HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use LOPINAVIR AND RITONAVIR TABLETS, USP safely and effectively. See full prescribing information for LOPINAVIR AND RITONAVIR TABLETS, USP.

LOPINAVIR and RITONAVIR tablets USP, for oral use

Initial U.S. Approval: 2000

RECENT MAJOR CHANGES

Dosage and Administration	
General Administration Recommendations (2.1)	01/2015
Dosage Recommendations in Adults (2.2)	01/2015
Dosage Recommendations in Pediatric Patients (2.3)	01/2015
Dosage Recommendations in Pregnancy (2.4)	01/2015
Warning and Precautions	
Risk of Serious Adverse Reactions	
Due to Drug Interactions (5.1)	03/2015

INDICATIONS AND USAGE

Lopinavir and ritonavir tablets USP are an HIV-1 protease inhibitor indicated in combination with other antiretroviral agents for the treatment of HIV-1 infection in adults and pediatric patients (14 days and older). (1)

DOSAGE AND ADMINISTRATION

Tablets: May be taken with or without food, swallowed whole and not chewed, broken, or crushed. (2.1)

Adults (2.2):

• Total recommended daily dosage is 800/200 mg given once or twice daily.

• Lopinavir and ritonavir tablets can be given as once daily or twice daily regimen. See Full Prescribing Information for details.

• Lopinavir and ritonavir tablets once daily dosing regimen is not recommended in:

• Adult patients with three or more of the following lopinavir resistance-associated substitutions: L10F/I/R/V, K20M/N/R, L24I, L33F, M36I, I47V, G48V, I54L/T/V, V82A/C/F/S/T, and I84V. (12.4)

• In combination with carbamazepine, phenobarbital, or phenytoin. (7.3)

• In combination with efavirenz, nevirapine, or nelfinavir. (12.3)

• In pregnant women. (2.4, 8.1, 12.3)

Pediatric Patients (14 days and older) (2.3):

• Lopinavir and ritonavir tablets once daily dosing regimen is not recommended in pediatric patients.

• Twice daily dose is based on body weight or body surface area.

Concomitant Therapy in Adults and Pediatric Patients:

• Dose adjustments of lopinavir and ritonavir tablets may be needed when co-administering with efavirenz, nevirapine, or nelfinavir.

(2.2, 2.3, 7.3)

Pregnancy (2.4):

• 400/100 mg twice daily in pregnant patients with no documented lopinavirassociated resistance substitutions.

• There are insufficient data to recommend a lopinavir and ritonavir tablets dose for pregnant patients with any documented lopinavir and ritonavir tablets -associated resistance substitutions.

• No dose adjustment of lopinavir and ritonavir tablets are required for patients during the postpartum period.

DOSAGE FORMS AND STRENGTHS

• Tablets: 200 mg lopinavir and 50 mg ritonavir (3)

• Tablets: 100 mg lopinavir and 25 mg ritonavir (3)

CONTRAINDICATIONS

• Hypersensitivity to lopinavir and ritonavir (e.g., toxic epidermal necrolysis, Stevens-Johnson syndrome, erythema multiforme, urticaria, angioedema) or any of its ingredients, including ritonavir. (4)

• Co-administration with drugs highly dependent on CYP3A for clearance and for which elevated plasma levels may result in serious and/or lifethreatening events. (4)

• Co-administration with potent CYP3A inducers where significantly reduced lopinavir plasma concentrations may be associated with the potential for loss of virologic response and possible resistance and cross resistance. (4)

WARNINGS AND PRECAUTIONS

The following have been observed in patients receiving lopinavir and ritonavir :

• The concomitant use of lopinavir and ritonavir and certain other drugs may result in known or potentially significant drug interactions. Consult the full prescribing information prior to and during treatment for potential drug interactions. (5.1, 7.3)

• Pancreatitis: Fatalities have occurred; suspend therapy as clinically appropriate. (5.3)

• Hepatotoxicity: Fatalities have occurred. Monitor liver function before and during therapy, especially in patients with underlying hepatic disease, including hepatitis B and hepatitis C, or marked transaminase elevations. (5.4, 8.6)

• QT interval prolongation and isolated cases of torsade de pointes have been reported although causality could not be established. Avoid use in patients with congenital long QT syndrome, those with hypokalemia, and with other drugs that prolong the QT interval. (5.1, 5.5, 12.3)

• PR interval prolongation may occur in some patients. Cases of second and third degree heart block have been reported. Use with caution in patients with pre-existing conduction system disease, ischemic heart disease, cardiomyopathy, underlying structural heart

disease or when administering with other drugs that may prolong the PR interval. (5.1, 5.6, 12.3)

• Patients may develop new onset or exacerbations of diabetes mellitus, hyperglycemia (5.7), immune reconstitution syndrome. (5.8), redistribution/accumulation of body fat. (5.10)

• Total cholesterol and triglycerides elevations. Monitor prior to therapy and periodically thereafter. (5.9)

• Hemophilia: Spontaneous bleeding may occur, and additional factor VIII may be required. (5.11)

ADVERSE REACTIONS

Commonly reported adverse reactions to lopinavir and ritonavir included diarrhea, nausea, vomiting, hypertriglyceridemia and hypercholesterolemia. (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact Macleods Pharma USA, Inc at 1-888-943-3210 or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch

DRUG INTERACTIONS

Co-administration of lopinavir and ritonavir can alter the plasma concentrations of other drugs and other drugs may alter the plasma concentrations of lopinavir. The potential for drug-drug interactions must be considered prior to and during therapy. (4, 5.1, 7, 12.3)

USE IN SPECIFIC POPULATIONS

Lactation: Breastfeeding not recommended. (8.2)

See 17 for PATIENT COUNSELING INFORMATION and Medication Guide.

Revised: 01/2016

FULL PRESCRIBING INFORMATION: CONTENTS*

1 INDICATIONS AND USAGE
2 DOSAGE AND ADMINISTRATION
2.1 General Administration Recommendations
2.2 Dosage Recommendations in Adults
2.3 Dosage Recommendations in Pediatric Patients
2.4 Dosage Recommendations in Pregnancy
3 DOSAGE FORMS AND STRENGTHS
4 CONTRAINDICATIONS
5 WARNINGS AND PRECAUTIONS
5.1 Risk of Serious Adverse Reactions Due to Drug Interactions
5.3 Pancreatitis
5.4 Hepatotoxicity
5.5 QT Interval Prolongation
5.6 PR Interval Prolongation
5.7 Diabetes Mellitus/Hyperglycemia
5.8 Immune Reconstitution Syndrome
5.9 Lipid Elevations
5.10 Fat Redistribution
5.11 Patients with Hemophilia
5.12 Resistance/Cross-resistance
6 ADVERSE REACTIONS
6.1 Clinical Trials Experience
6.2 Postmarketing Experience
7 DRUG INTERACTIONS
7.1 Potential for Lopinavir and Ritonavir to Affect Other Drugs
7.2 Potential for Other Drugs to Affect Lopinavir
7.3 Established and Other Potentially Significant Drug Interactions
7.4 Drugs with No Observed or Predicted Interactions with Lopinavir and Ritonavir.
8 USE IN SPECIFIC POPULATIONS
8.1 Pregnancy
8.2 Lactation
8.4 Pediatric Use
8.5 Geriatric Use
8.6 Hepatic Impairment
10 OVERDOSAGE
11 DESCRIPTION
12 CLINICAL PHARMACOLOGY
12.1 Mechanism of Action
12.3 Pharmacokinetics
12.4 Microbiology
13 NONCLINICAL TOXICOLOGY
13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility
14 CLINICAL STUDIES
14.1 Adult Patients without Prior Antiretroviral Therapy
14.2 Adult Patients with Prior Antiretroviral Therapy
14.3 Other Studies Supporting Approval in Adult Patients
14.4 Pediatric Studies
16 HOW SUPPLIED/STORAGE AND HANDLING
16.1 Lopinavir and Ritonavir Tablets, 200 mg lopinavir and 50 mg ritonavir
16.2 Lopinavir and Ritonavir Tablets, 100 mg lopinavir and 25 mg ritonavir
17 PATIENT COUNSELING INFORMATION

***Sections or subsections omitted from the full prescribing information are not listed.

FULL PRESCRIBING INFORMATION

1 INDICATIONS AND USAGE

Lopinavir and ritonavir tablets USP are indicated in combination with other antiretroviral agents for the treatment of HIV-1 infection in adults and pediatric patients (14 days and older).

The following points should be considered when initiating therapy with lopinavir and ritonavir tablets USP :

• The use of other active agents with lopinavir and ritonavir tablets USP is associated with a greater likelihood of treatment response *[see Microbiology (12.4)* and *Clinical Studies (14)]*.

• Genotypic or phenotypic testing and/or treatment history should guide the use of lopinavir and ritonavir tablets USP *[see Microbiology (12.4)]*.

The number of baseline lopinavir resistance-associated substitutions affects the virologic response to lopinavir and ritonavir tablets USP *[see Microbiology (12.4)]*.

2 DOSAGE AND ADMINISTRATION

2.1 General Administration Recommendations

Lopinavir and ritonavir tablets may be taken with or without food. The tablets should be swallowed whole and not chewed, broken, or crushed.

2.2 Dosage Recommendations in Adults

Considerations in Determining lopinavir and ritonavir tablets Once Daily vs. Twice Daily Dosing Regimen:

• Lopinavir and ritonavir tablets can be given as once daily or twice daily dosing regimen in patients with less than three lopinavir resistance-associated substitutions.

• Lopinavir and ritonavir tablets must be given as twice daily dosing regimen in patients with three or more resistance-associated substitutions.

• Table 1 includes the recommended once daily dosing regimen and Tables 2 and 3 include the recommended twice daily dosing regimen.

Lopinavir and ritonavir tablets once daily dosing regimen is not recommended in:

• Adult patients with three or more of the following lopinavir resistance-associated substitutions: L10F/I/R/V, K20M/N/R, L24I, L33F, M36I, I47V, G48V, I54L/T/V, V82A/C/F/S/T, and I84V *[see Microbiology (12.4)]*.

• In combination with carbamazepine, phenobarbital, or phenytoin *[see Drug Interactions (7.3)]*.

• In combination with efavirenz, nevirapine, or nelfinavir *[see Drug Interactions (7.3) and Clinical Pharmacology (12.3)]*.

• In pregnant women *[see Dosage and Administration (2.4), Use in Specific Populations (8.1) and Clinical Pharmacology (12.3)]*.

The dose of lopinavir and ritonavir tablets must be increased when administered in combination with efavirenz, nevirapine or nelfinavir.

Table 3 outlines the dosage recommendations for twice daily dosing when lopinavir and ritonavir tablets is taken in combination with efavirenz, nevirapine or nelfinavir.

Table 1. Recommended Dosage in Adults- Lopinavir and Ritonavir Tablets Once Daily Regimen

Lopinavir and Ritonavir Dosage Form	**Recommended Dosage**
200/50 mg Tablets	800 mg/200 mg (4 tablets) once daily

Table 2. Recommended Dosage in Adults - Lopinavir and Ritonavir Tablets Twice Daily Regimen

Lopinavir and Ritonavir Dosage Form	**Recommended Dosage**
200/50 mg Tablets	400 mg/100 mg (2 tablets) twice daily

Table 3. Recommended Dosage in Adults – Lopinavir and Ritonavir Tablets Twice Daily Regimen in Combination with Efavirenz, Nevirapine, or Nelfinavir

Lopinavir and Ritonavir Dosage Form	**Recommended Dosage**
200 mg/50 mg Tablets and 100 mg/25 mg Tablets	500 mg/125 mg (2 tablets of 200 mg/50 mg + 1 tablet of 100 mg/25 mg) twice daily

2.3 Dosage Recommendations in Pediatric Patients

Lopinavir and ritonavir tablets tablets and oral solution should not be administered once daily in pediatric patients <18 years of age. The dose of the oral solution should be administered using a calibrated dosing syringe.

Before prescribing lopinavir and ritonavir tablets 100/25 mg tablets, children should be assessed for the ability to swallow intact tablets. If a child is unable to reliably swallow a lopinavir and ritonavir tablets.

Special attention should be given to accurate calculation of the dosage of lopinavir and ritonavir tablets, transcription of the medication order, dispensing information and dosing instructions to minimize the risk for medication errors, and overdose. This is especially important for infants and young children.

Pediatric Dosage Calculations

Calculate the appropriate dose of lopinavir and ritonavir tabletsn for each individual pediatric patient based on body weight (kg) or body surface area (BSA) to avoid underdosing or exceeding the recommended adult dose.

Body surface area (BSA) can be calculated as follows:

$$\text{BSA } (m^2) = \sqrt{\frac{\text{Ht (Cm) x Wt (kg)}}{3600}}$$

The lopinavir and ritonavir tablets dose can be calculated based on weight or BSA:

Based on Weight:

Patient Weight (kg) × Prescribed lopinavir dose (mg/kg) = Administered lopinavir dose (mg)

Based on BSA:

Patient BSA (m^2) × Prescribed lopinavir dose (mg/m^2) = Administered lopinavir dose (mg)

Dosing recommendations using tablets

Table 6 provides the dosing recommendations for pediatric patients 6 months to 18 years of age based on body weight or body surface area for lopinavir and ritonavir tablets.

Table 6. Pediatric Dosing Recommendations for Patients 6 Months to 18 Years of Age Based on Body Weight or Body Surface Area for Lopinavir and Ritonavir Tablets Without Concomitant Efavirenz, Nevirapine, or Nelfinavir

Body Weight (kg)	Body Surface Area (m^2)*	Recommended number of 100/25 mg Tablets Twice Daily
15 to 25	≥0.6 to < 0.9	2
>25 to 35	≥0.9 to < 1.4	3
>35	≥1.4	4 (or two 200/50 mg tablets)

Concomitant Therapy: Efavirenz, Nevirapine, or Nelfinavir

Dosing recommendations using tablets

Table 7 provides the dosing recommendations for pediatric patients 6 months to 18 years of age based on body weight or body surface area for lopinavir and ritonavir tablets when given in combination with efavirenz, nevirapine, or nelfinavir.

Table 7. Pediatric Dosing Recommendations for Patients 6 Months to 18 Years of Age Based on Body Weight or Body Surface Area for Lopinavir and Ritonavir Tablets With Concomitant Efavirenz†, Nevirapine, or Nelfinavir†

Body Weight (kg)	Body Surface Area (m^2)*	Recommended number of 100/25 mg Tablets Twice Daily
15 to 20	≥0.6 to < 0.8	**2**
>20 to 30	≥0.8 to < 1.2	**3**
>30 to 45	≥1.2 to <1.7	4 (or two 200/50 mg tablets)
>45	≥1.7	5 *[see Dosage and Administration (2.2)]*

* Lopinavir and ritonavir oral solution is available for children with a BSA less than 0.6 m^2 or those who are unable to reliably swallow a tablet.
† Please refer to the individual product labels for appropriate dosing in children.

2.4 Dosage Recommendations in Pregnancy

Administer 400/100 mg of lopinavir and ritonavir tablets twice daily in pregnant patients with no documented lopinavir-associated resistance substitutions. Once daily lopinavir and ritonavir tablets dosing are not recommended in pregnancy *[see Use in Specific Populations (8.1) and Clinical Pharmacology (12.3)]*.

• There are insufficient data to recommend dosing in pregnant women with any documented lopinavir-associated resistance substitutions.

• No dosage adjustment of lopinavir and ritonavir tablets are required for patients during the postpartum period.

3 DOSAGE FORMS AND STRENGTHS

• *Tablets, 200 mg lopinavir, 50 mg ritonavir*: Yellow colored, capsule shaped, biconvex, filmcoated tablets debossed with "M 32" on one side and plain on other side.

• *Tablets, 100 mg lopinavir, 25 mg ritonavir*: Pale yellow colored, capsule shaped, biconvex, filmcoated tablets debossed with "M 31" on one side and plain on other side.

4 CONTRAINDICATIONS

• Lopinavir and ritonavir tablets are contraindicated in patients with previously demonstrated clinically significant hypersensitivity (e.g., toxic epidermal necrolysis, Stevens-Johnson syndrome, erythema multiforme, urticaria, angioedema) to any of its ingredients, including ritonavir.

• Co-administration of lopinavir and ritonavir tablets are contraindicated with drugs that are highly dependent on CYP3A for clearance and for which elevated plasma concentrations are associated with serious and/or life-threatening reactions.

• Co-administration of lopinavir and ritonavir tablets are contraindicated with potent CYP3A inducers where significantly reduced lopinavir plasma concentrations may be associated with the potential for loss of virologic response and possible resistance and cross-resistance. These drugs are listed in Table 8.

Table 8. Drugs That are Contraindicated with lopinavir and ritonavir tablets

Drug Class	Drugs Within Class That are Contraindicated with Lopinavir and Ritonavir	Clinical Comments
Alpha 1-Adrenoreceptor Antagonist	Alfuzosin	Potentially increased alfuzosin concentrations can result in hypotension.
Antimycobacterial	Rifampin	May lead to loss of virologic response and possible resistance to lopinavir and ritonavir tablets or to the class of protease inhibitors or other co-administered antiretroviral agents *[see Drug Interactions (7)]*.
Ergot Derivatives	Dihydroergotamine, ergotamine, methylergonovine	Potential for acute ergot toxicity characterized by peripheral vasospasm and ischemia of the extremities and other tissues.

GI Motility Agent	Cisapride	Potential for cardiac arrhythmias.
Herbal Products	St. John's Wort (hypericum perforatum)	May lead to loss of virologic response and possible resistance to lopinavir and ritonavir tablets or to the class of protease inhibitors.
HMG-CoA Reductase Inhibitors	Lovastatin, simvastatin	Potential for myopathy including rhabdomyolysis.
PDE5 Enzyme Inhibitor	Sildenafila (Revatio®) when used for the treatment of pulmonary arterial hypertension	A safe and effective dose has not been established when used with lopinavir and ritonavir tablets. There is an increased potential for sildenafil-associated adverse events, including visual abnormalities, hypotension, prolonged erection, and syncope *[see Drug Interactions (7)]*.
Neuroleptic	Pimozide	Potential for cardiac arrhythmias.
Sedative/Hypnotics	Triazolam; orally administered midazolamb	Prolonged or increased sedation or respiratory depression.
a see Drug Interactions (7), *Table 13* for co-administration of sildenafil in patients with erectiledysfunction. b see Drug Interactions (7), *Table 13* for parenterally administered midazolam.		

