LOPINAVIR AND RITONAVIR TABLETS 200 mg/50 mg and 100 mg/25 mg
7500xxxx

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7500xxxx

HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use lopinavir and ritonavir tablets safely and effectively. See full prescribing information for lopinavir and ritonavir tablets.

LOPINAVIR AND RITONAVIR TABLETS Film-Coated for Oral use.

Initial U.S. Approval : 2000

RECENT MAJOR CHANGES

Dosage and Administration, Adult Patients (2.1)	4/2010
Contraindications, Table 3 (4)	1/2010
Contraindications, Table 3 (4)	4/2010
Warnings and Precautions (5.1)	6/2010
Warnings and Precautions (5.3)	4/2010

INDICATIONS AND USAGE

Lopinavir and ritonavir tablets are an HIV-1 protease inhibitor indicated in combination with other antiretroviral agents for the treatment of HIV-1 infection. (1)

DOSAGE AND ADMINISTRATION

Do not use once daily administration of lopinavir and ritonavir tablets in:

- HIV-1 infected 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 (2.1)
- Combination with efavirenz, nevirapine, amprenavir, nelfinavir, carbamazepine, phenobarbital or phenytoin (2.1, 7.3)
- Pediatric patients (2.2)

Lopinavir and ritonavir tablets may be taken with or without food, swallowed whole and not chewed, broken or crushed. (2)

ADULT PATIENTS (2.1)

- 400 mg/100 mg (two 200 mg/50 mg tablets) twice daily or
- 800 mg/200 mg (four 200 mg/50 mg tablets) once daily in patients with less than three lopinavir resistance-associated substitutions.

PEDIATRIC PATIENTS (ages 6 months and older) (2.2)

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

Concomitant Therapy in Adults and Pediatric Patients (2.1, 2.2)

- Dose adjustments of lopinavir and ritonavir tablets may be needed when coadministering with efavirenz, nevirapine, amprenavir or nelfinavir.

DOSAGE FORMS AND STRENGTHS

- Film-coated tablets: 200 mg lopinavir and 50 mg ritonavir (3)
- Film-coated tablets: 100 mg lopinavir and 25 mg ritonavir (3)

CONTRAINDICATIONS

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

Coadministration with:

- drugs highly dependent on CYP3A for clearance and for which elevated plasma levels may result in serious and/or life threatening events. (4)
- 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)

WARINGS AND PRECAUTIONS

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

- Drug Interactions: Higher plasma concentrations of concomitant medications may occur, consider drug-drug interaction potential to reduce risk of serious or life threatening adverse reactions. (5.1)
- Pancreatitis: Fatalities have occurred; suspend therapy as clinically appropriate. (5.2)
- 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. (5.3, 8.6)
- 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 preexisting 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, 5.5, 12.3)
- 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, 5.6, 12.3)
- Patients may develop new onset or exacerbations of diabetes mellitus, hyperglycemia (5.4), immune reconstitution syndrome (5.7), redistribution/accumulation of body fat. (5.8)
- 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. (5.10)

ADVERSE REACTIONS

The most common adverse reactions (> 5%) were diarrhea, nausea, abdominal pain, asthenia, vomiting, headache and dyspepsia. (6.1, 6.2)

To report SUSPECTED ADVERSE REACTIONS, contact Mylan Pharmaceuticals Inc. at 1-877-4-INFO-RX (1-877-446-3679) or FDA at 1-800-FDA-1088 or *www.fda.gov/medwatch*

DRUG INTERACTIONS

Coadministration 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

- Pregnancy: Physicians are encouraged to register patients in the Antiretroviral Pregnancy Registry by calling 1-800-258-4263. (8.1)
- 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. (8.3)

See 17 for PATIENT COUNSELING INFORMATION and Medication Guide

August 2010

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FULL PRESCRIBING INFORMATION

1 INDICATIONS AND USAGE

Lopinavir and ritonavir tablets are indicated in combination with other antiretroviral agents for the treatment of HIV-1 infection.

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

- The use of other active agents with lopinavir and ritonavir tablets is associated with a greater likelihood of treatment response *[see Clinical Pharmacology (12.4) and Clinical Studies (14)]*.
- Genotypic or phenotypic testing and/or treatment history should guide the use of lopinavir and ritonavir tablets *[see Clinical Pharmacology (12.4)]*. The number of baseline lopinavir resistance-associated substitutions affects the virologic response to lopinavir and ritonavir tablets *[see Clinical Pharmacology (12.4)]*.
- Once daily administration of lopinavir and ritonavir tablets is not recommended for any pediatric patients.

