metabolized by CYP3A4. Rifampicin 600 mg daily increased quinine clearance by 6.9-fold and reduced quinine exposure (AUC) and half-life .
selective 5-HT ₃ receptor antagonists (eg ondansetron)	↓ ondansetron exposure	Ondansetron is metabolized by multiple CYP Enzymes Rifampicin 600 mg daily reduced the exposure (AUC) of orally administered ondansetron by 65% compared with placebo and the elimination half-life (t_{1/2}) by 38%. The oral bioavailability of ondansetron was reduced from 60% to 40% .
statins metabolized by CYP3A4 (e.g, simvastatin)	↓ simvastatin exposure	Simvastatin is a clinical index substrate of CYP3A4. Rifampicin 600 mg daily reduced simvastatin exposure (AUC) by 87% compared to placebo. Because the elimination half-life of simvastatin was not affected by rifampicin, induction of the CYP3A4-mediated first-pass metabolism of simvastatin in the intestine and the liver probably explains this interaction.

Drug or Drug Class	Effect	Comments
telithromycin	↓ telithromycin exposure	Telithromycin is metabolized primarily by CYP3A4. Rifampicin 600 mg daily reduced telithromycin exposure (AUC) by 86%
theophylline	↓ theophylline exposure	Theophylline is a clinical index inhibitor of CYP1A2. Rifampicin 600 mg daily increased theophylline clearance by 40%, reduced theophylline exposure (AUC) by 27%, and reduced elimination half-life by 30%.
thiazolidinediones (e.g.rosiglitazone)	↓ rosiglitazone exposure	Rosiglitazone is primarily metabolized by CYP2C8 and to a lesser extent by CYP2C9. Rifampicin 600 mg daily increased rosiglitazone apparent oral clearance by 3-fold, reduced rosiglitazone exposure (AUC) by 65%, and reduced elimination half-life from 3.9 to 1.5 h.
tricyclic antidepressants (e.g nortriptyline)	↓ nortriptyline exposure	Higher than expected doses of nortriptyline were required to obtain a therapeutic drug level when it was associated with Rifampicin 600 mg daily given as part of a tuberculosis treatment regimen that included isoniazid 300 mg daily, pyrazinamide 500 mg 3x per day and pyridoxine 25 mg. Following the discontinuation of rifampicin, the patient became drowsy and the serum nortriptyline levels rose precipitously (3-fold) into the toxic range .

Mifepristone	↓Mifepristone exposure	Rifampicin was shown to decrease mifepristone AUC by 6.3-fold and its metabolites 22-hydroxy mifepristone and N-demethyl mifepristone by 20- fold and 5.9-fold, respectively. Therefore, reduced efficacy can be expected when mifepristone is given concomitantly with rifampicin. If concomitant use is necessary, the dose of mifepristone should be increased.
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↓ : decrease; ↑ : increase

Effect of other medicinal products on Rifadin

Concomitant antacid administration may reduce the absorption of Rifadin. Daily doses of Rifadin should be given at least 1 hour before the ingestion of antacids.

Other Drug Interactions with Rifadin

When the two drugs were taken concomitantly, decreased concentrations of atovaquone and increased concentrations of rifampicin were observed.

Concurrent use of ketoconazole and Rifadin has resulted in decreased serum concentration of both drugs.

4.6. Pregnancy and Lactation

Contraception in males and females

Due to the genotoxic potential of Rifadin (see section 5.3), and the interaction between rifampicin and hormonal contraceptives, females of childbearing potential should be advised to use highly effective non-hormonal (see Section 4.5) contraception during treatment with Rifadin and for 6 months after the last dose.

Male patients with female partners of reproductive potential should be advised to use a condom plus an additional contraceptive method that together are highly effective during treatment with Rifadin and for 3 months after the last dose.

Fertility

There are no data on fertility in humans. Rifadin was found to be genotoxic in nonclinical studies and therefore may impair fertility (see section 5.3).

Pregnancy

There are limited amount of data from the use of Rifadin in pregnant women. Studies in animals have shown reproductive toxicity (see section 5.3).

Rifadin should only be used during pregnancy when strictly necessary for the patient. If Rifadin is administered during the last few weeks of pregnancy it may cause post-

natal bleeding in the mother and the newborn. Treatment of mother and child with Vitamin K1 is recommended in this case.

Breast-feeding

Although rifampicin is excreted in small quantities in human milk, no harmful effects have been established in infants. If it is necessary to treat the mother with this drug, breast-feeding can be continued.

4.7. Effects on Ability to Drive and Use Machines

A patient may feel dizzy or faint, or have problems with vision or other side effects that may affect their ability to drive while having this medicine. If this happens, the patient must not drive or use any tools or machines.

4.8. Undesirable Effects

The following CIOMS frequency rating is used, when applicable:

Very common $\geq 10\%$; Common ≥ 1 and $<10\%$; Uncommon ≥ 0.1 and $<1\%$;

Rare ≥ 0.01 and $<0.1\%$; Very rare $<0.01\%$, Unknown (cannot be estimated from available data).