5 WARNINGS AND PRECAUTIONS

5.1 Risk of Serious Adverse Reactions Due to Drug Interactions

Initiation of lopinavir and ritonavir tablets, a CYP3A inhibitor, in patients receiving medications metabolized by CYP3A or initiation of medications metabolized by CYP3A in patients already receiving lopinavir and ritonavir tablets may increase plasma concentrations of medications metabolized by CYP3A.

Initiation of medications that inhibit or induce CYP3A may increase or decrease concentrations of lopinavir and ritonavir tablets, respectively. These interactions may lead to:

• Clinically significant adverse reactions, potentially leading to severe, life-threatening, or fatal events from greater exposures of concomitant medications.

• Clinically significant adverse reactions from greater exposures of lopinavir and ritonavir tablets.

• Loss of therapeutic effect of lopinavir and ritonavir tablets and possible development of resistance.

See Table 13 for steps to prevent or manage these possible and known significant drug interactions, including dosing recommendations *[see Drug Interactions (7)]*. Consider the potential for drug interactions prior to and during lopinavir and ritonavir tablets therapy; review concomitant medications during lopinavir and ritonavir tablets therapy, and monitor for the adverse reactions associated with the concomitant medications *[see Contraindications (4)* and *Drug Interactions (7)]*.

5.3 Pancreatitis

Pancreatitis has been observed in patients receiving lopinavir and ritonavir therapy, including those who developed marked triglyceride elevations. In some cases, fatalities have been observed. Although a causal relationship to lopinavir and ritonavir has not been established, marked triglyceride elevations are a risk factor for development of pancreatitis *[see Warnings and Precautions (5.9)]*. Patients with advanced HIV-1 disease may be at increased risk of elevated triglycerides and pancreatitis, and patients with a history of pancreatitis may be at increased risk for recurrence during lopinavir and ritonavir therapy.

Pancreatitis should be considered if clinical symptoms (nausea, vomiting, abdominal pain) or abnormalities in laboratory values (such as increased serum lipase or amylase values) suggestive of pancreatitis occur. Patients who exhibit these signs or symptoms should be evaluated and lopinavir and ritonavir and/or other antiretroviral therapy should be suspended as clinically appropriate.

5.4 Hepatotoxicity

Patients with underlying hepatitis B or C or marked elevations in transaminase prior to treatment may be at increased risk for developing or worsening of transaminase elevations or hepatic decompensation with use of lopinavir and ritonavir.

There have been postmarketing reports of hepatic dysfunction, including some fatalities. These have generally occurred in patients with advanced HIV-1 disease taking multiple concomitant medications in the setting of underlying chronic hepatitis or cirrhosis. A causal relationship with lopinavir and ritonavir therapy has not been established.

Elevated transaminases with or without elevated bilirubin levels have been reported in HIV-1 mono-infected and uninfected patients as early as 7 days after the initiation of lopinavir and ritonavir in conjunction with other antiretroviral agents. In some cases, the hepatic dysfunction was serious; however, a definitive causal relationship with lopinavir and ritonavir therapy has not been established.

Appropriate laboratory testing should be conducted prior to initiating therapy with lopinavir and ritonavir and patients should be monitored closely during treatment. Increased AST/ALT monitoring should be considered in the patients with underlying chronic hepatitis or cirrhosis, especially during the first several months of lopinavir and ritonavir treatment *[see Use in Specific Populations (8.6)]*.

5.5 QT Interval Prolongation

Postmarketing cases of QT interval prolongation and torsade de pointes have been reported although causality of lopinavir and ritonavir could not be established. Avoid use in patients with congenital long QT syndrome, those with hypokalemia, and with other drugs that prolong the QT interval *[see Clinical Pharmacology (12.3)]*.

5.6 PR Interval Prolongation

Lopinavir/ritonavir prolongs the PR interval in some patients. Cases of second or third degree atrioventricular block have been reported. Lopinavir and ritonavir should be used with caution in patients with underlying structural heart disease, pre-existing conduction system abnormalities, ischemic heart disease or cardiomyopathies, as these patients may be at increased risk for developing cardiac conduction abnormalities.

The impact on the PR interval of co-administration of lopinavir and ritonavir with other drugs that prolong the PR interval (including calcium channel blockers, beta-adrenergic blockers, digoxin and atazanavir) has not been evaluated. As a result, co-administration of lopinavir and ritonavir with these drugs should be undertaken with caution, particularly with those drugs metabolized by CYP3A.

Clinical monitoring is recommended *[see Clinical Pharmacology (12.3)]*.

5.7 Diabetes Mellitus/Hyperglycemia

New onset diabetes mellitus, exacerbation of pre-existing diabetes mellitus, and hyperglycemia have been reported during post-marketing surveillance in HIV-1 infected patients receiving protease inhibitor therapy. Some patients required either initiation or dose adjustments of insulin or oral hypoglycemic agents for treatment of these events. In some cases, diabetic ketoacidosis has occurred. In those patients who discontinued protease inhibitor therapy, hyperglycemia persisted in some cases. Because these events have been reported voluntarily during clinical practice, estimates of frequency cannot be made and a causal relationship between protease inhibitor therapy and these events has not been established.

5.8 Immune Reconstitution Syndrome

Immune reconstitution syndrome has been reported in patients treated with combination antiretroviral therapy, including lopinavir and ritonavir. During the initial phase of combination antiretroviral treatment, patients whose immune system responds may develop an inflammatory response to indolent or residual opportunistic infections (such as *Mycobacterium avium* infection, cytomegalovirus, *Pneumocystis jirovecii* pneumonia [PCP], or tuberculosis) which may necessitate further evaluation and treatment.

Autoimmune disorders (such as Graves' disease, polymyositis, and Guillain-Barré syndrome) have also been reported to occur in the setting of immune reconstitution, however, the time to onset is more variable, and can occur many months after initiation of treatment.

5.9 Lipid Elevations

Treatment with lopinavir and ritonavir has resulted in large increases in the concentration of total cholesterol and triglycerides *[see Adverse Reactions (6.1)]*. Triglyceride and cholesterol testing should be performed prior to initiating lopinavir and ritonavir therapy and at periodic intervals during therapy. Lipid disorders should be managed as clinically appropriate, taking into account any potential drug-drug interactions with lopinavir and ritonavir and HMG-CoA reductase inhibitors *[see Contraindications (4)* and *Drug Interactions (7.3)]*.

5.10 Fat Redistribution

Redistribution/accumulation of body fat including central obesity, dorsocervical fat enlargement (buffalo hump), peripheral wasting, facial wasting, breast enlargement, and "cushingoid appearance" have been observed in patients receiving antiretroviral therapy. The mechanism and long-term consequences of these events are currently unknown. A causal relationship has not been established.

5.11 Patients with Hemophilia

Increased bleeding, including spontaneous skin hematomas and hemarthrosis have been reported in patients with hemophilia type A and B treated with protease inhibitors. In some patients additional factor VIII was given. In more than half of the reported cases, treatment with protease inhibitors was continued or reintroduced. A causal relationship between protease inhibitor therapy and these events has not been established.

5.12 Resistance/Cross-resistance

Because the potential for HIV cross-resistance among protease inhibitors has not been fully explored in lopinavir and ritonavir -treated patients, it is unknown what effect therapy with lopinavir and ritonavir will have on the activity of subsequently administered protease inhibitors *[see*

Microbiology (12.4)].

6 ADVERSE REACTIONS

The following adverse reactions are discussed in greater detail in other sections of the labeling.

• QT Interval Prolongation, PR Interval Prolongation *[see Warnings and Precautions (5.5,5.6)]*

• Drug Interactions *[see Warnings and Precautions (5.1)]*

• Pancreatitis *[see Warnings and Precautions (5.3)]*

• Hepatotoxicity *[see Warnings and Precautions (5.4)]*

6.1 Clinical Trials Experience

Because clinical trials are conducted under widely varying conditions, adverse reactions rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in clinical practice.

Adverse Reactions in Adults

The safety of lopinavir and ritonavir has been investigated in about 2,600 patients in Phase II-IV clinical trials, of which about 700 have received a dose of 800/200 mg (6 capsules or 4 tablets) once daily. Along with nucleoside reverse transcriptase inhibitors (NRTIs), in some studies, Lopinavir and ritonavir was used in combination with efavirenz or nevirapine.

In clinical studies the incidence of diarrhea in patients treated with either lopinavir and ritonavir capsules or tablets was greater in those patients treated once daily than in those patients treated twice daily.

Any grade of diarrhea was reported by at least half of patients taking once daily lopinavir and ritonavir capsules or tablets. At the time of treatment discontinuation, 4.2-6.3% of patients taking once daily lopinavir and ritonavir and 1.8-3.7% of those taking twice daily lopinavir and ritonavir reported ongoing diarrhea.

Commonly reported adverse reactions to lopinavir and ritonavir included diarrhea, nausea, vomiting, hypertriglyceridemia and hypercholesterolemia. Diarrhea, nausea and vomiting may occur at the beginning of the treatment while hypertriglyceridemia and hypercholesterolemia may occur later. The following have been identified as adverse reactions of moderate or severe intensity (Table 9):

Table 9. Adverse Reactions of Moderate or Severe Intensity Occurring in at Least 0.1% of Adult Patients Receiving Lopinavir and Ritonavir in Combined Phase II/IV Studies (N=2,612)

System Organ Class (SOC) and Adverse Reaction	n	%
BLOOD AND LYMPHATIC SYSTEM DISORDERS		
anemia*	54	2.1
leukopenia and neutropenia*	44	1.7
lymphadenopathy*	35	1.3
CARDIAC DISORDERS		
atherosclerosis such as myocardial infarction*	10	0.4
atrioventricular block*	3	0.1
tricuspid valve incompetence*	3	0.1
EAR AND LABYRINTH DISORDERS		
vertigo*	7	0.3
tinnitus	6	0.2
ENDOCRINE DISORDERS		
hypogonadism*	16	0.8[1]
EYE DISORDERS		
visual impairment*	8	0.3
GASTROINTESTINAL DISORDERS		
diarrhea*	510	19.5
nausea	269	10.3
vomiting*	177	6.8
abdominal pain (upper and lower)*	160	6.1
gastroenteritis and colitis*	66	2.5
dyspepsia	53	2.0
pancreatitis*	45	1.7
Gastroesophageal Reflux Disease (GERD)*	40	1.5
hemorrhoids	39	1.5
flatulence	36	1.4
abdominal distension	34	1.3
constipation*	26.	1.0
stomatitis and oral ulcers*	24	0.9
duodenitis and gastritis*	20	0.8
gastrointestinal hemorrhage including rectal hemorrhage*	13	0.5
dry mouth	9	0.3
gastrointestinal ulcer*	6	0.2
fecal incontinence	5	0.2
GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS		

fatigue including asthenia*	198	7.6
HEPATOBILIARY DISORDERS		
hepatitis including AST, ALT, and GGT increases*	91	3.5
hepatomegaly	5	0.2
cholangitis	3	0.1
hepatic steatosis	3	0.1
IMMUNE SYSTEM DISORDERS		
hypersensitivity including urticaria and angioedema*	70	2.7
immune reconstitution syndrome	3	0.1
INFECTIONS AND INFESTATIONS		
upper respiratory tract infection*	363	13.9
lower respiratory tract infection*	202	7.7
skin infections including cellulitis, folliculitis, and furuncle*	86	3.3
METABOLISM AND NUTRITION DISORDERS		
hypercholesterolemia*	192	7.4
hypertriglyceridemia*	161	6.2
weight decreased*	61	2.3
decreased appetite	52	2.0
blood glucose disorders including diabetes mellitus*	30	1.1
weight increased*	20	0.8
lactic acidosis*	11	0.4
increased appetite	5	0.2
MUSCULOSKELETAL AND CONNECTIVE TISSUE DISORDERS		
musculoskeletal pain including arthralgia and back pain*	166	6.4
myalgia*	46	1.8
muscle disorders such as weakness and spasms*	34	1.3
rhabdomyolysis*	18	0.7
osteonecrosis	3	0.1
NERVOUS SYSTEM DISORDERS		
headache including migraine*	165	6.3
insomnia*	99	3.8
neuropathy and peripheral neuropathy*	51	2.0
dizziness*	45	1.7
ageusia*	19	0.7
convulsion*	9	0.3
tremor*	9	0.3
cerebral vascular event*	6	0.2
PSYCHIATRIC DISORDERS		
anxiety*	101	3.9
abnormal dreams*	19	0.7

libido decreased	19	0.7
RENAL AND URINARY DISORDERS		
renal failure*	31	1.2
hematuria*	20	0.8
nephritis*	3	0.1
REPRODUCTIVE SYSTEM AND BREAST DISORDERS		
erectile dysfunction*	34	1.7[1]
menstrual disorders -amenorrhea, menorrhagia*	10	1.7[2]
SKIN AND SUBCUTANEOUS TISSUE DISORDERS		
rash including maculopapular rash*	99	3.8
lipodystrophy acquired including facial wasting*	58	2.2
dermatitis/rash including eczema and seborrheic dermatitis*	50	1.9
night sweats*	42	1.6
pruritus*	29	1.1
alopecia	10	0.4
capillaritis and vasculitis*	3	0.1
VASCULAR DISORDERS		
hypertension*	47	1.8
deep vein thrombosis*	17	0.7
*Represents a medical concept including several similar MedDRA PTs 1. Percentage of male population (N=2,038) 2. Percentage of female population (N=574)		

Laboratory Abnormalities in Adults

The percentages of adult patients treated with combination therapy with Grade 3-4 laboratory abnormalities are presented in Table 10 (treatment-naïve patients) and Table 11 (treatmentexperienced patients).

Table 10. Grade 3-4 Laboratory Abnormalities Reported in ≥ 2% of Adult Antiretroviral-Naïve Patients

		Study 863 (48 Weeks)		Study 720 (360 Weeks)	Study 730 (48 Weeks)	
Variable	**Limit[1]**	**Lopinavir and Ritonavir 400/100 mg Twice Daily + d4T +3TC (N = 326)**	**Nelfinavir 750 mg Three Times Daily + d4T + 3TC (N = 327)**	**Lopinavir and Ritonavir Twice Daily + d4T + 3TC (N = 100)**	**Lopinavir and Ritonavir Once Daily + TDF +FTC (N=333)**	**Lopinavir and Ritonavir Twice Daily + TDF +FTC (N=331)**
Chemistry	**High**					
Glucose	> 250 mg/dL	2%	2%	4%	0%	<1%
Uric Acid	>12 mg/dL	2%	2%	5%	<1%	1%
SGOT/ AST[2]	> 180 U/L	2%	4%	10%	1%	2%
SGPT/ ALT[2]	>215 U/L	4%	4%	11%	1%	1%
GGT	>300 U/L	N/A	N/A	10%	N/A	N/A
Total Cholesterol	>300 mg/dL	9%	5%	27%	4%	3%
Triglycerides	>750 mg/dL	9%	1%	29%	3%	6%
Amylase	>2 x ULN	3%	2%	4%	N/A	N/A
Lipase	>2 x ULN	N/A	N/A	N/A	3%	5%
Chemistry	**Low**					
Calculated Creatinine Clearance	<50 mL/min	N/A	N/A	N/A	2%	2%
Hematology	**Low**					
Neutrophils	$<0.75 \times 10^9$/L	1%	3%	5%	2%	1%

1 ULN = upper limit of the normal range; N/A = Not Applicable.
2 Criterion for Study 730 was >5x ULN (AST/ALT).

Table 11. Grade 3-4 Laboratory Abnormalities Reported in ≥ 2% of Adult Protease Inhibitor-Experienced Patients

		Study 888 (48 Weeks)		Study 957[2] and Study 765[3] (84-144 Weeks)	Study 802 (48 Weeks)	
Variable	**Limit[1]**	**Lopinavir and Ritonavir 400/100 mg Twice Daily + NVP + NRTIs (N = 148)**	**Investigator-Selected Protease Inhibitor(s) + NVP + NRTIs (N = 140)**	**Lopinavir and Ritonavir Twice Daily + NNRTI + NRTIs (N = 127)**	**Lopinavir and Ritonavir 800/200 mg Once Daily +NRTIs (N=300)**	**Lopinavir and Ritonavir 400/100 mg Twice Daily +NRTIs (N=299)**
Chemistry	**High**					
Glucose	>250 mg/dL	1%	2%	5%	2%	2%
Total Bilirubin	>3.48 mg/dL	1%	3%	1%	1%	1%
SGOT/AST[4]	>180 U/L	5%	11%	8%	3%	2%
SGPT/ALT[4]	>215 U/L	6%	13%	10%	2%	2%
GGT	>300 U/L	N/A	N/A	29%	N/A	N/A
Total Cholesterol	>300 mg/dL	20%	21%	39%	6%	7%
Triglycerides	>750 mg/dL	25%	21%	36%	5%	6%
Amylase	>2 x ULN	4%	8%	8%	4%	4%
Lipase	>2 x ULN	N/A	N/A	N/A	4%	1%
Creatine Phosphokinase	>4 x ULN	N/A	N/A	N/A	4%	5%
Chemistry	**Low**					
Calculated Creatinine Clearance	<50 mL/min	N/A	N/A	N/A	3%	3%
Inorganic Phosphorus	<1.5 mg/dL	1%	0%	2%	1%	<1%
Hematology						
Neutrophils	<0.75 x 10^9/L	1%	2%	4%	3%	4%
Hemoglobin	<80 g/L	1%	1%	1%	1%	2%

1 ULN = upper limit of the normal range; N/A = Not Applicable.
2 Includes clinical laboratory data from patients receiving 400/100 mg twice daily (n = 29) or 533/133 mg twice daily (n = 28) for 84 weeks. Patients received lopinavir and ritonavir in combination with NRTIs and efavirenz.
3 Includes clinical laboratory data from patients receiving 400/100 mg twice daily (n = 36) or 400/200 mg twice daily (n = 34) for 144 weeks. Patients received lopinavir and ritonavir in combination with NRTIs and nevirapine.
4 Criterion for Study 802 was >5x ULN (AST/ALT).