2 DOSAGE AND ADMINISTRATION

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

2.1 Adult Patients

- Lopinavir and ritonavir tablets 400 mg/100 mg (given as two 200 mg/50 mg tablets) twice daily.
- Lopinavir and ritonavir tablets 800 mg/200 mg (given as four 200 mg/50 mg tablets) once daily in patients with less than three lopinavir resistance-associated substitutions.

Once daily administration of lopinavir and ritonavir tablets is not recommended for 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 Clinical Pharmacology (12.4)]*.

Lopinavir and ritonavir tablets should not be administered once daily in combination with carbamazepine, phenobarbital or phenytoin *[see Drug Interactions (7.0)]*.

Concomitant Therapy: *Efavirenz, Nevirapine, Amprenavir or Nelfinavir: [See Clinical Pharmacology (12.3) and Drug Interactions (7.3).]*

Lopinavir and ritonavir tablets should not be administered as a once daily regimen in combination with efavirenz, nevirapine, amprenavir or nelfinavir.

- A dose increase is recommended for all patients who use lopinavir and ritonavir tablets. The recommended dose of lopinavir and ritonavir tablets is 500 mg/125 mg (such as two 200 mg/50 mg tablets and one 100 mg/25 mg tablet) twice daily in combination with efavirenz, nevirapine, amprenavir or nelfinavir.

2.2 Pediatric Patients

Lopinavir and ritonavir tablets should not be administered once daily in pediatric patients < 18 years of age.

Healthcare professionals should pay special attention to accurate calculation of the dose of lopinavir and ritonavir tablets, transcription of the medication order, dispensing information and dosing instructions to minimize the risk for medication errors, overdose, [see Overdosage (10)] and underdose.

Prescribers should calculate the appropriate dose of lopinavir and ritonavir tablets for each individual child based on body weight (kg) or body surface area (BSA) and should not exceed the recommended adult dose.

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

$$*BSA\ (m^2) = \sqrt{\frac{Ht\ (cm) \times Wt\ (Kg)}{3600}}$$

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

Based on Weight: Patient Weight (kg) x Prescribed lopinavir dose (mg/kg) = Administered lopinavir dose (mg)

Based on BSA: Patient BSA (m²) x Prescribed lopinavir dose (mg/m²) = Administered lopinavir dose (mg)

Before prescribing lopinavir and ritonavir 100 mg/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 tablet, the lopinavir and ritonavir oral solution formulation should be prescribed.

6 Months to 18 Years: *Without Concomitant Efavirenz, Nevirapine, Amprenavir or Nelfinavir:* Table 1 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 1. 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, Amprenavir or Nefinavir

Body Weight (kg)	Body Surface Area (m²)*	Recommended number of 100 mg/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 mg/50 mg tablets)

* Lopinavir and ritonavir oral solution is available for children with a BSA less than 0.6 m² or those who are unable to reliably swallow a tablet.

Concomitant Therapy: *Efavirenz, Nevirapine, Amprenavir or Nelfinavir:* A dose increase of lopinavir and ritonavir to 300/75 mg/m² is needed when coadministered with efavirenz, nevirapine, amprenavir or nelfinavir in children (both treatment-naïve and treatment-experienced) 6 months to 18 years of age, not to exceed the recommended adult dose. If weight-based dosing is preferred, the recommended dosage for patients < 15 kg is 13/3.25 mg/kg given twice daily and the dosage for patients ≥ 15 kg to 45 kg is 11/2.75 mg/kg given twice daily.

Table 2 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, amprenavir or nelfinavir.

Table 2. 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, Amprenavir† or Nelfinavir†

Body Weight (kg)	Body Surface Area (m²)*	Recommended number of 100 mg/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 mg/50 mg tablets)
> 45	≥ 1.7	5 *[See Dosage and Administration, Adult Patients (2.1).]*

* Lopinavir and ritonavir oral solution is available for children with a BSA less than 0.6 m² or those who are unable to reliably swallow a tablet.
† Please refer to the individual product labels for appropriate dosing in children.

3 DOSAGE FORMS AND STRENGTHS

- **Lopinavir and Ritonavir Tablets, 200 mg/50 mg**
  Light yellow to yellow colored, film-coated ovaloid tablets, debossed with "**M124**" on one side and plain on other side, providing 200 mg of lopinavir and 50 mg of ritonavir.
- **Lopinavir and Ritonavir Tablets, 100 mg/25 mg**
  Light Yellow to yellow colored, film-coated, round biconvex, tablets, debossed with "**M172**" on one side and plain on other side, providing 100 mg of lopinavir and 25 mg of ritonavir.

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) to any of its ingredients, including ritonavir.
- Coadministration of lopinavir and ritonavir is 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.
- Coadministration of lopinavir and ritonavir is 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 3.