Infections and infestations

Unknown: Pseudomembranous colitis, influenza

Blood and lymphatic system disorders

Common: Thrombocytopenia with or without purpura, usually associated with intermittent therapy, but is reversible if drug is discontinued as soon as purpura occurs.

Uncommon: Leukopenia Unknown: Disseminated intravascular coagulation, eosinophilia, agranulocytosis, hemolytic anemia

Vitamin K dependent coagulation disorders

Immune system disorders

Unknown: anaphylactic reaction

Endocrine disorders

Unknown: adrenal insufficiency in patients with compromised adrenal function have been observed.

Metabolism and nutritional disorders

Unknown: decreased appetite

Psychiatric disorders

Unknown: Psychotic disorder

Nervous system disorders

Common: Headache, dizziness

Unknown: Cerebral hemorrhage and fatalities have been reported when rifampicin administration has been continued or resumed after the appearance of purpura.

Eye disorders

Unknown: Tear discoloration

Vascular disorders

Unknown: Shock, flushing, vasculitis, bleeding

Respiratory, thoracic and mediastinal disorders

Unknown: Dyspnoea, wheezing, sputum discoloured, Interstitial lung disease (including pneumonitis)

Gastrointestinal disorders

Common: Nausea, vomiting

Uncommon: Diarrhea

Unknown: Gastrointestinal disorder, abdominal discomfort, tooth discoloration (which may be permanent)

Hepatobiliary disorders

Unknown: Hepatitis, hyperbilirubinaemia, cholestasis (see section 4.4: Special warnings and precautions for use)

Skin and subcutaneous tissue disorders

Unknown: Erythema multiforme, acute generalized exanthematous pustulosis (AGEP), Stevens-Johnson syndrome and toxic epidermal necrolysis, Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS) syndrome (See section 4.4), skin reaction, pruritus, rash pruritic, urticaria, dermatitis allergic, pemphigoid, sweat discoloration.

Musculoskeletal and connective tissue disorders

Unknown: Muscle weakness, myopathy, bone pain

Renal and urinary disorders

Unknown: acute kidney injury usually due to renal tubular necrosis or tubulointerstitial nephritis, chromaturia

Pregnancy, puerperium and perinatal conditions

Unknown: Post-partum haemorrhage, fetal-maternal haemorrhage

Reproductive system and breast disorders

Unknown: Menstrual disorder

Congenital, familial and genetic disorders

Unknown: Porphyria

General disorders and administration site conditions

Very Common: Pyrexia, chills

Common: Paradoxical drug reaction (Recurrence or appearance of new symptoms of tuberculosis, physical and radiological signs in a patient who had previously shown improvement with appropriate anti-tuberculosis treatment is called a paradoxical reaction, which is diagnosed after excluding poor compliance of the patient to

treatment, drug resistance, side effects of antitubercular therapy, secondary bacterial/fungal infections.).*

Unknown: Edema

* Incidence of paradoxical drug reaction: Lower frequency is reported as 9.2% (53/573) (data between October 2007 and March 2010) and higher frequency is reported as 25% (19/76) (data between 2000 and 2010).

Investigations

Common: Blood bilirubin increased, aspartate aminotransferase increased, alanine aminotransferase increased

Unknown: Blood pressure decreased, blood creatinine increased, hepatic enzyme increased

Rifampicin may produce a discolouration (yellow, orange, red, brown) of the teeth, urine, sputum and tears. The patient should be forewarned of this. Soft contact lenses may be permanently stained.

If serious complications arise, e.g. renal failure, thrombocytopenia or haemolytic anaemia, rifampicin should be stopped

Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via HPRA Pharmacovigilance, Website: www.hpra.ie

4.9 Overdose

Nausea, vomiting, abdominal pain, pruritus, headache and increasing lethargy will probably occur within a short time after acute ingestion: unconsciousness may occur when there is severe hepatic disease. Transient increases in liver enzymes and/or bilirubin may occur. Facial or periorbital edema has also been reported in paediatric patients. Hypotension, sinus tachycardia, ventricular arrhythmias, seizures and cardiac arrest were reported in some fatal cases. The minimum acute lethal or toxic dose is not well established. However, nonfatal acute overdoses in adults have been reported with doses ranging from 14 to 60g. Alcohol or a history of alcohol abuse was involved in some of the fatal and nonfatal reports. Nonfatal overdoses in paediatric patients ages 1 to 4 years old of 100mg/kg for one to two doses has been reported.

In cases of overdosage with rifampicin intensive supportive measures should be instituted and individual symptoms treated as they arise.

Since nausea and vomiting are likely to be present, gastric lavage is probably preferable to induction of emesis. Following evacuation of the gastric contents, the instillation of activated charcoal slurry into the stomach may help absorb any remaining drug from the gastrointestinal tract. Antiemetic medication may be required to control severe nausea and vomiting. Active diuresis (with measured intake and output) will help promote excretion of the drug. Haemodialysis may be of value in some patients.

5. PHARMACOLOGICAL PROPERTIES

5.1. Pharmacodynamic Properties

ATC: J04 AB02.