6.2 Postmarketing Experience

The following adverse reactions have been reported during postmarketing use of lopinavir and ritonavir.

Because these reactions are reported voluntarily from a population of unknown size, it is not possible to reliably estimate their frequency or establish a causal relationship to lopinavir and ritonavir exposure.

Body as a Whole

Redistribution/accumulation of body fat has been reported *[see Warnings and Precautions (5.10)]*.

Cardiovascular

Bradyarrhythmias. First-degree AV block, second-degree AV block, third-degree AV block, QTc interval prolongation, torsades (torsade) de pointes *[see Warnings and Precautions (5.5, 5.6)]*.

Skin and Appendages

Toxic epidermal necrolysis (TEN), Stevens-Johnson syndrome and erythema multiforme.

7 DRUG INTERACTIONS

See also Contraindications (4), Warnings and Precautions (5.1), Clinical Pharmacology (12.3)

7.1 Potential for Lopinavir and Ritonavir to Affect Other Drugs

Lopinavir/ritonavir is an inhibitor of CYP3A and may increase plasma concentrations of agents that are primarily metabolized by CYP3A. Agents that are extensively metabolized by CYP3A and have high first pass metabolism appear to be the most susceptible to large increases in AUC (> 3-fold) when co-administered with lopinavir and ritonavir. Thus, co-administration of lopinavir and ritonavir with drugs highly dependent on CYP3A for clearance and for which elevated plasma concentrations are associated with serious and/or life-threatening events is contraindicated. Co-administration with other CYP3A substrates may require a dose adjustment or additional monitoring as shown in Table 13.

Additionally, lopinavir and ritonavir induces glucuronidation.

7.2 Potential for Other Drugs to Affect Lopinavir

Lopinavir/ritonavir is a CYP3A substrate; therefore, drugs that induce CYP3A may decrease lopinavir plasma concentrations and reduce lopinavir and ritonavir's therapeutic effect. Although not observed in the lopinavir and ritonavir /ketoconazole drug interaction study, co-administration of lopinavir and ritonavir and other drugs that inhibit CYP3A may increase lopinavir plasma concentrations.

7.3 Established and Other Potentially Significant Drug Interactions

Table 13 provides a listing of established or potentially clinically significant drug interactions. Alteration in dose or regimen may be recommended based on drug interaction studies or predicted interaction *[see Clinical Pharmacology (12.3) for magnitude of interaction]*.

Table 13. Established and Other Potentially Significant Drug Interactions

Concomitant Drug Class: Drug Name	**Effect on Concentration of Lopinavir or Concomitant Drug**	**Clinical Comments**
HIV-1 Antiviral Agents		
HIV-1 Protease Inhibitor: fosamprenavir/ritonavir	↓ amprenavir ↓ lopinavir	An increased rate of adverse reactions has been observed with co-administration of these medications. Appropriate doses of the combinations with respect to safety and efficacy have not been established.
HIV-1 Protease Inhibitor: indinavir*	↑ indinavir	Decrease indinavir dose to 600 mg twice daily, when co-administered with lopinavir and ritonavir 400/100 mg twice daily *[see Clinical Pharmacology (12.3)]*. Lopinavir and ritonavir once daily has not been studied in combination with indinavir.
HIV-1 Protease Inhibitor: nelfinavir*	↑ nelfinavir ↑ M8 metabolite of nelfinavir ↓ lopinavir	Lopinavir and ritonavir should not be administered once daily in combination with nelfinavir *[see Dosage and Administration (2) and Clinical Pharmacology (12.3)]*.
HIV-1 Protease Inhibitor: ritonavir*	↑ lopinavir	Appropriate doses of additional ritonavir in combination with lopinavir and ritonavir with respect to safety and efficacy have not been established.
HIV-1 Protease Inhibitor: saquinavir*	↑ saquinavir	The saquinavir dose is 1000 mg twice daily, when co-administered with lopinavir and ritonavir 400/100 mg twice daily. Lopinavir and ritonavir once daily has not been studied in combination with saquinavir.
HIV-1 Protease Inhibitor: tipranavir	↓ lopinavir AUC and Cmin	Lopinavir and ritonavir should not be administered with tipranavir (500 mg twice daily) co-administered with ritonavir (200 mg twice daily).
HIV CCR5 – Antagonist: maraviroc	↑ maraviroc	Concurrent administration of maraviroc with lopinavir and ritonavir will increase plasma levels of maraviroc. When co-administered, patients

		should receive 150 mg twice daily of maraviroc. For further details see complete prescribing information for Selzentry® (maraviroc).
Non-nucleoside Reverse Transcriptase Inhibitor: etravirine	↓ etravirine	Because the reduction in the mean systemic exposures of etravirine in the presence of lopinavir/ritonavir is similar to the reduction in mean systemic exposures of etravirine in the presence of darunavir/ritonavir, no dose adjustment is required.
Non-nucleoside Reverse Transcriptase Inhibitors: efavirenz*, nevirapine*	↓ lopinavir	Lopinavir and ritonavir dose increase is recommended in all patients *[see Dosage and Administration (2) and Clinical Pharmacology (12.3)]*. Increasing the dose of lopinavir and ritonavir tablets to 500/125 mg (given as two 200/50 mg tablets and one 100/25 mg tablet) twice daily co-administered with efavirenz resulted in similar lopinavir concentrations compared to lopinavir and ritonavir tablets 400/100 mg (given as two 200/50 mg tablets) twice daily without efavirenz. Increasing the dose of lopinavir and ritonavir tablets to 600/150 mg (given as three 200/50 mg tablets) twice daily co-administered with efavirenz resulted in significantly higher lopinavir plasma concentrations compared to lopinavir and ritonavir tablets 400/100 mg twice daily without efavirenz. Lopinavir and ritonavir should not be administered once daily in combination with efavirenz or nevirapine *[see Dosage and Administration (2) and Clinical Pharmacology (12.3)]*.
Non-nucleoside Reverse Transcriptase Inhibitor: delavirdine	↑ lopinavir	Appropriate doses of the combination with respect to safety and efficacy have not been established.
Non-nucleoside Reverse Transcriptase Inhibitor: rilpivirine	↑ rilpivirine	No dose adjustment is required.
Nucleoside Reverse Transcriptase Inhibitor: didanosine		Lopinavir and ritonavir tablets can be administered simultaneously with didanosine without food. For lopinavir and ritonavir oral solution, it is recommended that didanosine be administered on an empty stomach; therefore, didanosine should be given one hour before or two hours after lopinavir and ritonavir oral solution (given with food).
Nucleoside Reverse Transcriptase Inhibitor: tenofovir	↑ tenofovir	Lopinavir and ritonavir increases tenofovir concentrations. The mechanism of this interaction is unknown. Patients receiving lopinavir and ritonavir and tenofovir should be monitored for adverse reactions associated with tenofovir.
Nucleoside Reverse Transcriptase Inhibitors: abacavir zidovudine	↓ abacavir ↓ zidovudine	Lopinavir and ritonavir induces glucuronidation; therefore, lopinavir and ritonavir has the potential to reduce zidovudine and abacavir plasma concentrations. The clinical significance of this potential interaction is unknown.
Other Agents		
Antiarrhythmics e.g.: amiodarone, bepridil, lidocaine (systemic), quinidine	↑ antiarrhythmics	Caution is warranted and therapeutic concentration monitoring (if available) is recommended for antiarrhythmics when co-administered with

		lopinavir and ritonavir.
Anticancer Agents: vincristine, vinblastine, dasatinib, nilotinib	↑ anticancer agents	Concentrations of these drugs may be increased when co-administered with lopinavir and ritonavir resulting in the potential for increased adverse events usually associated with these anticancer agents. For vincristine and vinblastine, consideration should be given to temporarily withholding the ritonavir-containing antiretroviral regimen in patients who develop significant hematologic or gastrointestinal side effects when lopnavir and ritoanvir is administered concurrently with vincristine or vinblastine. If the antiretroviral regimen must be withheld for a prolonged period, consideration should be given to initiating a revised regimen that does not include a CYP3A or P-gp inhibitor. A decrease in the dosage or an adjustment of the dosing interval of nilotinib and dasatinib may be necessary for patients requiring co-administration with strong CYP3A inhibitors such as lopinavir and ritonavir. Please refer to the nilotinib and dasatinib prescribing information for dosing instructions.
Anticoagulants: warfarin, rivaroxaban	↑ rivaroxaban	Concentrations of warfarin may be affected. It is recommended that INR (international normalized ratio) be monitored. Avoid concomitant use of rivaroxaban and lopinavir and ritonavir. Co-administration of lopinavir and ritonavir and rivaroxaban is expected to result in increased exposure of rivaroxaban which may lead to risk of increased bleeding.
Anticonvulsants: carbamazepine, phenobarbital, phenytoin	↓ lopinavir ↓ phenytoin	Lopinavir and ritonavir may be less effective due to decreased lopinavir plasma concentrations in patients taking these agents concomitantly and should be used with caution. Lopinavir and ritonavir should not be administered once daily in combination with carbamazepine, phenobarbital, or phenytoin. In addition, co-administration of phenytoin and lopinavir and ritonavir may cause decreases in steady-state phenytoin concentrations. Phenytoin levels should be monitored when co-administering with lopinavir and ritonavir.
Anticonvulsants: lamotrigine, valproate	↓ lamotrigine ↓ or ↔ valproate	Co-administration of lopinavir and ritonavir and lamotrigine or valproate may decrease the exposure of lamotrigine or valproate. A dose increase of lamotrigine or valproate may be needed when co-administered with lopinavir and ritonavir and therapeutic concentration monitoring for lamotrigine may be indicated; particularly during dosage adjustments.
Antidepressant: bupropion	↓ bupropion ↓ active metabolite, hydroxybupropion	Concurrent administration of bupropion with lopinavir and ritonavir may decrease plasma levels of both bupropion and its active metabolite (hydroxybupropion). Patients receiving lopinavir and ritonavir and bupropion concurrently should be monitored for an adequate clinical

		response to bupropion.
Antidepressant: trazodone	↑ trazodone	Concomitant use of trazodone and lopinavir and ritonavir may increase concentrations of trazodone. Adverse reactions of nausea, dizziness, hypotension and syncope have been observed following co-administration of trazodone and ritonavir. If trazodone is used with a CYP3A4 inhibitor such as ritonavir, the combination should be used with caution and a lower dose of trazodone should be considered.
Anti-infective: clarithromycin	↑ clarithromycin	For patients with renal impairment, the following dosage adjustments should be considered: • For patients with CL_{CR} 30 to 60 mL/min the dose of clarithromycin should be reduced by 50%. • For patients with CL_{CR} < 30 mL/min the dose of clarithromycin should be decreased by 75%. No dose adjustment for patients with normal renal function is necessary.
Antifungals: ketoconazole*, itraconazole, voriconazole	↑ ketoconazole ↑ itraconazole ↓ voriconazole	High doses of ketoconazole (>200 mg/day) or itraconazole (> 200 mg/day) are not recommended. Co-administration of voriconazole with lopinavir and ritonavir has not been studied. However, a study has been shown that administration of voriconazole with ritonavir 100 mg every 12 hours decreased voriconazole steady-state AUC by an average of 39%; therefore, co-administration of lopinavir and ritonavir and voriconazole may result in decreased voriconazole concentrations and the potential for decreased voriconazole effectiveness and should be avoided, unless an assessment of the benefit/risk to the patient justifies the use of voriconazole. Otherwise, alternative antifungal therapies should be considered in these patients.
Anti-gout: colchicine	↑ colchicine	Patients with renal or hepatic impairment should not be given colchicine with lopinavir and ritonavir. Treatment of gout flares-co-administration of colchicine in patients on lopinavir and ritonavir: 0.6 mg (1 tablet) x 1 dose, followed by 0.3 mg (half tablet) 1 hour later. Dose to be repeated no earlier than 3 days. Prophylaxis of gout flares-co-administration of colchicine in patients on lopinavir and ritonavir: If the original colchicine regimen was 0.6 mg twice a day, the regimen should be adjusted to 0.3 mg once a day. If the original colchicine regimen was 0.6 mg once a day, the regimen should be adjusted to 0.3 mg once every other day.

		Treatment of familial Mediterranean fever (FMF)-co-administration of colchicine in patients on lopinavir and ritonavir: Maximum daily dose of 0.6 mg (may be given as 0.3 mg twice a day).
Antimycobacterial: bedaquiline	↑ bedaquiline	Bedaquiline should only be used with lopinavir and ritonavir if the benefit of co-administration outweighs the risk *[see Pharmacokinetics (12.3)]*.
Antimycobacterial: rifabutin*	↑ rifabutin and rifabutin metabolite	Dosage reduction of rifabutin by at least 75% of the usual dose of 300 mg/day is recommended (i.e., a maximum dose of 150 mg every other day or three times per week). Increased monitoring for adverse reactions is warranted in patients receiving the combination. Further dosage reduction of rifabutin may be necessary.
Antimycobacterial: rifampin	↓ lopinavir	May lead to loss of virologic response and possible resistance to lopinavir and ritonavir or to the class of protease inhibitors or other co-administered antiretroviral agents. A study evaluated combination of rifampin 600 mg once daily, with lopinavir and ritonavir 800/200 mg twice daily or lopinavir and ritonavir 400/100 mg + ritonavir 300 mg twice daily. Pharmacokinetic and safety results from this study do not allow for a dose recommendation. Nine subjects (28%) experienced a ≥ grade 2 increase in ALT/AST, of which seven (21%) prematurely discontinued study per protocol. Based on the study design, it is not possible to determine whether the frequency or magnitude of the ALT/AST elevations observed is higher than what would be seen with rifampin alone *[see Clinical Pharmacology (12.3)* for magnitude of interaction*]*.
Antiparasitic: atovaquone	↓ atovaquone	Clinical significance is unknown; however, increase in atovaquone doses may be needed.
Antipsychotics: Quetiapine	↑ quetiapine	Initiation of lopinavir and ritonavir in patients taking quetiapine: Consider alternative antiretroviral therapy to avoid increases in quetiapine exposures. If coadministration is necessary, reduce the quetiapine dose to 1/6 of the current dose and monitor for quetiapine-associated adverse reactions. Refer to the quetiapine prescribing information for recommendations on adverse reaction monitoring. Initiation of quetiapine in patients taking lopinavir and ritonavir: Refer to the quetiapine prescribing information for initial dosing and titration of quetiapine.
Benzodiazepines: parenterally administered midazolam	↑ midazolam	Midazolam is extensively metabolized by CYP3A4. Increases in the concentration of midazolam are expected to be significantly higher with oral than parenteral administration. Therefore, lopinavir and ritonavir should not be given with orally administered midazolam *[see Contraindications (4)]*. If lopinavir and ritonavir is co-administered with parenteral midazolam, close clinical monitoring for respiratory depression and/or prolonged sedation should be exercised and dosage adjustment

		should be considered.
Contraceptive: ethinyl estradiol*	↓ ethinyl estradiol	Because contraceptive steroid concentrations may be altered when lopinavir and ritonavir is co-administered with oral contraceptives or with the contraceptive patch, alternative methods of nonhormonal contraception are recommended.
Corticosteroids (systemic): e.g. budesonide, dexamethasone, prednisone	↓ lopinavir ↑ glucocorticoids	Use with caution. Lopinavir and ritonavir may be less effective due to decreased lopinavir plasma concentrations in patients taking these agents concomitantly. Concomitant use may result in increased steroid concentrations and reduced serum cortisol concentrations. Concomitant use of glucocorticoids that are metabolized by CYP3A, particularly for long-term use, should consider the potential benefit of treatment versus the risk of systemic corticosteroid effects. Concomitant use may increase the risk for development of systemic corticosteroid effects including Cushing's syndrome and adrenal suppression.
Dihydropyridine Calcium Channel Blockers: e.g. felodipine, nifedipine, nicardipine	↑ dihydropyridine calcium channel blockers	Caution is warranted and clinical monitoring of patients is recommended.
Endothelin Receptor Antagonists: bosentan	↑ bosentan	Co-administration of bosentan in patients on lopinavir and ritonavir: In patients who have been receiving lopinavir and ritonavir for at least 10 days, start bosentan at 62.5 mg once daily or every other day based upon individual tolerability. Co-administration of lopinavir and ritonavir in patients on bosentan: Discontinue use of bosentan at least 36 hours prior to initiation of lopinavir and ritonavir. After at least 10 days following the initiation of lopinavir and ritonavir, resume bosentan at 62.5 mg once daily or every other day based upon individual tolerability.
HCV-Protease Inhibitor: boceprevir	↓ lopinavir ↓ boceprevir ↓ ritonavir	It is not recommended to co-administer lopinavir and ritonavir and boceprevir. Concomitant administration of lopinavir and ritonavir and boceprevir reduced boceprevir, lopinavir and ritonavir steady-state exposures *[see Clinical Pharmacology (12.3)]*.
HCV-Protease Inhibitor: simeprevir	↑ simeprevir	It is not recommended to co-administer lopinavir and ritonavir and simeprevir.
HMG-CoA Reductase Inhibitors: atorvastatin rosuvastatin	↑ atorvastatin ↑ rosuvastatin	Use atorvastatin with caution and at the lowest necessary dose. Titrate rosuvastatin dose carefully and use the lowest necessary dose; do not exceed rosuvastatin 10 mg/day. See Drugs with No Observed or Predicted Interactions with lopinavir and ritonavir *(7.4)* and Clinical Pharmacology *(12.3)* for drug interaction data with other HMG-CoA reductase inhibitors.
Immunosuppressants: e.g. cyclosporine, tacrolimus, sirolimus	↑ immuno suppressants	Therapeutic concentration monitoring is recommended for immunosuppressant agents when co-administered with lopinavir and