Table 3. Drugs That Are Contraindicated With Lopinavir and Ritonavir

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 or to the class of protease inhibitors or other coadministered antiretroviral agents *[see Drug Interactions (7)]*.
Ergot Derivatives	Dihydroergotamine, ergonovine, 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 Johns wort (hypericum perforatum)	May lead to loss of virologic response and possible resistance to lopinavir and ritonavir or to the class of protease inhibitors.
HMG-CoA Reductase Inhibitors	Lovastatin, simvastatin	Potential for myopathy including rhabdomyolysis.
PDE5 enzyme inhibitor	Sildenafil[a] (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. 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 midazolam[b]	Prolonged or increased sedation or respiratory depression.

[a] See Drug Interactions (7) for coadministration of sildenafil in patients with erectile dysfunction.
[b] See Drug Interactions (7), Table 9 for parenterally administered midazolam.

5 WARNINGS AND PRECAUTIONS

5.1 Drug Interactions-CYP3A Enzyme Inhibition

Lopinavir and ritonavir is a CYP3A inhibitor. Initiating treatment with lopinavir and ritonavir in patients receiving medications metabolized by CYP3A or initiating medications metabolized by CYP3A in patients already maintained on lopinavir and ritonavir may result in increased plasma concentrations of concomitant medications. Higher plasma concentrations of concomitant medications can result in increased or prolonged therapeutic or adverse effects, potentially leading to severe, life threatening or fatal events. The potential for drug-drug interactions must be considered prior to and during therapy with lopinavir and ritonavir. Review of other medications taken by patients and monitoring of patients for adverse effects is recommended during therapy with lopinavir and ritonavir.

See Tables 3 and 9 for listing of drugs that are contraindicated for use with lopinavir and ritonavir due to potentially life threatening adverse events, significant drug interactions or loss of virologic activity *[see Contraindications (4) and Drug Interactions (7)]*.

5.2 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.

5.3 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 post-marketing 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)]*.

5.4 Diabetes Mellitus/Hyperglycemia

New onset diabetes mellitus, exacerbation of preexisting 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.

5.5 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, preexisting 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 coadministration 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, coadministration 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)]*.

5.6 QT Interval Prolongation

Post-marketing 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)]*.

5.7 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.

5.8 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.

5.9 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 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.

5.11 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 Clinical Pharmacology (12.4)]*.

6 ADVERSE REACTIONS

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

- PR Interval Prolongation, QT Interval Prolongation *[see Warnings and Precautions (5.5, 5.6)]*
- Drug Interactions *[see Warnings and Precautions (5.1)]*
- Pancreatitis *[see Warnings and Precautions (5.2)]*
- Hepatotoxicity *[see Warnings and Precautions (5.3)]*

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 practice.

6.1 Adults – Clinical Trials Experience

The safety profile of lopinavir and ritonavir in adults is primarily based on 1,964 HIV-1 infected patients in clinical trials.

The most common adverse reaction was diarrhea, which was generally of mild to moderate severity. In study 730, the incidence of diarrhea of any severity during 48 weeks of therapy was 60% in patients receiving lopinavir and ritonavir tablets once daily compared to 57% in patients receiving lopinavir and ritonavir tablets twice daily. More patients receiving lopinavir and ritonavir tablets once daily (14, 4.2%) had ongoing diarrhea at the time of discontinuation as compared to patients receiving lopinavir and ritonavir tablets twice daily (6, 1.8%). In study 730, discontinuations due to any adverse reaction were 4.8% in patients receiving lopinavir and ritonavir tablets once daily as compared to 3% in patients receiving lopinavir and ritonavir tablets twice daily. In study 802, the incidence of diarrhea of any severity during 48 weeks of therapy was 50% in patients receiving lopinavir and ritonavir tablets once daily compared to 39% in patients receiving lopinavir and ritonavir tablets twice daily. Moderate or severe drug-related diarrhea occurred in 14% of patients receiving lopinavir and ritonavir tablets once daily as compared to 11% in patients receiving lopinavir and ritonavir tablets twice daily. At the time of discontinuation, 19 (6.3%) patients receiving lopinavir and ritonavir tablets once daily had ongoing diarrhea, as compared to 11 (3.7%) patients receiving lopinavir and ritonavir tablets twice daily. Discontinuations due to any adverse reaction occurred in 4.3% of patients receiving lopinavir and ritonavir tablets once daily compared to 7% in patients receiving lopinavir and ritonavir tablets twice daily. In study 863, discontinuations of randomized therapy due to adverse reactions were 3.4% in lopinavir and ritonavir-treated and 3.7% in nelfinavir-treated patients.