Rifampicin is an active bactericidal antituberculosis drug which is particularly active against the rapidly growing extracellular organisms and also has bactericidal activity intracellularly. Rifampicin has activity against slow and intermittently-growing *M. 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.

5.2. Pharmacokinetic Properties

In normal subjects the biological half-life of rifampicin in serum averages about 3 hours after a 600 mg dose and increases to 5.1 hours after a 900 mg dose. With repeated administration, the half-life decreases and reaches average values of approximately 2-3 hours. It does not differ in patients with renal failure and consequently, no dosage adjustment is required.

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 absorption 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.

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 ionized and therefore is diffused freely in tissues.

5.3. Preclinical Safety Data

Data from literature report that rifampicin possesses a mutagenic potential in the Ames test and is considered to be aneugenic as well as clastogenic in mice after oral administration. Therefore, rifampicin is considered genotoxic.

An increase in the incidence of hepatomas in female mice (of a strain known to be particularly susceptible to the spontaneous development of hepatomas) was observed when Rifadin was administered in doses 2 to 10 times the average daily human dose for 60 weeks followed by an observation period of 46 weeks.

No evidence of carcinogenicity was found in male mice of the same strain, mice of a different strain, or rats, under similar experimental conditions. There is insufficient data to conclude on the carcinogenicity potential of rifampicin.

Rifadin has been reported to possess immunosuppressive potential in rabbits, mice, rats, guinea pigs, human lymphocytes in vitro, and humans. Antitumor activity in vitro has also been shown with Rifadin.

6. PHARMACEUTICAL PARTICULARS

6.1. List of Excipients

Powder

Sodium formaldehyde sulfoxylate

Sodium Hydroxide (for pH adjustment)

Solvent

Water for Injections

6.2. Incompatibilities

This medicinal product must not be mixed with other medicinal products except those stated as compatible in this section or mentioned in section 6.6.

Compatibilities: Rifadin for Intravenous Infusion is compatible with the following infusion solutions: Dextrose 5% solution for injections and normal saline solution.

Incompatibilities: Rifadin for Intravenous Infusion is incompatible with the following: Perfudex, Sodium Bicarbonate 5%, Sodium Lactate 0.167M, Ringer Acetate with Dextrose.

6.3. Shelf Life

Unopened vial of lyophilisate:	3 years.
Unopened ampoule of solvent:	5 years
Reconstituted solution:	Immediate use
Reconstituted solution further diluted in normal Saline	6 hours
Reconstituted solution further diluted in dextrose 5%	6 hours.

The product once reconstituted with solvent should be used immediately.

Product once reconstituted with solvent and further diluted with either Normal Saline or 5% Dextrose:

The chemical and physical in use stability of the diluted solution in either normal saline or 5% dextrose has been demonstrated for use within 6 hours at room temperature.

From a microbiological point of view, once the reconstituted solution has been diluted in either normal saline or 5% dextrose the solution should be used immediately. If not used immediately in-use storage times and conditions prior to use are the responsibility

of the user and would normally be not longer than 24 hours at 2-8 °C unless reconstitution / dilution has taken place in controlled and validated aseptic conditions.

6.4. Special Precautions for Storage

Unopened vial: Do not store above 25°C.

Please refer to section 6.3 for storage of the opened product.

Discoloured solution should not be used.

6.5. Nature and Contents of Container

Lyophilised product: 20ml vials of clear neutral glass, sealed with chlorobutyl rubber stopper and combination aluminium/plastic “flip-off” cap (colour coded blue), containing a red, sterile lyophilised powder.

Solvent ampoule: 10ml clear Type I glass ampoule containing a sterile, clear, colourless solution.

6.6. Instruction for Use/Handling

Rifadin for Infusion is prepared for use by aseptically adding the 10ml vial of solvent provided (water for injections) to the vial of 600mg rifampicin powder. Swirl the vial gently to completely dissolve the antibiotic. The resultant solution is red in colour and contains 60mg of Rifadin per ml. This reconstituted solution, should be diluted for use immediately in the one of the recommended infusion mediums (normal saline or 5% dextrose for injection).

Prior to dilution, withdraw the volume of reconstituted Rifadin solution required and dilute the dose into 500ml of infusion medium. Mix well and infuse at a rate allowing for complete infusion in up to 3 hours.

Dilutions in dextrose 5% for injection are stable up to 6 hours at room temperature and should be prepared and used within this time.

Dilutions in normal saline are stable up to 6 hours at room temperature and should be prepared and used within this time.

Precipitation of Rifadin from the infusion solution may occur beyond this time.

Other infusion solutions are not recommended.

Any unused product or waste material should be disposed of in accordance with local requirements.

7. MARKETING AUTHORISATION HOLDER

sanofi-aventis Ireland Ltd. T/A SANOFI
Citywest Business Campus,
Dublin 24

8. MARKETING AUTHORISATION NUMBER

PA 540/66/3

9. DATE OF FIRST AUTHORISATION/RENEWAL OF AUTHORISATION

4th October 1983 / 4th October 2003

10. DATE OF (PARTIAL) REVISION OF TEXT

July 2026.