		ritonavir.
Inhaled or Intranasal Steroids e.g.: fluticasone, budesonide	↑ glucocorticoids	Concomitant use of lopinavir and ritonavir and fluticasone or other glucocorticoids that are metabolized by CYP3A is not recommended unless the potential benefit of treatment outweighs the risk of systemic corticosteroid effects. Concomitant use may result in increased steroid concentrations and reduce serum cortisol concentrations. Systemic corticosteroid effects including Cushing's syndrome and adrenal suppression have been reported during postmarketing use in patients when certain ritonavir-containing products have been co-administered with fluticasone propionate or budesonide.
Long-acting beta-adrenoceptor Agonist: salmeterol	↑ salmeterol	Concurrent administration of salmeterol and lopinavir and ritonavir is not recommended. The combination may result in increased risk of cardiovascular adverse events associated with salmeterol, including QT prolongation, palpitations and sinus tachycardia.
Narcotic Analgesics: methadone,* fentanyl	↓ methadone ↑ fentanyl	Dosage of methadone may need to be increased when co-administered with lopinavir and ritonavir. Concentrations of fentanyl are expected to increase. Careful monitoring of therapeutic and adverse effects (including potentially fatal respiratory depression) is recommended when fentanyl is concomitantly administered with lopinavir and ritonavir.
PDE5 inhibitors: avanafil, sildenafil, tadalafil, vardenafil	↑ avanafil ↑ sildenafil ↑ tadalafil ↑ vardenafil	Do not use lopinavir and ritonavir with avanafil because a safe and effective avanafil dosage regimen has not been established. Particular caution should be used when prescribing sildenafil, tadalafil, or vardenafil in patients receiving lopinavir and ritonavir. Co-administration of lopinavir and ritonavir with these drugs is expected to substantially increase their concentrations and may result in an increase in PDE5 inhibitor associated adverse reactions including hypotension, syncope, visual changes and prolonged erection. Use of PDE5 inhibitors for pulmonary arterial hypertension (PAH): Sildenafil (Revatio®) is contraindicated when used for the treatment of pulmonary arterial hypertension (PAH) because a safe and effective dose has not been established when used with lopinavir and ritonavir *[see Contraindications (4)]*. The following dose adjustments are recommended for use of tadalafil (Adcirca®) with lopinavir and ritonavir: <u>Co-administration of ADCIRCA in patients on lopinavir and ritonavir:</u> In patients receiving lopinavir and ritonavir for at least one week, start ADCIRCA at 20 mg once daily. Increase to 40 mg once daily based upon individual tolerability.

		Co-administration of lopinavir and ritonavir in patients on ADCIRCA: Avoid use of ADCIRCA during the initiation of lopinavir and ritonavir. Stop ADCIRCA at least 24 hours prior to starting lopinavir and ritonavir. After at least one week following the initiation of lopinavir and ritonavir, resume ADCIRCA at 20 mg once daily. Increase to 40 mg once daily based upon individual tolerability. Use of PDE5 inhibitors for erectile dysfunction: It is recommended not to exceed the following doses: • Sildenafil: 25 mg every 48 hours • Tadalafil: 10 mg every 72 hours • Vardenafil: 2.5 mg every 72 hours Use with increased monitoring for adverse events.
* *see Clinical Pharmacology (12.3)* for magnitude of interaction.		

7.4 Drugs with No Observed or Predicted Interactions with Lopinavir and Ritonavir

Drug interaction or clinical studies reveal no clinically significant interaction between lopinavir and ritonavir and desipramine (CYP2D6 probe), pitavastatin, pravastatin, stavudine, lamivudine, omeprazole, raltegravir, or ranitidine.

Based on known metabolic profiles, clinically significant drug interactions are not expected between lopinavir and ritonavir and dapsone, trimethoprim/sulfamethoxazole, azithromycin, erythromycin, or fluconazole.

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Teratogenic Effects

Pregnancy category C

Risk Summary

Available data from the Antiretroviral Pregnancy Registry show no difference in the risk of overall major birth defects compared to the background rate for major birth defects of 2.7% in the U.S. reference population of the Metropolitan Atlanta Congenital Defects Program (MACDP). No treatment-related malformations were observed when lopinavir in combination with ritonavir was administered to pregnant rats or rabbits; however embryonic and fetal developmental toxicities occurred in rats administered maternally toxic doses.

Clinical Considerations

Dose Adjustments During Pregnancy and the Postpartum Period Administer 400/100 mg of lopinavir and ritonavir twice daily in pregnant patients with no documented lopinavir-associated resistance substitutions *[see Dosage and Administration (2.4) and Clinical Pharmacology (12.3)]*. There are insufficient data to recommend lopinavir and ritonavir dosing for pregnant patients with any documented lopinavir-associated resistance substitutions. No dose adjustment of lopinavir and ritonavir is required for patients during the postpartum period.

Once daily lopinavir and ritonavir dosing is not recommended in pregnancy.

Data

Human Data

Lopinavir and ritonavir was evaluated in 12 HIV-infected pregnant women in an open-label pharmacokinetic trial *[see Clinical Pharmacology (12.3)]*. No new trends in the safety profile were identified in pregnant women dosed with lopinavir and ritonavir compared to the safety described in non-pregnant adults, based on the review of these limited data.

Antiretroviral Pregnancy Registry Data: Based on prospective reports from the Antiretroviral Pregnancy Registry (APR) of over 3,000 exposures to lopinavir containing regimens (including over 1,000 exposed in the first trimester), there was no difference between lopinavir and overall birth defects compared with the background birth defect rate of 2.7% in the U.S. reference population of the Metropolitan Atlanta Congenital Defects Program. Based on prospective reports from the APR of over 5,000 exposures to ritonavir containing regimens (including over 2,000 exposures in the first trimester) there was no difference between ritonavir and overall birth defects compared with the U.S. background rate (MACDP). For both lopinavir and ritonavir, sufficient numbers of first trimester exposures have been monitored to detect at least a 1.5 fold increase in risk of overall birth defects and a 2 fold increase in risk of birth defects in the cardiovascular and genitourinary systems.

Animal Data

Embryonic and fetal developmental toxicities (early resorption, decreased fetal viability, decreased fetal body weight, increased incidence of

skeletal variations and skeletal ossification delays) occurred in rats at a maternally toxic dosage. Based on AUC measurements, the drug exposures in rats at the toxic doses were approximately 0.7-fold for lopinavir and 1.8-fold for ritonavir for males and females that of the exposures in humans at the recommended therapeutic dose (400/100 mg twice daily). In a peri- and postnatal study in rats, a developmental toxicity (a decrease in survival in pups between birth and postnatal Day 21) occurred.

No embryonic and fetal developmental toxicities were observed in rabbits at a maternally toxic dosage. Based on AUC measurements, the drug exposures in rabbits at the toxic doses were approximately 0.6-fold for lopinavir and 1.0-fold for ritonavir that of the exposures in humans at the recommended therapeutic dose (400/100 mg twice daily).

8.2 Lactation

Risk Summary

The Centers for Disease Control and Prevention recommend that HIV-1 infected mothers not breastfeed their infants to avoid risking postnatal transmission of HIV-1. Because of the potential for HIV-1 transmission in breastfed infants, advise women not to breastfeed.

8.4 Pediatric Use

The safety, efficacy, and pharmacokinetic profiles of lopinavir and ritonavir in pediatric patients below the age of 14 days have not been established. Lopinavir and ritonavir should not be administered once daily in pediatric patients. An open-label, multi-center, dose-finding trial was performed to evaluate the pharmacokinetic profile, tolerability, safety and efficacy of lopinavir and ritonavir oral solution containing lopinavir 80 mg/mL and ritonavir 20 mg/mL at a dose of 300/75 mg/m^2 twice daily plus two NRTIs in HIVinfected infants ≥14 days and < 6 months of age. Results revealed that infants younger than 6 months of age generally had lower lopinavir AUC12 than older children (6 months to 12 years of age), however, despite the lower lopinavir drug exposure observed, antiviral activity was demonstrated as reflected in the proportion of subjects who achieved HIV-1 RNA <400 copies/mL at Week 24 *[see Adverse Reactions (6.2), Clinical Pharmacology (12.3), ClinicalStudies (14.4)]*.

Safety and efficacy in pediatric patients > 6 months of age was demonstrated in a clinical trial in 100 patients. The clinical trial was an open-label, multicenter trial evaluating the pharmacokinetic profile, tolerability, safety, and efficacy of lopinavir and ritonavir oral solution containing lopinavir 80 mg/mL and ritonavir 20 mg/mL in 100 antiretroviral naïve and experienced pediatric patients ages 6 months to 12 years. Dose selection for patients 6 months to 12 years of age was based on the following results. The 230/57.5 mg/m^2 oral solution twice daily regimen without nevirapine and the 300/75 mg/m^2 oral solution twice daily regimen with nevirapine provided lopinavir plasma concentrations similar to those obtained in adult patients receiving the 400/100 mg twice daily regimen (without nevirapine) *[see Adverse Reactions (6.2), Clinical Pharmacology (12.3), Clinical Studies (14.4)]*.

A prospective multicenter, open-label trial evaluated the pharmacokinetic profile, tolerability, safety and efficacy of high-dose lopinavir and

ritonavir with or without concurrent NNRTI therapy (Group 1: 400/100 mg/m^2 twice daily + ≥ 2 NRTIs; Group 2: 480/120 mg/m^2 twice daily + ≥ 1 NRTI + 1 NNRTI) in 26 children and adolescents ≥ 2 years to < 18 years of age who had failed prior therapy. Patients also had saquinavir mesylate added to their regimen. This strategy was intended to assess whether higher than approved doses of lopinavir and ritonavir could overcome protease inhibitor cross-resistance. High doses of lopinavir and ritonavir exhibited a safety profile similar to those observed in previous trials; changes in HIV-1 RNA were less than anticipated; three patients had HIV-1 RNA <400 copies/mL at Week 48. CD4+ cell count increases were noted in the eight patients who remained on treatment for 48 weeks *[see Adverse Reactions (6.2), Clinical Pharmacology (12.3)]*.

A prospective multicenter, randomized, open-label study evaluated the efficacy and safety of twice-daily versus once-daily dosing of lopinavir and ritonavir tablets dosed by weight as part of combination antiretroviral therapy (cART) in virologically suppressed HIV-1 infected children (n=173). Children were eligible when they were aged < 18 years, ≥ 15 kg in weight, receiving cART that included lopinavir and ritonavir, HIV-1 ribonucleic acid (RNA) < 50 copies/mL for at least 24 weeks and able to swallow tablets. At week 24, efficacy (defined as the proportion of subjects with plasma HIV-1 RNA less than 50 copies per mL) was significantly higher in subjects receiving twice daily dosing compared to subjects receiving once daily dosing. The safety profile was similar between the two treatment arms although there was a greater incidence of diarrhea in the once daily treated subjects.

8.5 Geriatric Use

Clinical studies of lopinavir and ritonavir did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. In general, appropriate caution should be exercised in the administration and monitoring of lopinavir and ritonavir in elderly patients reflecting the greater frequency of decreased hepatic, renal, or cardiac function, and of concomitant disease or other drug therapy.

8.6 Hepatic Impairment

Lopinavir and ritonavir is principally metabolized by the liver; therefore, caution should be exercised when administering this drug to patients with hepatic impairment, because lopinavir concentrations may be increased *[see Warnings and Precautions (5.4)* and *Clinical Pharmacology (12.3)]*.

10 OVERDOSAGE

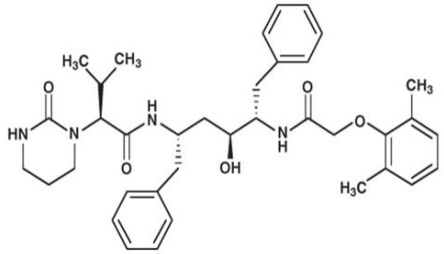
Human experience of acute overdosage with lopinavir and ritonavir is limited. Treatment of overdose with lopinavir and ritonavir should consist of general supportive measures including monitoring of vital signs and observation of the clinical status of the patient. There is no specific antidote for overdose with lopinavir and ritonavir. If indicated, elimination of unabsorbed drug should be achieved by gastric lavage. Administration of activated charcoal may also be used to aid in removal of unabsorbed drug. Since lopinavir is highly protein bound, dialysis is

unlikely to be beneficial in significant removal of the drug.

11 DESCRIPTION

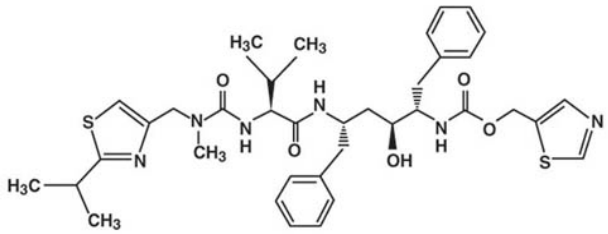
Lopinavir and ritonavir tablets, USP are a co-formulation of lopinavir USP and ritonavir USP. Lopinavir is an inhibitor of the HIV-1 protease. As co-formulated in lopinavir and ritonavir tablets, ritonavir inhibits the CYP3A-mediated metabolism of lopinavir, thereby providing increased plasma levels of lopinavir.

Lopinavir USP is chemically designated as [1*S*-[1*R**,(*R**), 3*R**, 4*R**]]-*N*-[4-[[(2,6-dimethylphenoxy)acetyl]amino]-3-hydroxy-5-phenyl-1-(phenylmethyl)pentyl]tetrahydro-alpha-(1-methylethyl)-2-oxo-1(2*H*)-pyrimidineacetamide. Its molecular formula is $C_{37}H_{48}N_4O_5$, and its molecular weight is 628.80. Lopinavir is a white to light tan powder. It is freely soluble in methanol and ethanol, soluble in isopropanol and practically insoluble in water. Lopinavir has the following structural formula:



Ritonavir USP is chemically designated as 10-hydroxy-2-methyl-5-(1-methylethyl)-1- [2-(1- methylethyl)-4-thiazolyl]-3,6-dioxo-8,11-bis(phenylmethyl)-2,4,7,12-tetraazatridecan-13-oic acid, 5-thiazolylmethyl ester, [5*S*-(5*R**,8*R**,10*R**,11*R**)]. Its molecular formula is $C_{37}H_{48}N_6O_5S_2$, and its molecular weight is 720.95. Ritonavir is a white to light tan powder. It is freely soluble in methanol and ethanol, soluble in isopropanol and practically insoluble in water.

Ritonavir has the following structural formula:



Lopinavir and ritonavir tablets USP are available for oral administration in two strengths:

• Yellow tablets containing 200 mg of lopinavir USP and 50 mg of ritonavir USP.

• Pale yellow tablets containing 100 mg of lopinavir USP and 25 mg of ritonavir USP.

The lopinavir and ritonavir tablets USP contain the following inactive ingredients: copovidone, sorbitan monolaurate, colloidal silicon dioxide, anhydrous dibasic calcium phosphate and sodium stearyl fumarate. The film coating contains: polyvinyl alcohol-part hydrolyzed, titanium dioxide, polyethylene glycol 4000, talc, iron oxide yellow.

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

Lopinavir is an antiviral drug *[see Microbiology (12.4)]*. As co-formulated in lopinavir and ritonavir tablets, ritonavir inhibits the CYP3A-mediated metabolism of lopinavir, thereby providing increased plasma levels of lopinavir.

12.3 Pharmacokinetics

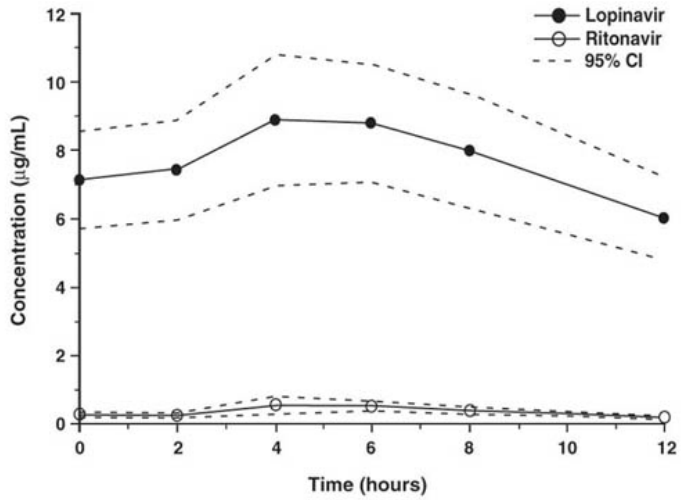
The pharmacokinetic properties of lopinavir co-administered with ritonavir have been evaluated in healthy adult volunteers and in HIV-1 infected patients; no substantial differences were observed between the two groups. Lopinavir is essentially completely metabolized by CYP3A. Ritonavir inhibits the metabolism of lopinavir, thereby increasing the plasma levels of lopinavir.

Across studies, administration of lopinavir and ritonavir 400/100 mg twice daily yields mean steady-state lopinavir plasma concentrations 15- to 20-fold higher than those of ritonavir in HIV-1 infected patients. The plasma levels of ritonavir are less than 7% of those obtained after the ritonavir dose of 600 mg twice daily. The *in vitro* antiviral EC50 of lopinavir is approximately 10-fold lower than that of ritonavir. Therefore, the antiviral activity of lopinavir and ritonavir is due to lopinavir.