Treatment-emergent clinical adverse reactions of moderate or severe intensity in ≥ 2% of patients treated with combination therapy for up to 48 weeks (Studies 863 and 730) and for up to 360 weeks (Study 720) are presented in Table 4 (treatment-naïve patients); and for up to 48 weeks (Studies 888 and 802), 84 weeks (Study 957) and 144 weeks (Study 765) in Table 5 (protease inhibitor-experienced patients).

Table 4. Percentage of Adult Patients with Selected Treatment-Emergent[1] Adverse Reactions of Moderate or Severe Intensity Reported in ≥ 2% of Adult Antiretroviral-Naïve Patients

	Study 863 (48 Weeks)		Study 720 (360 Weeks)	Study 730 (48 Weeks)	
	Lopinavir and Ritonavir 400 mg/100 mg twice daily + d4T + 3TC (n = 326)	Nelfinavir 750 mg three times daily + d4T + 3TC (n = 327)	Lopinavir and Ritonavir twice daily[2] + d4T + 3TC (n = 100)	Lopinavir and Ritonavir 800 mg/200 mg once daily + TDF + FTC (n = 333)	Lopinavir and Ritonavir 400 mg/100 mg twice daily + TDF + FTC (n = 331)
Endocrine Disorders					
Hypogonadism	0%	0%	2%	0%	0%
Gastrointestinal Disorders					
Diarrhea	16%	17%	28%	17%	15%
Nausea	7%	5%	16%	7%	5%
Vomiting	2%	2%	6%	3%	4%
Abdominal Pain	4%	3%	11%	1%	1%
Dyspepsia	2%	< 1%	6%	0%	0%
Flatulence	2%	1%	4%	1%	1%
General Disorders and Administration Site Conditions					
Asthenia	4%	3%	9%	< 1%	< 1%
Infections and Infestations					
Bronchitis	0%	0%	2%	0%	< 1%
Investigations					
Weight Decreased	1%	< 1%	2%	0%	< 1%
Metabolism and Nutrition Disorders					
Anorexia	1%	< 1%	2%	< 1%	1%
Musculoskeletal and Connective Tissue Disorders					
Myalgia	1%	1%	2%	0%	0%
Nervous System Disorders					
Headache	2%	2%	6%	2%	2%
Paresthesia	1%	1%	2%	0%	0%
Psychiatric Disorders					
Insomnia	2%	1%	3%	1%	0%
Depression	1%	2%	0%	0%	0%
Libido Decreased	< 1%	< 1%	2%	0%	< 1%
Skin and Subcutaneous Tissue Disorders					
Rash	1%	2%	5%	< 1%	1%
Vascular Disorders					
Vasodilation	0%	0%	3%	0%	0%

1 Includes adverse reactions of possible or probable relationship to study drug.
2 Includes adverse reaction data from dose group I (200 mg/100 mg twice daily [n = 16] and 400 mg/100 mg twice daily [n = 16]) and dose group II (400 mg/100 mg twice daily [n = 35] and 400 mg/200 mg twice daily [n = 33]). Within dosing groups, moderate to severe nausea of probable/possible relationship to lopinavir and ritonavir occurred at a higher rate in the 400 mg/200 mg dose arm compared to the 400 mg/100 mg dose arm in group II.
Definitions: d4T = Stavudine; 3TC = Lamivudine; TDF = Tenofovir Disoproxil Fumarate; FTC = Emtricitabine

Table 5. Percentage of Adult Patients with Selected Treatment-Emergent[1] Adverse Reactions of Moderate or Severe Intensity Reported in ≥ 2% of Adult Protease Inhibitor-Experienced Patients

	Study 888 (48 Weeks)		Study 957[2] and Study 765[3] (84 to 144 Weeks)	Study 802 (48 Weeks)	
	Lopinavir and Ritonavir 400 mg/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 mg/200 mg Once Daily + NRTIs (n = 300)	Lopinavir and Ritonavir 400 mg/100 mg Twice Daily + NRTIs (n = 299)
Gastrointestinal Disorders					
Diarrhea	7%	9%	23%	14%	11%
Nausea	7%	16%	5%	3%	7%
Vomiting	4%	12%	2%	2%	3%
Abdominal Pain	2%	2%	4%	2%	< 1%
Abdominal Pain Upper	N/A	N/A	N/A	1%	2%
Dyspepsia	1%	1%	2%	1%	< 1%
Flatulence	1%	2%	2%	1%	1%
Dysphasia	2%	1%	0%	0%	0%
General Disorders and Administration Site Conditions					
Asthenia	3%	6%	9%	< 1%	< 1%
Pyrexia	2%	1%	2%	0%	< 1%
Chills	2%	0%	0%	0%	0%
Investigations					
Weight Decreased	0%	1%	3%	< 1%	< 1%
Metabolism and Nutrition Disorders					
Anorexia	1%	3%	0%	0%	1%
Musculoskeletal and Connective Tissue Disorders					
Myalgia	1%	1%	2%	0%	0%
Nervous System Disorders					
Headache	2%	3%	2%	< 1%	0%
Paresthesia	0%	1%	2%	0%	< 1%
Psychiatric Disorders					
Depression	1%	2%	3%	< 1%	0%
Insomnia	0%	2%	2%	0%	< 1%
Skin and Subcutaneous Tissue Disorders					
Rash	2%	1%	2%	0%	0%
Vascular Disorders					
Hypertension	0%	0%	2%	0%	0%