Figure 1 displays the mean steady-state plasma concentrations of lopinavir and ritonavir after lopinavir and ritonavir 400/100 mg twice daily

with food for 3 weeks from a pharmacokinetic study in HIV-1 infected adult subjects (n = 19)

Figure 1. Mean Steady-State Plasma Concentrations with 95% Confidence Intervals (CI) for HIV-1 Infected Adult Subjects (N = 19)



Absorption

In a pharmacokinetic study in HIV-1 positive subjects (n = 19), multiple dosing with 400/100 mg lopinavir and ritonavir twice daily with food for 3 weeks produced a mean ± SD lopinavir peak plasma concentration (C_{max}) of 9.8 ± 3.7 µg/mL, occurring approximately 4 hours after administration. The mean steady-state trough concentration prior to the morning dose was 7.1 ± 2.9 µg/mL and minimum concentration within a dosing interval was 5.5 ± 2.7 µg/mL. Lopinavir AUC over a 12 hour dosing interval averaged 92.6 ± 36.7 µg•h/mL. The absolute bioavailability of lopinavir coformulated with ritonavir in humans has not been established. Under nonfasting conditions (500 kcal, 25% from fat), lopinavir concentrations were similar following administration of lopinavir and ritonavir co-formulated capsules and oral solution. When administered under fasting conditions, both the mean AUC and C_{max} of lopinavir were 22% lower for the lopinavir and ritonavir oral solution relative to the capsule formulation.

Plasma concentrations of lopinavir and ritonavir after administration of two 200/50 mg lopinavir and ritonavir tablets are similar to three 133.3/33.3 mg lopinavir and ritonavir capsules under fed conditions with less pharmacokinetic variability.

Effects of Food on Oral Absorption

Lopinavir and ritonavir Tablets No clinically significant changes in Cmax and AUC were observed following administration of lopinavir and ritonavir tablets under fed conditions compared to fasted conditions. Relative to fasting, administration lopinavir and ritonavir tablets with a moderate fat meal (500 - 682 Kcal, 23 to 25% calories from fat) increased lopinavir AUC and C_{max} by 26.9% and 17.6%, respectively. Relative to fasting, administration of lopinavir and ritonavir tablets with a high fat meal (872 Kcal, 56% from fat) increased lopinavir AUC by 18.9% but not C_{max}. Therefore, lopinavir and ritonavir tablets may be taken with or without food.

Lopinavir and Ritonavir Oral Solution

Relative to fasting, administration of lopinavir and ritonavir oral solution with a moderate fat meal (500 - 682 Kcal, 23 to 25% calories from fat) increased lopinavir AUC and C_{max} by 80 and 54%, respectively. Relative to fasting, administration of lopinavir and ritonavir oral solution with a high fat meal (872 Kcal, 56% from fat) increased lopinavir AUC and Cmax by 130% and 56%, respectively. To enhance bioavailability and minimize pharmacokinetic variability lopinavir and ritonavir oral solution should be taken with food.

Distribution

At steady state, lopinavir is approximately 98-99% bound to plasma proteins. Lopinavir binds to both alpha-1-acid glycoprotein (AAG) and albumin; however, it has a higher affinity for AAG. At steady state, lopinavir protein binding remains constant over the range of observed concentrations after 400/100 mg lopinavir and ritonavir twice daily, and is similar between healthy volunteers and HIV-1 positive patients.

Metabolism

In vitro experiments with human hepatic microsomes indicate that lopinavir primarily undergoes oxidative metabolism. Lopinavir is extensively metabolized by the hepatic cytochrome P450 system, almost exclusively by the CYP3A isozyme. Ritonavir is a potent CYP3A inhibitor which inhibits the metabolism of lopinavir, and therefore increases plasma levels of lopinavir. A ^{14}Clopinavir study in humans showed that 89% of the plasma radioactivity after a single 400/100 mg lopinavir and ritonavir dose was due to parent drug. At least 13 lopinavir oxidative metabolites have been identified in man. Ritonavir has been shown to induce metabolic enzymes, resulting in the induction of its own metabolism. Pre-dose lopinavir concentrations decline with time during multiple dosing, stabilizing after approximately 10 to 16 days.

Elimination

Following a 400/100 mg ^{14}C-lopinavir/ritonavir dose, approximately 10.4 ± 2.3% and 82.6 ± 2.5% of an administered dose of ^{14}C-lopinavir can be accounted for in urine and feces, respectively, after 8 days. Unchanged lopinavir accounted for approximately 2.2 and 19.8% of the administered dose in urine and feces, respectively. After multiple dosing, less than 3% of the lopinavir dose is excreted unchanged in the urine. The apparent oral clearance (CL/F) of lopinavir is 5.98 ± 5.75 L/hr (mean ± SD, n = 19).

Once Daily Dosing

The pharmacokinetics of once daily lopinavir and ritonavir have been evaluated in HIV-1 infected subjects naïve to antiretroviral treatment. Lopinavir and ritonavir 800/200 mg was administered in combination with emtricitabine 200 mg and tenofovir DF 300 mg as part of a once daily regimen. Multiple dosing of 800/200 mg lopinavir and ritonavir once daily for 4 weeks with food (n = 24) produced a mean ± SD lopinavir peak plasma concentration (C_{max}) of 11.8 ± 3.7 μg/mL, occurring approximately 6 hours after administration. The mean steady-state lopinavir trough concentration prior to the morning dose was 3.2 ± 2.1 μg/mL and minimum concentration within a dosing interval was 1.7 ± 1.6 μg/mL. Lopinavir AUC over a 24 hour dosing interval averaged 154.1 ± 61.4 μg• h/mL.

The pharmacokinetics of once daily lopinavir and ritonavir has also been evaluated in treatment experienced HIV-1 infected subjects. Lopinavir exposure (C_{max}, $AUC_{[0-24h]}$, C_{trough}) with once daily lopinavir and ritonavir administration in treatment experienced subjects is comparable to the once daily lopinavir exposure in treatment naïve subjects.

Effects on Electrocardiogram

QTcF interval was evaluated in a randomized, placebo and active (moxifloxacin 400 mg once daily) controlled crossover study in 39 healthy adults, with 10 measurements over 12 hours on Day 3. The maximum mean time-matched (95% upper confidence bound) differences in QTcF interval from placebo after baseline-correction were 5.3 (8.1) and 15.2 (18.0) mseconds (msec) for 400/100 mg twice daily and supratherapeutic 800/200 mg twice daily lopinavir and ritonavir, respectively. Lopinavir and ritonavir 800/200 mg twice daily resulted in a Day 3 mean C_{max} approximately 2-fold higher than the mean C_{max} observed with the approved once daily and twice daily lopinavir and ritonavir doses at steady state.

PR interval prolongation was also noted in subjects receiving lopinavir and ritonavir in the same study on Day 3. The maximum mean (95% upper confidence bound) difference from placebo in the PR interval after baseline-correction were 24.9 (21.5, 28.3) and 31.9 (28.5, 35.3) msec

for 400/100 mg twice daily and supratherapeutic 800/200 mg twice daily lopinavir and ritonavir, respectively *[seeWarnings and Precautions (5.5, 5.6)]*.

Special Populations

Gender, Race and Age

No gender related pharmacokinetic differences have been observed in adult patients. No clinically important pharmacokinetic differences due to race have been identified. Lopinavir pharmacokinetics have not been studied in elderly patients.

Pediatric Patients

The pharmacokinetics of lopinavir and ritonavir oral solution 300/75 mg/m^2 twice daily and 230/57.5 mg/m^2 twice daily have been studied in a total of 53 pediatric patients in Study 940, ranging in age from 6 months to 12 years *[see Clinical Studies (14.4)]*. The 230/57.5 mg/m^2 twice daily regimen without nevirapine and the 300/75 mg/m^2 twice daily regimen with nevirapine provided lopinavir plasma concentrations similar to those obtained in adult patients receiving the 400/100 mg twice daily regimen (without nevirapine).

The mean steady-state lopinavir AUC, C_{max}, and C_{min} were 72.6 ± 31.1 μg•h/mL, 8.2 ± 2.9 and 3.4 ± 2.1 μg/mL, respectively after lopinavir and ritonavir oral solution 230/57.5 mg/m^2 twice daily without nevirapine (n = 12), and were 85.8 ± 36.9 μg• h/mL, 10.0 ± 3.3 and 3.6 ± 3.5 μg/mL, respectively, after 300/75 mg/m^2 twice daily with nevirapine (n = 12). The nevirapine regimen was 7 mg/kg twice daily (6 months to 8 years) or 4 mg/kg twice daily (> 8 years).

The pharmacokinetics of lopinavir and ritonavir oral solution at approximately 300/75 mg/m^2 twice daily have also been evaluated in infants at approximately 6 weeks of age (n = 9) and between 6 weeks and 6 months of age (n = 18) in Study 1030. The mean steady-state lopinavir AUC12, C_{max}, and C12 were 43.4 ± 14.8 μg• h/mL, 5.2 ± 1.8 μg/mL and 1.9 ± 1.1 μg/mL, respectively, in infants at approximately 6 weeks of age, and 74.5 ± 37.9 μg• h/mL, 9.4 ± 4.9 and 3.1 ± 1.8 μg/mL, respectively, in infants between 6 weeks and 6 months of age after lopinavir and ritonavir oral solution was administered at approximately 300/75 mg/m^2 twice daily without concomitant NNRTI therapy.

The pharmacokinetics of lopinavir and ritonavir soft gelatin capsule and oral solution (Group 1: 400/100 mg/m^2 twice daily + 2 NRTIs; Group 2: 480/120 mg/m^2 twice daily + ≥ 1 NRTI + 1 NNRTI) have been evaluated in children and adolescents age ≥ 2 years to < 18 years of age who had failed prior therapy (n=26) in Study 1038. Lopinavir and ritonavir doses of 400/100 and 480/120 mg/m^2 resulted in high lopinavir exposure, as

almost all subjects had lopinavir AUC12 above 100 μg•h/mL. Both groups of subjects also achieved relatively high average minimum lopinavir concentrations.

Pregnancy

In an open-label pharmacokinetic study, 12 HIV-infected pregnant women received lopinavir and ritonavir 400 mg/100 mg (two 200/50 mg tablets) twice daily as part of an antiretroviral regimen. Plasma concentrations of lopinavir were measured over 12-hour periods during the second trimester (20-24 weeks gestation), the third trimester (30 weeks gestation) and at 8 weeks post-partum. The C_{12h} values of lopinavir were lower during the second and third trimester by approximately 40% as compared to post-partum, but this decrease is not considered clinically relevant in patients with no documented lopinavir and ritonavir -associated resistance substitutions receiving 400 mg/100 mg twice daily.

Renal Impairment

Lopinavir pharmacokinetics have not been studied in patients with renal impairment; however, since the renal clearance of lopinavir is negligible, a decrease in total body clearance is not expected in patients with renal impairment.

Hepatic Impairment

Lopinavir is principally metabolized and eliminated by the liver. Multiple dosing of lopinavir and ritonavir 400/100 mg twice daily to HIV-1 and HCV co-infected patients with mild to moderate hepatic impairment (n = 12) resulted in a 30% increase in lopinavir AUC and 20% increase in C_{max} compared to HIV-1 infected subjects with normal hepatic function (n = 12). Additionally, the plasma protein binding of lopinavir was statistically significantly lower in both mild and moderate hepatic impairment compared to controls (99.09 vs. 99.31%, respectively). Caution should be exercised when administering lopinavir and ritonavir to subjects with hepatic impairment.

Lopinavir and ritonavir has not been studied in patients with severe hepatic impairment *[see Warnings and Precautions (5.4)* and *Use in Specific Populations (8.6)]*.

Drug Interactions

Lopinavir and ritonavir is an inhibitor of the P450 isoform CYP3A *in vitro*. Co-administration of lopinavir and ritonavir and drugs primarily metabolized by CYP3A may result in increased plasma concentrations of the other drug, which could increase or prolong its therapeutic and adverse effects *[see Contraindications (4)* and *Drug Interactions (7)]*.

Lopinavir and ritonavir does not inhibit CYP2D6, CYP2C9, CYP2C19, CYP2E1, CYP2B6 or CYP1A2 at clinically relevant concentrations.

Lopinavir and ritonavir has been shown *in vivo* to induce its own metabolism and to increase the biotransformation of some drugs metabolized by cytochrome P450 enzymes and by glucuronidation.

Lopinavir and ritonavir is metabolized by CYP3A. Drugs that induce CYP3A activity would be expected to increase the clearance of lopinavir, resulting in lowered plasma concentrations of lopinavir.

Although not noted with concurrent ketoconazole, co-administration of lopinavir and ritonavir and other drugs that inhibit CYP3A may increase lopinavir plasma concentrations.

Drug interaction studies were performed with lopinavir and ritonavir and other drugs likely to be coadministered and some drugs commonly used as probes for pharmacokinetic interactions. The effects of co-administration of lopinavir and ritonavir on the AUC, C_{max} and C_{min} are summarized in Table 14 (effect of other drugs on lopinavir) and Table 15 (effect of lopinavir and ritonavir on other drugs). The effects of other drugs on ritonavir are not shown since they generally correlate with those observed with lopinavir (if lopinavir concentrations are decreased, ritonavir concentrations are decreased) unless otherwise indicated in the table footnotes. For information regarding clinical recommendations, see Table 13 in *Drug Interactions (7).*

Table 14. Drug Interactions: Pharmacokinetic Parameters for Lopinavir in the Presence of the Co-administered Drug for Recommended Alterations in Dose or Regimen

Co-administered Drug	Dose of Co-administered Drug (mg)	Dose of Lopinavir and Ritonavir (mg)	n	Ratio (in combination with Co-administered drug/alone) of Lopinavir Pharmacokinetic Parameters (90% CI); No Effect = 1.00		
				C_{max}	AUC	C_{min}
Boceprevir	800 q8h, 6 d	400/100 tablet twice daily, 22 d	13	0.70 (0.65, 0.77)	0.66[12] (0.60, 0.72)	0.57 (0.49, 0.65)
Efavirenz[1,2]	600 at bedtime, 9 d	400/100 capsule twice daily, 9 d	11, 7*	0.97 (0.78, 1.22)	0.81 (0.64, 1.03)	0.61 (0.38, 0.97)
	600 at bedtime, 9 d	500/125 tablet twice daily, 10 d	19	1.12 (1.02, 1.23)	1.06 (0.96, 1.17)	0.90 (0.78, 1.04)
	600 at bedtime, 9 d	600/150 tablet twice daily, 10 d	23	1.36 (1.28, 1.44)	1.36 (1.28, 1.44)	1.32 (1.21, 1.44)
Etravirine	200 twice daily	400/100 mg twice day (tablets)	16	0.89 (0.82-0.96)	0.87 (0.83-0.92)	0.80 (0.73-0.88)
Fosamprenavir[3]	700 twice daily plus ritonavir 100 twice daily, 14 d	400/100 capsule twice daily, 14 d	18	1.30 (0.85, 1.47)	1.37 (0.80, 1.55)	1.52 (0.72, 1.82)
Ketoconazole	200 single dose	400/100 capsule twice daily, 16 d	12	0.89 (0.80, 0.99)	0.87 (0.75, 1.00)	0.75 (0.55, 1.00)
Nelfinavir	1000 twice daily, 10 d	400/100 capsule twice daily, 21 d	13	0.79 (0.70, 0.89)	0.73 (0.63, 0.85)	0.62 (0.49, 0.78)
Nevirapine	200 twice daily, steady-state (> 1 yr)[4#]	400/100 capsule twice daily, steady-state	22, 19*	0.81 (0.62, 1.05)	0.73 (0.53, 0.98)	0.49 (0.28, 0.74)
	7 mg/kg or 4 mg/kg once daily, 2 wk; twice daily 1 wk[5]	(> 1 yr) 300/75 mg/m^2 oral solution twice daily, 3 wk	12, 15*	0.86 (0.64, 1.16)	0.78 (0.56, 1.09)	0.45 (0.25, 0.81)
Omeprazole	40 once daily, 5 d	400/100 tablet twice daily, 10 d	12	1.08 (0.99, 1.17)	1.07 (0.99, 1.15)	1.03 (0.90, 1.18)
	40 once daily, 5 d	800/200 tablet once daily, 10 d	12	0.94 (0.88, 1.00)	0.92 (0.86, 0.99)	0.71 (0.57, 0.89)
Pitavastatin[6]	4 mg once daily, 5 d	400/100 tablet twice daily, 16 d	23	0.93 (0.88-0.98)	0.91 (0.86-0.97)	NA
Pravastatin	20 once daily, 4 d	400/100 capsule twice daily, 14 d	12	0.98 (0.89, 1.08)	0.95 (0.85, 1.05)	0.88 (0.77, 1.02)

Rifabutin	150 once daily, 10 d	400/100 capsule twice daily, 20 d	14	1.08 (0.97, 1.19)	1.17 (1.04, 1.31)	1.20 (0.96, 1.65)
Ranitidine	150 single dose	400/100 tablet twice daily, 10 d	12	0.99 (0.95, 1.03)	0.97 (0.93, 1.01)	0.90 (0.85, 0.95)
	150 single dose	800/200 tablet once daily, 10 d	10	0.97 (0.95, 1.00)	0.95 (0.91, 0.99)	0.82 (0.74, 0.91)
Rifampin	600 once daily, 10 d	400/100 capsule twice daily, 20 d	22	0.45 (0.40, 0.51)	0.25 (0.21, 0.29)	0.01 (0.01, 0.02)
	600 once daily, 14 d	800/200 capsule twice daily, 9 d[7]	10	1.02 (0.85, 1.23)	0.84 (0.64, 1.10)	0.43 (0.19, 0.96)
	600 once daily, 14 d	400/400 capsule twice daily, 9 d[8]	9	0.93 (0.81, 1.07)	0.98 (0.81, 1.17)	1.03 (0.68, 1.56)
Rilpivirine	150 mg once daily[13]	400/100 mg twice daily (capsules)	15	0.96 (0.88-1.05)	0.99 (0.89-1.10)	0.89 (0.73-1.08)
Ritonavir[4]	100 twice daily, 3-4 wk#[#]	400/100 capsule twice daily, 3-4 wk	8, 21*	1.28 (0.94, 1.76)	1.46 (1.04, 2.06)	2.16 (1.29, 3.62)
Tenofovir[9]	300 mg once daily, 14 d	400/100 capsule twice daily, 14 d	24	NC[†]	NC[†]	NC[†]
Tipranavir/ritonavir[4]	500/200 mg twice daily (28 doses)[#]	400/100 capsule twice daily (27 doses)	21 69	0.53 (0.40, 0.69)[10]	0.45 (0.32, 0.63)[10]	0.30 (0.17, 0.51)[10] 0.48 (0.40, 0.58)[11]

All interaction studies conducted in healthy, HIV-1 negative subjects unless otherwise indicated.
1 The pharmacokinetics of ritonavir are unaffected by concurrent efavirenz.
2 Reference for comparison is lopinavir/ritonavir 400/100 mg twice daily without efavirenz.
3 Data extracted from the fosamprenavir package insert.
4 Study conducted in HIV-1 positive adult subjects.
5 Study conducted in HIV-1 positive pediatric subjects ranging in age from 6 months to 12 years.
6 Data extracted from the pitavastatin package insert and results presented at the 2011 International AIDS Society Conference on HIV Pathogenesis, Treatment and Prevention (Morgan, *et al, poster #MOPE170)*.
7 Titrated to 800/200 twice daily as 533/133 twice daily x 1 d, 667/167 twice daily x 1 d, then 800/200 twice daily x 7 d, compared to 400/100 twice daily x 10 days alone.
8 Titrated to 400/400 twice daily as 400/200 twice daily x 1 d, 400/300 twice daily x 1 d, then 400/400 twice daily x 7 d, compared to 400/100 twice daily x 10 days alone.
9 Data extracted from the tenofovir package insert.
10 Intensive PK analysis.
11 Drug levels obtained at 8-16 hrs post-dose.
12 AUC parameter is AUC(0-last)
13 This interaction study has been performed with a dose higher than the recommended dose for rilpivirine (25 mg once daily) assessing the maximal effect on the co-administered drug.
* Parallel group design; n for lopinavir and ritonavir + co-administered drug, n for lopinavir and ritonavir alone.
† NC = No change.
# For the nevirapine 200 mg twice daily study, ritonavir, and tipranavir/ritonavir studies, lopinavir and ritonavir was administered with or without food. For all other studies, lopinavir and ritonavir was administered with food.