1 Includes adverse reactions of possible or probable relationship to study drug.
2 Includes adverse reaction data from patients receiving 400 mg/100 mg twice daily (n = 29) or 533 mg/133 mg twice daily (n = 28) for 84 weeks. Patients received lopinavir and ritonavir in combination with NRTIs and efavirenz.
3 Includes adverse reaction data from patients receiving 400 mg/100 mg twice daily (n = 36) or 400 mg/200 mg twice daily (n = 34) for 144 weeks. Patients received lopinavir and ritonavir in combination with NRTIs and nevirapine.
Definitions: NVP = Nevirapine; NRTI = Nucleoside Reverse Transcriptase Inhibitors; NNRTI = Non-nucleoside Reverse Transcriptase Inhibitors

Less Common Adverse Reactions: Treatment-emergent adverse reactions occurring in less than 2% of adult patients receiving lopinavir and ritonavir in the clinical trials supporting approval and of at least moderate intensity are listed below by system organ class.

Blood and Lymphatic System Disorders: Anemia, leukopenia, lymphadenopathy and splenomegaly.

Cardiac Disorders: Angina pectoris, atrial fibrillation, atrioventricular block, myocardial infarction, palpitation and tricuspid valve incompetence.

Ear and Labyrinth Disorders: Hyperacusis, tinnitus and vertigo.

Endocrine Disorders: Cushing's syndrome and hypothyroidism.

Eye Disorders: Eye disorder and visual disturbance.

Gastrointestinal Disorders: Abdominal discomfort, abdominal distension, abdomen pain lower, constipation, duodenitis, dry mouth, enteritis, enterocolitis, enterocolitis hemorrhagic, eructation, esophagitis, fecal incontinence, gastric disorder, gastric ulcer, gastritis, gastroesophageal reflux disease, hemorrhoids, mouth ulceration, pancreatitis, periodontitis, rectal hemorrhage, stomach discomfort and stomatitis.

General Disorders and Administration Site Conditions: Chest pain, cyst, drug interaction, edema, edema peripheral, face edema, fatigue, hypertrophy and malaise.

Hepatobiliary Disorders: Cholangitis, cholecystitis, cytolytic hepatitis, hepatic steatosis, hepatitis, hepatomegaly, jaundice and liver tenderness.

Immune System Disorders: Drug hypersensitivity, hypersensitivity and immune reconstitution syndrome.

Infections and Infestations: Bacterial infection, bronchopneumonia, cellulitis, folliculitis, furuncle, gastroenteritis, influenza, otitis media, perineal abscess, pharyngitis, rhinitis, sialoadenitis, sinusitis and viral infection.

Investigations: Drug level increased, glucose tolerance decreased and weight increased.

Metabolism and Nutrition Disorders: Decreased appetite, dehydration, diabetes mellitus, hypovitaminosis, increased appetite, lactic acidosis, lipomatosis and obesity.

Musculoskeletal and Connective Tissue Disorders: Arthralgia, arthropathy, back pain, muscular weakness, osteoarthritis, osteonecrosis and pain in extremity.

Neoplasms Benign, Malignant and Unspecified (incl Cysts and Polyps): Benign neoplasm of skin, lipoma and neoplasm.

Nervous System Disorders: Ageusia, amnesia, ataxia, balance disorder, cerebral infarction, convulsion, dizziness, dysgeusia, dyskinesia, encephalopathy, extrapyramidal disorder, facial palsy, hypertonia, migraine, neuropathy, neuropathy peripheral, somnolence and tremor.

Psychiatric Disorders: Abnormal dreams, affect lability, agitation, anxiety, apathy, confusional state, disorientation, mood swings, nervousness and thinking abnormal.

Renal and Urinary Disorders: Hematuria, nephritis, nephrolithiasis, renal disorder, urine abnormality and urine odor abnormal.

Reproductive System and Breast Disorders: Breast enlargement, ejaculation disorder, erectile dysfunction, gynecomastia and menorrhagia.

Respiratory, Thoracic and Mediastinal Disorders: Asthma, cough, dyspnea and pulmonary edema.

Skin and Subcutaneous Tissue Disorders: Acne, alopecia, dermatitis acneiform, dermatitis allergic, dermatitis exfoliative, dry skin, eczema, hyperhidrosis, idiopathic capillaritis, nail disorder, pruritis, rash generalized, rash maculo-papular, seborrhea, skin discoloration, skin hypertrophy, skin striae, skin ulcer and swelling face.

Vascular Disorders: Deep vein thrombosis, orthostatic hypotension, thrombophlebitis, varicose vein and vasculitis.

Laboratory Abnormalities: The percentages of adult patients treated with combination therapy with Grade 3-4 laboratory abnormalities are presented in Table 6 (treatment-naïve patients) and Table 7 (treatment-experienced patients).

Table 6. 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 mg/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 x 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 > 5 x ULN (AST/ALT)

Table 7. 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 to 144 Weeks)	Study 802 (48 Weeks)	
Variable	Limit[1]	Lopinavir and Ritonavir 400 mg/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 mg/200 mg Once Daily + NRTIs (n = 300)	Lopinavir and Ritonavir 400 mg/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%	9%
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	**Low**					
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 mg/100 mg twice daily (n = 29) or 533 mg/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 mg/100 mg twice daily (n = 36) or 400 mg/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 > 5 x ULN (AST/ALT).

6.2 Pediatric Patients – Clinical Trials Experience

Lopinavir and ritonavir oral solution dosed up to 300/75 mg/m² has been studied in 100 pediatric patients 6 months to 12 years of age. The adverse reaction profile seen during Study 940 was similar to that for adult patients.

Dysgeusia (22%), vomiting (21%) and diarrhea (12%) were the most common adverse reactions of any severity reported in pediatric patients treated with combination therapy for up to 48 weeks in Study 940. A total of eight patients experienced adverse reactions of moderate to severe intensity. The adverse reactions meeting these criteria and reported for the eight subjects include: hypersensitivity (characterized by fever, rash and jaundice), pyrexia, viral infection, constipation, hepatomegaly, pancreatitis, vomiting, alanine aminotransferase increased, dry skin, rash and dysgeusia. Rash was the only event of those listed that occurred in two or more subjects (n = 3).

Lopinavir and ritonavir oral solution and soft gelatin capsules dosed at higher than recommended doses including 400/100 mg/m² (without concomitant NNRTI) and 480/120 mg/m² (with concomitant NNRTI) have been studied in 26 pediatric patients 7 to 18 years of age in Study 1038. Patients also had saquinavir mesylate added to their regimen at Week 4. Rash (12%), blood cholesterol abnormal (12%) and blood triglycerides abnormal (12%) were the only adverse reactions reported in greater than 10% of subjects. Adverse drug reactions of moderate to severe intensity occurring in two or more subjects included rash (n = 3), blood triglycerides abnormal (n = 3), and electrocardiogram QT prolonged (n = 2). Both subjects with QT prolongation had additional predisposing conditions such as electrolyte abnormalities, concomitant medications or preexisting cardiac abnormalities.

Laboratory Abnormalities: The percentages of pediatric patients treated with combination therapy including lopinavir and ritonavir with Grade 3-4 laboratory abnormalities are presented in Table 8.

Table 8. Grade 3-4 Laboratory Abnormalities Reported in ≥ 2% Pediatric Patients in Study 940

Variable	Limit[1]	Lopinavir and Ritonavir twice daily + RTIs (n = 100)
Chemistry	**High**	
Sodium	> 149 mEq/L	3%
Total Bilirubin	≥ 3 x ULN	3%
SGOT/AST	> 180 U/L	8%
SGPT/ALT	> 215 U/L	7%
Total Cholesterol	> 300 mg/dL	3%
Amylase	> 2.5 x ULN	7%[2]
Chemistry	**Low**	
Sodium	< 130 mEq/L	3%
Hematology	**Low**	
Platelet Count	< 50 x 10^9/L	4%
Neutrophils	< 0.40 x 10^9/L	2%

1 ULN = upper limit of the normal range.
2 Subjects with Grade 3-4 amylase confirmed by elevations in pancreatic amylase.

6.3 Post-Marketing Experience

The following adverse reactions have been reported during post-marketing 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 (5.8)]*.

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 and 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 coadministered with lopinavir and ritonavir. Thus, coadministration 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. Coadministration with other CYP3A substrates may require a dose adjustment or additional monitoring as shown in Table 9.

Additionally, lopinavir and ritonavir induces glucuronidation.