Table 15. Drug Interactions: Pharmacokinetic Parameters for Co-administered Drug in the Presence of Lopinavir and Ritonavir for Recommended Alterations in Dose or Regimen

Co-administered Drug	**Dose of Coadministered Drug (mg)**	**Dose of Lopinavir and Ritonavir (mg)**	**n**	**Ratio (in combination with Lopinavir and Ritonavir /alone) of Co-administered Drug Pharmacokinetic Parameters (90% CI); No Effect = 1.00**		
				C_{max}	**AUC**	**C_{min}**
Bedaquiline[1]	400 single dose	400/100 twice daily, 24 d	N/A	N/A	1.22 (1.11, 1.34)	N/A
Boceprevir	800 q8h, 6 d	400/100 tablet twice daily, 22 d	13[9]	0.50 (0.45, 0.55)	0.55 (0.49, 0.61)	0.43 (0.36, 0.53)
Desipramine[3]	100 single dose	400/100 capsule twice daily, 10 d	15	0.91 (0.84, 0.97)	1.05 (0.96, 1.16)	N/A
Efavirenz	600 at bedtime, 9 d	400/100 capsule twice daily, 9 d	11, 12*	0.91 (0.72, 1.15)	0.84 (0.62, 1.15)	0.84 (0.58, 1.20)

Ethinyl Estradiol	35 µg once daily, 21 d (Ortho Novum®)	400/100 capsule twice daily, 14 d	12	0.59 (0.52, 0.66)	0.58 (0.54, 0.62)	0.42 (0.36, 0.49)
Etravirine	200 twice daily	400/100 mg twice day (tablets)	16	0.70 (0.64-0.78)	0.65 (0.59-0.71)	0.55 (0.49-0.62)
Fosamprenavir[4]	700 twice daily plus ritonavir 100 twice daily, 14 d	400/100 capsule twice daily, 14 d	18	0.42 (0.30, 0.58)	0.37 (0.28, 0.49)	0.35 (0.27, 0.46)
Indinavir[2]	600 twice daily, 10 d combo nonfasting vs. 800 three times daily, 5 d alone fasting	400/100 capsule twice daily, 15 d	13	0.71 (0.63, 0.81)	0.91 (0.75, 1.10)	3.47 (2.60, 4.64
Ketoconazole	200 single dose	400/100 capsule twice daily, 16 d	12	1.13 (0.91, 1.40)	3.04 (2.44, 3.79)	N/A
Methadone	5 single dose	400/100 capsule twice daily, 10 d	11	0.55 (0.48, 0.64)	0.47 (0.42, 0.53)	N/A
Nelfinavir[2]	1000 twice daily, 10 d combo vs. 1250 twice daily 14 d alone	400/100 capsule twice daily, 21 d	13	0.93 (0.82, 1.05)	1.07 (0.95, 1.19)	1.86 (1.57, 2.22)
M8 metabolite				2.36 (1.91, 2.91)	3.46 (2.78, 4.31)	7.49 (5.85, 9.58)
Nevirapine	200 once daily, 14 d; twice daily, 6 d	400/100 capsule twice daily, 20 d	5, 6*	1.05 (0.72, 1.52)	1.08 (0.72, 1.64)	1.15 (0.71, 1.86)
Norethindrone	1 once daily, 21 d (Ortho Novum®)	400/100 capsule twice daily, 14 d	12	0.84 (0.75, 0.94)	0.83 (0.73, 0.94)	0.68 (0.54, 0.85)
Pitavastatin[5]	4 once daily , 5 d	400/100 tablet twice daily, 16 d	23	0.96 (0.84-1.10)	0.80 (0.73-0.87)	N/A
Pravastatin	20 once daily, 4 d	400/100 capsule twice daily, 14 d	12	1.26 (0.87, 1.83)	1.33 (0.91, 1.94)	N/A
Rifabutin	150 once daily, 10 d; combo vs. 300 once daily, 10 d; alone	400/100 capsule twice daily, 10 d	12	2.12 (1.89, 2.38)	3.03 (2.79, 3.30)	4.90 (3.18, 5.76)
25-*O*-desacetyl rifabutin				23.6 (13.7, 25.3)	47.5 (29.3, 51.8)	94.9 (74.0, 122)
Rifabutin + 25-*O*desacetyl rifabutin[6]				3.46 (3.07, 3.91)	5.73 (5.08, 6.46)	9.53 (7.56, 12.01)
Rilpivirine	150 mg once daily[10]	400/100 mg twice daily (capsules)	15	1.29 (1.18-1.40)	1.52 (1.36-1.70)	1.74 (1.46-2.08)
Rosuvastatin[7]	20 mg once daily, 7 d	400/100 tablet twice daily, 7 d	15	4.66 (3.4, 6.4)	2.08 (1.66, 2.6)	1.04 (0.9, 1.2)
Tenofovir[8]	300 mg once daily, 14 d	400/100 capsule twice daily, 14 d	24	NC†	1.32 (1.26, 1.38)	1.51 (1.32, 1.66)

All interaction studies conducted in healthy, HIV-1 negative subjects unless otherwise indicated.
1 Data extracted from the bedaquiline package insert.

2 Ratio of parameters for amprenavir, indinavir, and nelfinavir, are not normalized for dose.

3 Desipramine is a probe substrate for assessing effects on CYP2D6-mediated metabolism.

4 Data extracted from the fosamprenavir package insert.

5 Data extracted from the pitavastatin package insert and results presented at the 2011 International AIDS Society Conference on HIV Pathogenesis, Treatment and Prevention (Morgan, *et al, poster #MOPE170*).

6 Effect on the dose-normalized sum of rifabutin parent and 25-*O*-desacetyl rifabutin active metabolite.

7 Kiser, et al. J Acquir Immune Defic Syndr. 2008 Apr 15;47(5):570-8.

8 Data extracted from the tenofovir package insert.

9 N=12 for C_{min} (test arm)
10 This interaction study has been performed with a dose higher than the recommended dose for rilpivirine (25 mg once daily) assessing the maximal effect on the co-administered drug.

* Parallel group design; n for lopinavir and ritonavir + co-administered drug, n for co-administered drug alone.

N/A = Not available.

† NC = No change.

12.4 Microbiology

Mechanism of Action

Lopinavir, an inhibitor of the HIV-1 protease, prevents cleavage of the Gag-Pol polyprotein, resulting in the production of immature, non-infectious viral particles.

Antiviral Activity

The antiviral activity of lopinavir against laboratory HIV strains and clinical HIV-1 isolates was evaluated in acutely infected lymphoblastic cell lines and peripheral blood lymphocytes, respectively. In the absence of human serum, the mean 50% effective concentration (EC50) values of lopinavir against five different HIV-1 subtype B laboratory strains ranged from 10-27 nM (0.006-0.017 μg/mL, 1 μg/mL = 1.6 μM) and ranged from 4-11 nM (0.003-0.007 μg/mL) against several HIV-1 subtype B clinical isolates (n = 6). In the presence of 50% human serum, the mean

EC50 values of lopinavir against these five HIV-1 laboratory strains ranged from 65-289 nM (0.04-0.18 μg/mL), representing a 7 to 11-fold attenuation. Combination antiviral drug activity studies with lopinavir in cell cultures demonstrated additive to antagonistic activity with nelfinavir and additive to synergistic activity with amprenavir, atazanavir, indinavir, saquinavir and tipranavir. The EC50 values of lopinavir against three different HIV-2 strains ranged from 12-180 nM (0.008-113 μg/mL).

Resistance

HIV-1 isolates with reduced susceptibility to lopinavir have been selected in cell culture. The presence of ritonavir does not appear to influence the selection of lopinavir-resistant viruses in cell culture.

The selection of resistance to lopinavir and ritonavir in antiretroviral treatment naïve patients has not yet been characterized. In a study of 653 antiretroviral treatment naïve patients (Study 863), plasma viral isolates from each patient on treatment with plasma HIV-1 RNA > 400 copies/mL at Week 24, 32, 40 and/or 48 were analyzed. No evidence of resistance to lopinavir and ritonavir was observed in 37 evaluable lopinavir and ritonavir -treated patients (0%). Evidence of genotypic resistance to nelfinavir, defined as the presence of the D30N and/or L90M substitution in HIV-1 protease, was observed in 25/76 (33%) of evaluable nelfinavir-treated patients. The selection of resistance to lopinavir and ritonavir in antiretroviral treatment naïve pediatric patients (Study 940) appears to be consistent with that seen in adult patients (Study 863).

Resistance to lopinavir and ritonavir has been noted to emerge in patients treated with other protease inhibitors prior to lopinavir and ritonavir therapy. In studies of 227 antiretroviral treatment naïve and protease inhibitor experienced patients, isolates from 4 of 23 patients with quantifiable (> 400 copies/mL) viral RNA following treatment with lopinavir and ritonavir for 12 to 100 weeks displayed significantly reduced susceptibility to lopinavir compared to the corresponding baseline viral isolates. Three of these patients had previously received treatment with a single protease inhibitor (indinavir, nelfinavir, or saquinavir) and one patient had received treatment with multiple protease inhibitors (indinavir, ritonavir, and saquinavir). All four of these patients had at least 4 substitutions associated with protease inhibitor resistance immediately prior to lopinavir and ritonavir therapy. Following viral rebound isolates from these patients all contained additional substitutions, some of which are recognized to be associated with protease inhibitor resistance. However, there are insufficient data at this time to identify patterns of lopinavir resistance-associated substitutions in isolates from patients on lopinavir and ritonavir therapy. The assessment of these patterns is under study.

Cross-resistance - Preclinical Studies

Varying degrees of cross-resistance have been observed among HIV-1 protease inhibitors. Little information is available on the cross-resistance of viruses that developed decreased susceptibility to lopinavir during lopinavir and ritonavir therapy.

The antiviral activity in cell culture of lopinavir against clinical isolates from patients previously treated with a single protease inhibitor was determined. Isolates that displayed > 4-fold reduced susceptibility to nelfinavir (n = 13) and saquinavir (n = 4), displayed < 4-fold reduced susceptibility to lopinavir. Isolates with > 4-fold reduced susceptibility to indinavir (n = 16) and ritonavir (n = 3) displayed a mean of 5.7- and 8.3-fold reduced susceptibility to lopinavir, respectively. Isolates from patients previously treated with two or more protease inhibitors showed greater reductions in susceptibility to lopinavir, as described in the following paragraph.

Clinical Studies - Antiviral Activity of Lopinavir and Ritonavir in Patients with Previous Protease Inhibitor Therapies

The clinical relevance of reduced susceptibility in cell culture to lopinavir has been examined by assessing the virologic response to lopinavir and ritonavir therapy in treatment-experienced patients, with respect to baseline viral genotype in three studies and baseline viral phenotype in one study.

Virologic response to lopinavir and ritonavir has been shown to be affected by the presence of three or more of the following amino acid substitutions in protease at baseline: L10F/I/R/V, K20M/N/R, L24I, L33F, M36I, I47V, G48V, I54L/T/V, V82A/C/F/S/T, and I84V. Table 16 shows the 48-week virologic response (HIV-1 RNA <400 copies/mL) according to the number of the above protease inhibitor resistance-associated substitutions at baseline in studies 888 and 765 *[see Clinical Studies (14.2)* and *(14.3)]* and study 957 (see below). Once daily administration of lopinavir and ritonavir for adult patients with three or more of the above substitutions is not recommended.

Table 16. Virologic Response (HIV-1 RNA <400 copies/mL) at Week 48 by Baseline Lopinavir and Ritonavir Susceptibility and by Number of Protease Substitutions Associated with Reduced Response to Lopinavir and Ritonavir[1]

Number of protease inhibitor substitutions at baseline[1]	**Study 888 (Single Protease Inhibitore xperienced[2], NNRT-Inaïve) n=130**	**Study 765 (Single protease Inhibitore xperienced[3], NNRT-Inaïve) n=56**	**Study 957 (Multiple protease Inhibitore xperienced[4], NNRT-Inaïve) n=50**
0-2	76/103 (74%)	34/45 (76%)	19/20 (95%)
3-5	13/26 (50%)	8/11 (73%)	18/26 (69%)
6 or more	0/1 (0%)	N/A	1/4 (25%)
1 Substitutions considered in the analysis included L10F/I/R/V, K20M/N/R, L24I, L33F, M36I, I47V, G48V, I54L/T/V, V82A/C/F/S/T, and I84V.			

2 43% indinavir, 42% nelfinavir, 10% ritonavir, 15% saquinavir.
3 41% indinavir, 38% nelfinavir, 4% ritonavir, 16% saquinavir.
4 86% indinavir, 54% nelfinavir, 80% ritonavir, 70% saquinavir.

Virologic response to lopinavir and ritonavir therapy with respect to phenotypic susceptibility to lopinavir at baseline was examined in Study 957. In this study 56 NNRTI-naïve patients with HIV-1 RNA >1,000 copies/mL despite previous therapy with at least two protease inhibitors selected from indinavir, nelfinavir, ritonavir, and saquinavir were randomized to receive one of two doses of lopinavir and ritonavir in combination with efavirenz and nucleoside reverse transcriptase inhibitors (NRTIs). The EC50 values of lopinavir against the 56 baseline viral isolates ranged from 0.5- to 96-fold the wild-type EC50 value. Fifty-five percent (31/56) of these baseline isolates displayed >4-fold reduced susceptibility to lopinavir. These 31 isolates had a median reduction in lopinavir susceptibility of 18-fold. Response to therapy by baseline lopinavir susceptibility is shown in Table 17.

Table 17. HIV-1 RNA Response at Week 48 by Baseline Lopinavir Susceptibility[1]

Lopinavir susceptibility2 at baseline	HIV-1 RNA <400 copies/mL (%)	HIV-1 RNA <50 copies/mL (%)
< 10 fold	25/27 (93%)	22/27 (81%)
> 10 and < 40 fold	11/15 (73%)	9/15 (60%)
≥ 40 fold	2/8 (25%)	2/8 (25%)

1 Lopinavir susceptibility was determined by recombinant phenotypic technology performed by Virologic.
2 Fold change in susceptibility from wild type.

13 NONCLINICAL TOXICOLOGY

13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

Carcinogenesis

Lopinavir/ritonavir combination was evaluated for carcinogenic potential by oral gavage administration to mice and rats for up to 104 weeks. Results showed an increase in the incidence of benign hepatocellular adenomas and an increase in the combined incidence of hepatocellular adenomas plus carcinoma in both males and females in mice and males in rats at doses that produced approximately 1.6-2.2 times (mice) and 0.5

times (rats) the human exposure (based on $AUC_{0\text{-}24hr}$ measurement) at the recommended dose of 400/100 mg lopinavir and ritonavir twice daily. Administration of lopinavir/ritonavir did not cause a statistically significant increase in the incidence of any other benign or malignant neoplasm in mice or rats.

Carcinogenicity studies in mice and rats have been carried out on ritonavir. In male mice, there was a dose dependent increase in the incidence of both adenomas and combined adenomas and carcinomas in the liver. Based on AUC measurements, the exposure at the high dose was approximately 4-fold for males that of the exposure in humans with the recommended therapeutic dose (400/100 mg lopinavir and ritonavir twice daily). There were no carcinogenic effects seen in females at the dosages tested. The exposure at the high dose was approximately 9-fold for the females that of the exposure in humans. There were no carcinogenic effects in rats. In this study, the exposure at the high dose was approximately 0.7-fold that of the exposure in humans with the 400/100 mg lopinavir and ritonavir twice daily regimen. Based on the exposures achieved in the animal studies, the significance of the observed effects is not known.

Mutagenesis

Neither lopinavir nor ritonavir was found to be mutagenic or clastogenic in a battery of *in vitro* and *in vivo* assays including the Ames bacterial reverse mutation assay using *S. typhimurium* and *E. coli*, the mouse lymphoma assay, the mouse micronucleus test and chromosomal aberration assays in human lymphocytes.