7.2 Potential for Other Drugs to Affect Lopinavir

Lopinavir and 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, coadministration 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 9 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 9. Established and Other Potentially Significant Drug Interactions

Concomitant Drug Class: Drug Name	Effect on Concentration of Lopinavir or Concomitant Drug	Clinical Comment
HIV-1 Antiviral Agents		
Non-nucleoside Reverse Transcriptase Inhibitors: efavirenz*, nevirapine*	↓ lopinavir	Lopinavir and ritonavir dose increase is recommended in all patients *[see Dosage and Administration (2.1) and Clinical Pharmacology (12.3)]*. Increasing the dose of lopinavir and ritonavir tablets to 500 mg/125 mg (given as two 200 mg/50 mg tablets and one 100 mg/25mg tablet) twice daily coadministered with efavirenz resulted in similar lopinavir concentrations compared to lopinavir and ritonavir tablets 400 mg/100 mg (given as two 200 mg/50 mg tablets) twice daily without efavirenz. Increasing the dose of lopinavir and ritonavir tablets to 600 mg/150 mg (given as three 200 mg/50 mg tablets) twice daily coadministered with efavirenz resulted in significantly higher lopinavir plasma concentrations compared to lopinavir and ritonavir tablets 400 mg/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 (2.1) 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.
Nucleoside Reverse Transcriptase Inhibitor: didanosine		Lopinavir and ritonavir tablets can be administered simultaneously with didanosine without 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 Inhibitor: 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.
HIV-1 Protease Inhibitor: amprenavir*	↑ amprenavir ↓ lopinavir	Lopinavir and ritonavir should not be administered once daily in combination with amprenavir. *[See Dosage and Administration (2.1)]*.
HIV-1 Protease Inhibitor: fosamprenavir/ ritonavir	↓ amprenavir ↓ lopinavir	An increased rate of adverse reactions has been observed with coadministration 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 coadministered with lopinavir and ritonavir 400 mg/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 (2.1) 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 coadministered with lopinavir and ritonavir 400 mg/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 C_{min}	Lopinavir and ritonavir should not be administered with tipranavir (500 mg twice daily) coadministered 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 coadministered, patients should receive 150 mg twice daily of maraviroc. For further details see complete prescribing information for Selzentry® (maraviroc).
Other Agents		
Antiarrhythmics: amiodarone, bepridil, lidocaine (systemic), and quinidine	↑ antiarrhythmics	Caution is warranted and therapeutic concentration monitoring (if available) is recommended for antiarrhythmics when coadministered with lopinavir and ritonavir.
Anticancer Agents: vincristine vinblastine nilotinib dasatinib	↑ anticancer agents	Concentrations of these drugs may be increased when coadministered 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 lopinavir/ritonavir 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 on the dosage or an adjustment of the dosing interval of nilotinib and dasatinib may be necessary for patients requiring coadministration with strong CYP3A inhibitors such as lopinavir and ritonavir. Please refer to the nilotinib and dasatinib prescribing information for dosing instructions.
Anticoagulant: Warfarin		Concentrations of warfarin may be affected. It is recommended that INR (international normalized ratio) be monitored.
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, coadministration of phenytoin and lopinavir and ritonavir may cause decreases in steady-state phenytoin concentrations. Phenytoin levels should be monitored when coadministering with lopinavir and ritonavir.
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 coadministration 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. Coadministration 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, coadministration 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-coadministration 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-coadministration 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)-coadministration 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: 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 coadministered antiretroviral agents. A study evaluated combination of rifampin 600 mg once daily, with lopinavir and ritonavir 800 mg/200 mg twice daily or lopinavir and ritonavir 400 mg/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.
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 coadministered with parenteral midazolam, close clinical monitoring for respiratory depression and/or prolonged sedation should be exercised and dosage adjustment should be considered.
Calcium Channel Blockers, dihydropyridine: e.g., felodipine, nifedipine, nicardipine	↑ dihydropyridine calcium channel blockers	Caution is warranted and clinical monitoring of patients is recommended.
Contraceptive: ethinyl estradiol*	↓ ethinyl estradiol	Because contraceptive steroid concentrations may be altered when lopinavir and ritonavir is coadministered with oral contraceptives or with the contraceptive patch, alternative methods of nonhormonal contraception are recommended.
Corticosteroid: dexamethasone	↓ lopinavir	Use with caution. Lopinavir and ritonavir may be less effective due to decreased lopinavir plasma concentrations in patients taking these agents concomitantly.
Endothelin receptor antagonists: bosentan	↑ bosentan	Coadministration 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. Coadministration 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.
HMG-CoA Reductase Inhibitors: atorvastatin rosuvastatin	↑ atorvastatin ↑ rosuvastatin	Use lowest possible dose of atorvastatin or rosuvastatin with careful monitoring, or consider other HMG-CoA reductase inhibitors such as pravastatin or fluvastatin in combination with lopinavir and ritonavir.
Immunosuppressants: cyclosporine, tacrolimus, rapamycin	↑ immunosuppressants	Therapeutic concentration monitoring is recommended for immunosuppressant agents when coadministered with lopinavir and ritonavir.
Inhaled Steroid: fluticasone	↑ fluticasone	Concomitant use of fluticasone propionate and lopinavir and ritonavir may increase plasma concentrations of fluticasone propionate, resulting in significantly reduced serum cortisol concentrations. Systemic corticosteroid effects including Cushing's syndrome and adrenal suppression have been reported during post-marketing use in patients receiving ritonavir and inhaled or intranasally administered fluticasone propionate. Coadministration of fluticasone propionate and lopinavir and ritonavir is not recommended unless the potential benefit to the patient outweighs the risk of systemic corticosteroid side effect.
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 Analgesic: methadone* fentanyl	↓ methadone ↑ fentanyl	Dosage of methadone may need to be increased when coadministered with lopinavir and ritonavir. Concentrations of fentanyl are expected to increase. Careful monitoring of therapeutic and adverse effects (including potentially fatal respiratory depression) in recommended when fentanyl is concomitantly administered with lopinavir and ritonavir.
PDE5 inhibitors: sildenafil, tadalafil, vardenafil	↑ sildenafil ↑ tadalafil ↑ vardenafil	Particular caution should be used when prescribing sildenafil, tadalafil or vardenafil in patients receiving lopinavir and ritonavir. Coadministration 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: Coadministration of ADCIRCA in patients on lopinavir and ritonavir: 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. Coadministration 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 studies reveal no clinically significant interaction between lopinavir and ritonavir and desipramine (CYP2D6 probe), pravastatin, stavudine, lamivudine, omeprazole or ranitidine.