Impairment of Fertility

Lopinavir in combination with ritonavir at a 2:1 ratio produced no effects on fertility in male and female rats at levels of 10/5, 30/15 or 100/50 mg/kg/day. Based on AUC measurements, the exposures in rats at the high doses were approximately 0.7-fold for lopinavir and 1.8-fold for ritonavir of the exposures in humans at the recommended therapeutic dose (400/100 mg twice daily).

14 CLINICAL STUDIES

14.1 Adult Patients without Prior Antiretroviral Therapy

Study 863: Lopinavir and ritonavir capsules twice daily + stavudine + lamivudine compared to nelfinavir three times daily + stavudine + lamivudine

Study 863 was a randomized, double-blind, multicenter trial comparing treatment with lopinavir and ritonavir capsules (400/100 mg twice daily) plus stavudine and lamivudine versus nelfinavir (750 mg three times daily) plus stavudine and lamivudine in 653 antiretroviral treatment naïve patients. Patients had a mean age of 38 years (range: 19 to 84), 57% were Caucasian, and 80% were male. Mean baseline CD4+ cell count was 259 cells/mm3 (range: 2 to 949 cells/mm3) and mean baseline plasma HIV-1 RNA was 4.9 log10 copies/mL (range: 2.6 to 6.8 log10 copies/mL). Treatment response and outcomes of randomized treatment are presented in Table 18.

Table 18. Outcomes of Randomized Treatment Through Week 48 (Study 863)

Outcome	**Lopinavir and Ritonavir +d4T+3TC (N = 326)**	**Nelfinavir+ d4T+3TC (N = 327)**
Responder1	75%	62%
Virologic failure2 Rebound Never suppressed through Week 48	9% 7% 2%	25% 15% 9%
Death	2%	1%
Discontinued due to adverse events	4%	4%
Discontinued for other reasons3	10%	8%

1 Patients achieved and maintained confirmed HIV-1 RNA < 400 copies/mL through Week 48.
2 Includes confirmed viral rebound and failure to achieve confirmed < 400 copies/mL through Week 48.
3 Includes lost to follow-up, patient's withdrawal, non-compliance, protocol violation and other reasons. Overall discontinuation through Week 48, including patients who discontinued subsequent to virologic failure, was 17% in the lopinavir and ritonavir arm and 24% in the nelfinavir arm.

Through 48 weeks of therapy, there was a statistically significantly higher proportion of patients in the lopinavir and ritonavir arm compared to the nelfinavir arm with HIV-1 RNA < 400 copies/mL (75% vs. 62%, respectively) and HIV-1 RNA < 50 copies/mL (67% vs. 52%, respectively). Treatment response by baseline HIV-1 RNA level subgroups is presented in Table 19.

Table 19. Proportion of Responders Through Week 48 by Baseline Viral Load (Study 863)

Baseline Viral Load (HIV-1 RNA copies/mL)	Lopinavir and Ritonavir +d4T+3TC			Nelfinavir +d4T+3TC		
	<400 copies/ mL [1]	**<50 Copies /mL [2]**	**n**	**<400 copies/mL [1]**	**<50 copies/ mL [2]**	**n**
< 30,000	74%	71%	82	79%	72%	87
≥ 30,000 to < 100,000	81%	73%	79	67%	54%	79
≥ 100,000 to < 250,000	75%	64%	83	60%	47%	72
≥ 250,000	72%	60%	82	44%	33%	89
1 Patients achieved and maintained confirmed HIV-1 RNA < 400 copies/mL through Week 48. 2 Patients achieved HIV-1 RNA < 50 copies/mL at Week 48.						

Through 48 weeks of therapy, the mean increase from baseline in CD4+ cell count was 207 cells/mm^3 for the lopinavir and ritonavir arm and 195 cells/mm^3 for the nelfinavir arm.

Study 730: Lopinavir and ritonavir Tablets once daily + tenofovir DF + emtricitabine compared to lopinavir and ritonavir Tablets twice daily + tenofovir DF + emtricitabine

Study 730 was a randomized, open-label, multicenter trial comparing treatment with lopinavir and ritonavir tablets 800/200 mg once daily plus tenofovir DF and emtricitabine versus lopinavir and ritonavir tablets 400/100 mg twice daily plus tenofovir DF and emtricitabine in 664 antiretroviral treatment-naïve patients. Patients were randomized in a 1:1 ratio to receive either lopinavir and ritonavir tablets 800/200 mg once daily (n = 333) or lopinavir and ritonavir tablets 400/100 mg twice daily (n = 331). Further stratification within each group was 1:1 (tablet vs. capsule). Patients administered the capsule were switched to the tablet formulation at Week 8 and maintained on their randomized dosing schedule. Patients were administered emtricitabine 200 mg once daily and tenofovir DF 300 mg once daily. Mean age of patients enrolled was 39 years (range: 19 to 71); 75% were Caucasian, and 78% were male. Mean baseline CD4+ cell count was 216 cells/mm^3 (range: 20 to 775

cells/mm^3) and mean baseline plasma HIV-1 RNA was 5.0 log10 copies/mL (range: 1.7 to 7.0 log10 copies/mL).

Treatment response and outcomes of randomized treatment through Week 48 are presented in Table 20.

Table 20. Outcomes of Randomized Treatment Through Week 48 (Study 730)

Outcome	**Lopinavir and Ritonavir Once Daily + TDF + FTC (n = 333)**	**Lopinavir and Ritonavir Twice Daily + TDF + FTC (n = 331)**
Responder[1]	78%	77%
Virologic failure[2] Rebound Never suppressed through Week 48	10% 5% 5%	8% 5% 3%
Death	1%	<1%
Discontinued due to adverse events	4%	3%
Discontinued for other reasons[3]	8%	11%

1 Patients achieved and maintained confirmed HIV-1 RNA < 50 copies/mL through Week 48.
2 Includes confirmed viral rebound and failure to achieve confirmed < 50 copies/mL through Week 48.
3 Includes lost to follow-up, patient's withdrawal, non-compliance, protocol violation and other reasons.

Through 48 weeks of therapy, 78% in the lopinavir and ritonavir once daily arm and 77% in the lopinavir and ritonavir twice daily arm achieved and maintained HIV-1 RNA < 50 copies/mL (95% confidence interval for the difference, -5.9% to 6.8%). Mean CD4+ cell count increases at Week 48 were 186 cells/mm^3 for the lopinavir and ritonavir once daily arm and 198 cells/mm^3 for the lopinavir and ritonavir twice daily arm.

14.2 Adult Patients with Prior Antiretroviral Therapy

Study 888: Lopinavir and ritonavir Capsules twice daily + nevirapine + NRTIs compared to investigatorselected protease inhibitor(s) + nevirapine + NRTIs

Study 888 was a randomized, open-label, multicenter trial comparing treatment with lopinavir and ritonavir capsules (400/100 mg twice daily) plus nevirapine and nucleoside reverse transcriptase inhibitors versus investigator-selected protease inhibitor(s) plus nevirapine and nucleoside reverse transcriptase inhibitors in 288 single protease inhibitor-experienced, non-nucleoside reverse transcriptase inhibitor (NNRTI)-naïve patients. Patients had a mean age of 40 years (range: 18 to 74), 68% were Caucasian, and 86% were male. Mean baseline CD4+ cell count was 322 cells/mm^3 (range: 10 to 1059 cells/mm^3) and mean baseline plasma HIV-1 RNA was 4.1 log_{10} copies/mL (range: 2.6 to 6.0 log_{10} copies/mL).

Treatment response and outcomes of randomized treatment through Week 48 are presented in Table 21.

Table 21. Outcomes of Randomized Treatment Through Week 48 (Study 888)

Outcome	**Lopinavir and Ritonavir + nevirapine + NRTIs (n = 148)**	**Investigator-Selected Protease Inhibitor(s) + nevirapine + NRTIs (n = 140)**
Responder1	57%	33%
Virologic failure[2] Rebound Never suppressed through Week 48	24% 11% 13%	41% 19% 23%
Death	1%	2%
Discontinued due to adverse events	5%	11%
Discontinued for other reasons[3]	14%	13%

1 Patients achieved and maintained confirmed HIV-1 RNA < 400 copies/mL through Week 48.
2 Includes confirmed viral rebound and failure to achieve confirmed < 400 copies/mL through Week 48.
3 Includes lost to follow-up, patient's withdrawal, non-compliance, protocol violation and other reasons.

Through 48 weeks of therapy, there was a statistically significantly higher proportion of patients in the lopinavir and ritonavir arm compared to the investigator-selected protease inhibitor(s) arm with HIV-1 RNA < 400 copies/mL (57% vs. 33%, respectively).

Through 48 weeks of therapy, the mean increase from baseline in CD4+ cell count was 111 cells/mm^3 for the lopinavir and ritonavir arm and 112 cells/mm^3 for the investigator-selected protease inhibitor(s) arm.

Study 802: lopinavir and ritonavir Tablets 800/200 mg Once Daily Versus 400/100 mg Twice Daily when Co-administered with Nucleoside/Nucleotide Reverse Transcriptase Inhibitors in Antiretroviral-Experienced, HIV-1 Infected Subjects M06-802 was a randomized open-label study comparing the safety, tolerability, and antiviral activity of once daily and twice daily dosing of lopinavir and ritonavir tablets in

599 subjects with detectable viral loads while receiving their current antiviral therapy. Of the enrolled subjects, 55% on both treatment arms had not been previously treated with a protease inhibitor and 81 – 88% had received prior NNRTIs as part of their anti-HIV treatment regimen. Patients were randomized in a 1:1 ratio to receive either lopinavir and ritonavir tablets 800/200 mg once daily (n = 300) or lopinavir and ritonavir tablets 400/100 mg twice daily (n = 299). Patients were administered at least two nucleoside/nucleotide reverse transcriptase inhibitors selected by the investigator. Mean age of patients enrolled was 41 years (range: 21 to 73); 51% were Caucasian, and 66% were male. Mean baseline CD4+ cell count was 254 cells/mm^3 (range: 4 to 952 cells/mm^3) and mean baseline plasma HIV-1 RNA was 4.3 log10 copies/mL (range: 1.7 to 6.6 log10 copies/mL). Treatment response and outcomes of randomized treatment through Week 48 are presented in Table 22.

Table 22. Outcomes of Randomized Treatment Through Week 48 (Study 802)

Outcome	**Lopinavir and Ritonavir Once Daily + NRTIs (n = 300)**	**Lopinavir and Ritonavir Twice Daily + NRTIs (n = 299)**
Virologic Success (HIV-1 RNA <50 copies/mL)	57%	54%
Virologic failure[1]	22%	24%
No virologic data in Week 48 window		
Discontinued study due to adverse event or death[2]	5%	7%
Discontinued study for other reasons[3]	13%	12%
Missing data during window but on study	3%	3%

1 Includes patients who discontinued prior to Week 48 for lack or loss of efficacy and patients with HIV-1 RNA ≥ 50 copies/mL at Week 48.
2 Includes patients who discontinued due to adverse events or death at any time from Day 1 through Week 48 if this resulted in no virologic data on treatment at Week 48.
3 Includes withdrawal of consent, loss to follow-up, non-compliance, protocol violation and other reasons.

Through 48 weeks of treatment, the mean change from baseline for CD4 + cell count was 135 cells/mm^3 for the once daily group and 122 cells/mm^3 for the twice daily group.

14.3 Other Studies Supporting Approval in Adult Patients

Study 720: Lopinavir and ritonavir twice daily + stavudine + lamivudine

Study 765: Lopinavir and ritonavir twice daily + nevirapine + NRTIs

Study 720 (patients without prior antiretroviral therapy) and study 765 (patients with prior protease inhibitor therapy) were randomized, blinded, multi-center trials evaluating treatment with lopinavir and ritonavir at up to three dose levels (200/100 mg twice daily [720 only], 400/100 mg twice daily, and 400/200 mg twice daily). In Study 720, all patients switched to 400/100 mg twice daily between Weeks 48-72. Patients in study 720 had a mean age of 35 years, 70% were Caucasian, and 96% were male, while patients in study 765 had a mean age of 40 years, 73% were Caucasian, and 90% were male. Mean (range) baseline CD4+ cell counts for patients in study 720 and study 765 were 338 (3-918) and 372 (72-807) cells/mm^3, respectively. Mean (range) baseline plasma HIV-1 RNA levels for patients in study 720 and study 765 were 4.9 (3.3 to 6.3) and 4.0 (2.9 to 5.8) log_{10} copies/mL, respectively.

Through 360 weeks of treatment in study 720, the proportion of patients with HIV-1 RNA < 400 (< 50) copies/mL was 61% (59%) [n = 100]. Among patients completing 360 weeks of treatment with CD4+ cell count measurements [n=60], the mean (median) increase in CD4+ cell count was 501 (457) cells/mm^3. Thirty-nine patients (39%) discontinued the study, including 13 (13%) discontinuations due to adverse reactions and 1 (1%) death. Through 144 weeks of treatment in study 765, the proportion of patients with HIV-1 RNA < 400 (< 50) copies/mL was 54% (50%) [n = 70], and the corresponding mean increase in CD4+ cell count was 212 cells/mm^3. Twenty-seven patients (39%) discontinued the study, including 5 (7%) discontinuations secondary to adverse reactions and 2 (3%) deaths.

16 HOW SUPPLIED/STORAGE AND HANDLING

Lopinavir and Ritonavir tablets USP are available in the following strengths and package sizes:

16.1 Lopinavir and Ritonavir Tablets, 200 mg lopinavir and 50 mg ritonavir

Yellow colored, capsule shaped, biconvex, film-coated tablets debossed with “M 32” on one side and plain on other side.

Bottles of 120 tablets …..…… (NDC 33342-164-54)

Recommended Storage

Store lopinavir and ritonavir tablets at 20° to 25°C (68° to 77°F); excursions permitted to 15° to 30°C (59° to 86°F) [see USP controlled room temperature]. Dispense in original container or USP equivalent tight container (250 mL or less). For patient use: exposure of this product to high humidity outside the original container or USP equivalent tight container (250 mL or less) for longer than 2 weeks is not recommended.

16.2 Lopinavir and Ritonavir Tablets, 100 mg lopinavir and 25 mg ritonavir

Pale yellow colored, capsule shaped, biconvex, filmcoated tablets debossed with “M 31” on one side and plain on other side.

Bottles of 60 tablets …..…… (NDC 33342-163-09)

Recommended Storage

Store lopinavir and ritonavir tablets at 20° to 25°C (68° to 77°F); excursions permitted to 15° to 30°C (59° to 86°F)[see USP controlled room temperature]. Dispense in original container or USP equivalent tight container (100 mL or less). For patient use: exposure of this product to high humidity outside the original container or USP equivalent tight container (100 mL or less) for longer than 2 weeks is not recommended.

17 PATIENT COUNSELING INFORMATION

Advise the patient to read the FDA-approved patient labeling (Medication Guide)

Patients or parents of patients should be informed that:

General Information

They should pay special attention to accurate administration of their dose to minimize the risk of accidental overdose or underdose of lopinavir and ritonavir tablets.

They should inform their healthcare provider if their children’s weight changes in order to make sure that the child’s lopinavir and ritonavir tablets dose is the correct one.

They should take the prescribed dose of lopinavir and ritonavir tablets as directed and to set up a daily routine in order to do so.

Lopinavir and ritonavir tablets may be taken with or without food.

Sustained decreases in plasma HIV-1 RNA have been associated with a reduced risk of progression to AIDS and death. Patients should remain under the care of a physician while using lopinavir and ritonavir tablets. Patients should be advised to take lopinavir and ritonavir tablets and other concomitant antiretroviral therapy every day as prescribed. Lopinavir and ritonavir tablets must always be used in combination with other antiretroviral drugs. Patients should not alter the dose or discontinue therapy without consulting with their doctor. If a dose of lopinavir and ritonavir tablets are missed patients should take the dose as soon as possible and then return to their normal schedule. However, if a dose is skipped the patient should not double the next dose. The amount of HIV-1 virus in their blood may increase if the medicine is stopped for even a

short time. The virus may become resistant to lopinavir and ritonavir tablets and become harder to treat.

Lopinavir and ritonavir tablets are not a cure for HIV-1 infection and patients may continue to experience illnesses associated with HIV-1 infection, including opportunistic infections. Patients should remain under the care of a physician when using lopinavir and ritonavir tablets. Patients should be advised to avoid doing things that can spread HIV-1 infection to others.

• **Do not share needles or other injection equipment.**

• **Do not share personal items that can have blood or body fluids on them, like toothbrushes and razor blades.**

• **Do not have any kind of sex without protection**. Always practice safe sex by using a latex or polyurethane condom to lower the chance of sexual contact with semen, vaginal secretions, or blood.

• **Do not breastfeed**. Mothers with HIV-1 should not breastfeed because HIV-1 can be passed to the baby in the breast milk.

Drug Interactions

Lopinavir and ritonavir tablets may interact with some drugs; therefore, patients should be advised to report to their doctor the use of any other prescription, non-prescription medication or herbal products, particularly St. John's Wort.

Lopinavir and ritonavir tablets can be taken at the same time as didanosine without food.

If they are receiving avanafil, sildenafil, tadalafil, or vardenafil for the treatment of erectile dysfunction, there may be an increased risk of associated adverse reactions including hypotension, visual changes, and sustained erection, and should promptly report any symptoms to their doctor. If they are currently using or planning to use avanafil or tadalafil (for the treatment of pulmonary arterial hypertension) they should ask their doctor about potential adverse reactions these medications may cause when taken with lopinavir and ritonavir tablets. The doctor may choose not to keep them on avanafil, or may adjust the dose of tadalafil while initiating treatment with lopinavir and ritonavir tablets .

If they are receiving estrogen-based hormonal contraceptives, additional or alternate contraceptive measures should be used during therapy with lopinavir and ritonavir tablets.

If they are taking or before they begin using Serevent® (salmeterol) and lopinavir and ritonavir tablets, they should talk to their doctor about problems these two medications may cause when taken together.

The doctor may choose not to keep someone on Serevent® (salmeterol).

If they are taking or before they begin taking Advair® (salmeterol in combination with fluticasone propionate) and lopinavir and ritonavir tablets, they should talk to their doctor about problems these two medications may cause when taken together. The doctor may choose not to keep someone on Advair® (salmeterol in combination with fluticasone propionate).

Potential Adverse Effects

Skin rashes ranging in severity from mild to toxic epidermal necrolysis (TEN), Stevens-Johnson syndrome, erythema multiforme, urticaria, and angioedema have been reported in patients receiving lopinavir and ritonavir tablets or its components lopinavir and/or ritonavir. Patients should be advised to contact their healthcare provider if they develop a rash while taking lopinavir and ritonavir tablets. The healthcare provider will determine if treatment should be continued or an alternative antiretroviral regimen used.

Patients should be advised that appropriate liver function testing will be conducted prior to initiating and during therapy with lopinavir and ritonavir tablets. Pre-existing liver disease including Hepatitis B or C can worsen with use of lopinavir and ritonavir tablets. This can be seen as worsening of transaminase elevations or hepatic decompensation. Patients should be advised that their liver function tests will need to be monitored closely especially during the first several months of lopinavir and ritonavir tablets treatment and that they should notify their healthcare provider if they develop the signs and symptoms of worsening liver disease including loss of appetite, abdominal pain, jaundice, and itchy skin.

New onset of diabetes or exacerbations of pre-existing diabetes mellitus, and hyperglycemia have been reported during lopinavir and ritonavir tablets use. Patients should be advised to notify their healthcare provider if they develop the signs and symptoms of diabetes mellitus including frequent urination, excessive thirst, extreme hunger or unusual weight loss and/or an increased blood sugar while on lopinavir and ritonavir tablets as they may require a change in their diabetes treatment or new treatment.

Lopinavir and ritonavir tablets might produce changes in the electrocardiogram (e.g., PR and/or QT prolongation). Patients should consult their physician if they experience symptoms such as dizziness, lightheadedness, abnormal heart rhythm or loss of consciousness.

They should seek medical assistance immediately if they develop a sustained penile erection lasting more than 4 hours while taking lopinavir and ritonavir tablets and a PDE 5 Inhibitor such as Viagra, Cialis or Levitra.

Redistribution or accumulation of body fat may occur in patients receiving antiretroviral therapy and that the cause and long term health effects

of these conditions are not known at this time.

Patients should be informed that there may be a greater chance of developing diarrhea with the once daily regimen as compared with the twice daily regimen.

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MEDICATION GUIDE

Lopinavir and Ritonavir Tablets USP

(loe PIN a vir and ri TOE na veer)

Read this Medication Guide before you start taking lopinavir and ritonavir tablets and each time you get a refill. There may be new information. This information does not take the place of talking with your doctor about your medical condition or treatment. You and your doctor should talk about your treatment with lopinavir and ritonavir tablets before you start taking it and at regular check-ups. You should stay under your doctor's care when taking lopinavir and ritonavir tablets.

What is the most important information I should know about lopinavir and ritonavir tablets?

Lopinavir and ritonavir tablets may cause serious side effects, including:

• **Interactions with other medicines. It is important to know the medicines that should not be taken with lopinavir and ritonavir tablets.**

For more information, see "Who should not take **lopinavir and ritonavir tablets?"**

• **Changes in your heart rhythm and the electrical activity of your heart.**

These changes may be seen on an EKG (electrocardiogram) and can lead to serious heart problems. Your risk for these problems may be higher if you:

◦ already have a history of abnormal heart rhythm or other types of heart disease.

◦ take other medicines that can affect your heart rhythm while you take lopinavir and ritonavir tablets.

Tell your doctor right away if you have any of these symptoms while taking lopinavir and ritonavir tablets :

• dizziness

• lightheadedness

• fainting

• sensation of abnormal heartbeats

See "What are the possible side effects of lopinavir and ritonavir tablets?" for more information about serious side effects.

What are lopinavir and ritonavir tablets?

Lopinavir and ritonavir tablets are a prescription HIV-1 medicine that is used with other HIV medicines to treat HIV-1 (Human Immunodeficiency Virus) infection in adults and children 14 days of age and older. HIV is the virus that causes AIDS (Acquired Immune Deficiency Syndrome). Lopinavir and ritonavir tablets are a type of HIV medicine called a protease inhibitor. Lopinavir and ritonavir tablets contain two medicines: lopinavir and ritonavir.

When used with other HIV medicines, lopinavir and ritonavir tablets may help to reduce the amount of HIV in your blood (called "viral load"). Lopinavir and ritonavir tablets may also help to increase the number of white blood cells called CD4 (T) cell which help fight off other infections.

Reducing the amount of HIV and increasing the CD4 (T) cell count may improve your immune system. This may reduce your risk of death or infections that can happen when your immune system is weak (opportunistic infections).

It is not known if lopinavir and ritonavir tablets are safe and effective in children under 14 days old.

Lopinavir and ritonavir tablets does not cure HIV infection or AIDS. People taking lopinavir and ritonavir tablets lopinavir and ritonavir tablets may develop infections or other conditions associated with HIV infection, including opportunistic infections (for example, pneumonia and herpes virus infections).

Avoid doing things that can spread HIV-1 infection to others:

• **Do not share needles or other injection equipment.**

• **Do not share personal items that can have blood or body fluids on them, like toothbrushes and razor blades.**

• **Do not have any kind of sex without protection.** Always practice safer sex by using a latex or polyurethane condom to lower the chance of sexual contact with semen, vaginal secretions, or blood.

Ask your doctor if you have any questions on how to prevent passing HIV to other people.

Who should not take lopinavir and ritonavir tablets?

Do not take lopinavir and ritonavir tablets if you take any of the following medicines:

• alfuzosin (Uroxatral®)

• cisapride (Propulsid®, Quicksolv®)

• ergot containing medicines including

◦ ergotamine tartrate (Cafergot®, Migergot®, Ergomar®, Ergostat®, Medihaler®, Ergotamine, Wigraine®, Wigrettes®)

◦ dihydroergotamine mesylate (D.H.E. 45®, Migranal®)

◦ methylergonovine (Methergine®)

• lovastatin (Advicor®, Altoprev®, Mevacor®)

• midazolam oral syrup

• pimozide (Orap®)

• rifampin (Rifadin®, Rifamate®, Rifater®, Rimactane®)

• sildenafil (Revatio®), when used for the treatment of pulmonary arterial

hypertension

• simvastatin (Zocor®, Vytorin®, Simcor®)

• St. John's Wort (Hypericum perforatum)

• triazolam (Halcion®)

Serious problems can happen if you or your child take any of the medicines listed above with lopinavir and ritonavir tablets.

• **Do not take lopinavir and ritonavir tablets if you are allergic** to lopinavir, ritonavir or any of the ingredients in lopinavir and ritonavir tablets. See the end of this Medication Guide for a complete list of ingredients in lopinavir and ritonavir tablets.

What should I tell my doctor before taking lopinavir and ritonavir tablets?

Lopinavir and ritonavir tablets may not be right for you. Tell your doctor about all your medical conditions, including if you:

• have any heart problems, including if you have a condition called Congenital Long QT Syndrome.

• have or had pancreas problems.

• have liver problems, including Hepatitis B or Hepatitis C.

• have diabetes.

• have hemophilia. People who take lopinavir and ritonavir tablets may have increased bleeding.

• have low potassium in your blood.

• are pregnant or plan to become pregnant. Taking lopinavir and ritonavir tablets during pregnancy has not been associated with an increased risk of birth defects. You and your doctor should decide if lopinavir and ritonavir tablets are right for you.

• are breastfeeding or plan to breastfeed. **Do not breastfeed if you take lopinavir and ritonavir tablets**.

• You should not breastfeed if you have HIV-1 because of the risk of passing HIV-1 to your baby.

• Talk to your doctor about the best way to feed your baby.

Tell your doctor about all the medicines you take, including prescription and over-the-counter medicines, vitamins, and herbal supplements. Many medicines interact with lopinavir and ritonavir tablets. Do not start taking a new medicine without telling your doctor or pharmacist. Your doctor can tell you if it is safe to take lopinavir and ritonavir tablets with other medicines. Your doctor may need to change the dose of other

medicines while you take lopinavir and ritonavir tablets.

Especially tell your doctor if you take:

• medicine to treat HIV

• estrogen-based contraceptives (birth control pills and patches). Lopinavir and ritonavir tablets may reduce the effectiveness of estrogen-based contraceptives. During treatment with lopinavir and ritonavir tablets, you should use a different type or an extra form of birth control.

Talk to your doctor about what types of birth control you can use to prevent pregnancy while taking lopinavir and ritonavir tablets.

• medicines to prevent organ transplant rejection

• medicines to treat cancer

• amiodarone (Cordarone®, Pacerone®)

• atorvastatin (Lipitor®)

• atovaquone (Marlarone®, Mepron®)

• avanafil (Stendra®), sildenafil (Viagra®), tadalafil (Cialis®), or vardenafil (Levitra®) for the treatment of erectile dysfunction (ED). If you get dizzy or faint (low blood pressure), have vision changes or have an erection that last longer than 4 hours, call your doctor or get medical help right away.

• bedaquiline (Sirturo®)

• bepridil (Bepadin®, Vascor®)

• boceprevir (Victrelis®)

• bosentan (Tracleer®)

• budesonide (Rhinocort®, Symbicort®, Pulmicort®, Entocort EC®)

• bupropion (Aplenzin®, Forfivo XL®, Wellbutrin®, Zyban®)

• carbamazepine (Carbatrol®, Epitol®, Equetro®, Tegretol®)

• clarithromycin (Biaxin®, Prevpac®)

• colchicine (Colcrys®)

- dexamethasone (Maxidex®, Ozurdex®)
- disulfiram
- felodipine
- fentanyl (Abstral®, Actiq®, Duragesic®, Fentora®, Lazanda®, Onsolis®, Subsys®)
- fluticasone (Cutivate®, Flonase®, Flovent®, Flovent Diskus®, Flovent HFA®, Veramyst®)
- itraconazole (Onmel®, Sporanox®)
- ketoconazole (Extina®, Ketozole®, Nizoral®, Xolegel®)
- lamotrigine (Lamictal®)
- lidocaine
- methadone hydrochloride (Dolphine hydrochloride, Methadose®)
- metronidazole
- nicardipine (Cardene®)
- nifedipine (Adalat CC®, Afeditab CR®, Procardia®)
- phenobarbital
- phenytoin (Dilantin®, Phenytek®)
- prednisone
- quinidine (Quinidex®)
- quetiapine (Seroquel®)
- rifabutin (Mycobutin®)
- rivaroxaban (Xarelto®)
- rosuvastatin (Crestor®)
- salmeterol (Serevent®) or salmeterol when taken in combination with fluticasone (Advair Diskus®, Advair HFA®)
- Simeprevir (Olysio®)

• tadalafil (Adcirca®) for the treatment of pulmonary arterial hypertension

• trazodone (Oleptro®)

• valproate (Depakote®, Depakene®, Depacon®)

• voriconazole (Vfend®)

• warfarin (Coumadin®, Jantoven®)

Lopinavir and ritonavir tablets should not be administered once daily in combination with carbamazepine (Carbatrol®, Epitol®, Equetro®, Tegretol®), phenobarbital, or phenytoin (Dilantin®, Phenytek®)

Ask your doctor or pharmacist if you are not sure if your medicine is one that is listed above.

Know all the medicines that you take. Keep a list of them with you to show doctors and pharmacists when you get a new medicine.

If you are not sure if you are taking a medicine above, ask your doctor.

How should I take lopinavir and ritonavir tablets?

• Take lopinavir and ritonavir tablets every day exactly as prescribed by your doctor.

• It is very important to set up a dosing schedule and follow it every day.

• Do not change your treatment or stop treatment without first talking with your doctor.

• Lopinavir and ritonavir tablets **should not** be taken 1 time each day if you are pregnant.

• Swallow lopinavir and ritonavir tablets whole. Do not chew, break, or crush lopinavir and ritonavir tablets.

• Lopinavir and ritonavir tablets can be taken with or without food.

• If you are taking both didanosine (Videx®) and lopinavir and ritonavir :

◦ didanosine can be taken at the same time as lopinavir and ritonavir tablets, without food.

• Do not miss a dose of lopinavir and ritonavir tablet. This could make the virus harder to treat. If you forget to take lopinavir and ritonavir tablet, take the missed dose right away. If it is almost time for your next dose, do not take the missed dose. Instead, follow your regular dosing schedule by taking your next dose at its regular time. Do not take more than one dose of lopinavir and ritonavir tablets at one time.

• If you take more than the prescribed dose of lopinavir and ritonavir tablet, call your doctor or go to the nearest emergency room right away.

• If your child is prescribed lopinavir and ritonavir tablets, tell your doctor if your child's weight changes.

• Lopinavir and ritonavir tablets **should not** be given one time each day in children. When giving lopinavir and ritonavir tablets to your child, give lopinavir and ritonavir tablets exactly as prescribed.

◦ Talk with your doctor if you take or plan to take metronidazole or disulfiram.

You can have severe nausea and vomiting if you take these medicines with lopinavir and ritonavir tablets.

• When your lopinavir and ritonavir tablets supply starts to run low, get more from your doctor or pharmacy. It is important not to run out of lopinavir and ritonavir tablets. The amount of HIV-1 virus in your blood may increase if the medicine is stopped for even a short time. The virus may become resistant to lopinavir and ritonavir tablets and become harder to treat.

What are the possible side effects of lopinavir and ritonavir tablets?

Lopinavir and ritonavir tablets can cause serious side effects, including:

• See **"What is the most important information I should know about lopinavir and ritonavir tablets?"**

• **Inflammation of the pancreas (pancreatitis).** Some people who take lopinavir and ritonavir tablets get inflammation of the pancreas which may be serious and cause death. You have a higher chance of getting pancreatitis if you have had it before. Tell your doctor if you have nausea, vomiting, or abdominal pain while taking lopinavir and ritonavir tablets. These may be signs of pancreatitis.

• **Liver problems.** Liver problems, including death, can happen in people who take lopinavir and ritonavir tablets. Your doctor should do blood tests before and during your treatment with lopinavir and ritonavir tablets to check your liver function. Some people with liver disease such as Hepatitis B and Hepatitis C who take lopinavir and ritonavir tablets may have worsening liver disease. Tell your doctor right away if you have any of these signs and symptoms of liver problems:

◦ loss of appetite

◦ yellow skin and whites of eyes (jaundice)

◦ dark-colored urine

◦ pale colored stools

◦ itchy skin

◦ stomach area (abdominal) pain.

• **Diabetes and high blood sugar (hyperglycemia).** Some people who take protease inhibitors including lopinavir and ritonavir tablets get new or more serious diabetes, or high blood sugar. Tell your doctor if you notice an increase in thirst or urinate often while taking lopinavir and ritonavir tablets.

• **Changes in your immune system (Immune Reconstitution Syndrome)** can happen when you start taking HIV medicines. Your immune system may get stronger and begin to fight infections that have been hidden in your body for a long time. Call your doctor right away if you start having new symptoms after starting your HIV medicine.

• **Increases in certain fat (triglycerides and cholesterol) levels in your blood**. Large increases of triglycerides and cholesterol can be seen in blood test results of some people who take lopinavir and ritonavir tablets. Your doctor should do blood tests to check your cholesterol and triglyceride levels before you start taking lopinavir and ritonavir tablets and during your treatment.

• **Changes in body fat**. Changes in body fat in some people who take antiretroviral therapy. These changes may include increased amount of fat in the upper back and neck ("buffalo hump"), breast, and around the trunk. Loss of fat from the legs, arms and face may also happen. The cause and long-term health effects of these conditions are not known at this time.

• **Increased bleeding for hemophiliacs**. Some people with hemophilia have increased bleeding with protease inhibitors including lopinavir and ritonavir tablets.

• **Allergic reactions.** Skin rashes, some of them severe, can occur in people who take lopinavir and ritonavir tablets. Tell your doctor if you had a rash when you took another medicine for your HIV-1 infection or if you notice any skin rash when you take lopinavir and ritonavir tablets.

Common side effects of lopinavir and ritonavir tablets include:

• diarrhea

• nausea

• increased fats in blood (triglycerides or cholesterol)

• vomiting

Tell your doctor about any side effect that bothers you or that does not go away.

These are not all of the possible side effects of lopinavir and ritonavir tablets. For more information, ask your doctor or pharmacist.

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

How should I store lopinavir and ritonavir tablets?

• Store lopinavir and ritonavir tablets at room temperature, between 59°F to 86°F (15°C to 30°C).

• Do not keep lopinavir and ritonavir tablets out of the container it comes in for longer than 2 weeks, especially in areas where there is a lot of humidity. Keep the container closed tightly.

Throw away any medicine that is out of date or that you no longer need.

Keep lopinavir and ritonavir tablets and all medicines out of the reach of children.

General information about lopinavir and ritonavir tablets

Medicines are sometimes prescribed for purposes other than those listed in a Medication Guide. Do not use lopinavir and ritonavir tablets for a condition for which it was not prescribed. Do not give lopinavir and ritonavir tablets to other people, even if they have the same condition you have. It may harm them.

This Medication Guide summarizes the most important information about lopinavir and ritonavir tablets.

If you would like more information, talk with your doctor. You can ask your pharmacist or doctor for information about lopinavir and ritonavir tablets that is written for health professionals.

For more information about lopinavir and ritonavir tablets call 1- 888-943-3210.

What are the ingredients in lopinavir and ritonavir tablets?

Active ingredients: lopinavir and ritonavir

Inactive ingredients: copovidone, sorbitan monolaurate, colloidal silicon dioxide, anhydrous dibasic calcium phosphate and sodium stearyl fumarate. The film coating contains: polyvinyl alcohol-part hydrolyzed, titanium dioxide, polyethylene glycol 4000, talc, iron oxide yellow.

This Medication Guide has been approved by the U.S. Food and Drug Administration.

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Manufactured for:

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