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

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy:

Pregnancy Category C.

No treatment-related malformations were observed when lopinavir in combination with ritonavir was administered to pregnant rats or rabbits. 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 mg/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-fold for ritonavir that of the exposures in humans at the recommended therapeutic dose (400 mg/100 mg twice daily). There are, however, no adequate and well controlled studies in pregnant women. Lopinavir and ritonavir should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

MEDICATION GUIDE
LOPINAVIR AND RITONAVIR TABLETS
200 mg/50 mg and 100 mg/25 mg

Read the Medication Guide that comes with lopinavir and ritonavir tablets before you start taking it 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.** Read the section "What should I tell my doctor before taking 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 the section below "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 anti-HIV medicine that contains two medicines: lopinavir and ritonavir. Lopinavir and ritonavir tablets are called a protease inhibitor that is used with other anti-HIV-1 medicines to treat people with human immunodeficiency virus (HIV-1) infection. HIV-1 is the virus that causes AIDS (Acquired Immune Deficiency Syndrome).

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

Who should not take lopinavir and ritonavir tablets?

- Do not take lopinavir and ritonavir tablets if you are taking certain medicines. For more information about medicines you should not take with lopinavir and ritonavir tablets, please see **"Can I take other medicines with lopinavir and ritonavir tablets?" and consult with your doctor about all other medicines you take.**
- Do not take lopinavir and ritonavir tablets if you have an allergy to lopinavir and ritonavir or any of its ingredients.

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 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. It is not known if lopinavir and ritonavir tablets will harm your unborn baby. Birth control pills or patches may not work as well while you take lopinavir and ritonavir tablets. To prevent pregnancy while taking lopinavir and ritonavir tablets, women who take birth control pills or use estrogen patch for birth control should either use a different type of birth control or an extra form of birth control. Talk to your doctor about how to prevent pregnancy while taking lopinavir and ritonavir tablets.
- take lopinavir and ritonavir tablets during pregnancy, talk with your doctor about how you can take part in an antiretroviral pregnancy registry. The purpose of the pregnancy registry is to follow the health of you and your baby.
- are breast-feeding. Do not breast-feed if you are taking lopinavir and ritonavir tablets. You should not breast-feed if you have HIV-1. If you are a woman who has or will have a baby while taking lopinavir and ritonavir tablets, talk with your doctor about the best way to feed your baby. If your baby does not already have HIV-1, there is a chance that HIV-1 can be passed to your baby through your breast milk.

Tell your doctor about all the medicines you take, including prescription and non-prescription 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.

Medicines you should not take with lopinavir and ritonavir tablets.

Serious problems or death can happen if you take these medicines with lopinavir and ritonavir tablets:

- ergot containing medicines, including:
  - ergotamine tartrate (Cafergot®, Migergot, Ergomar, Ergostat, Medihaler Ergotamine, Wigraine, Wigrettes)
  - dihydroergotamine mesylate (D.H.E. 45®, Embolex, Migranal®)
  - ergonovine, ergonovine and methylergonovine (Ergotrate, Methergine), ergotamine and methylergonovine
  - Ergotrate Maleate, methylergonovine maleate (Methergine)
- triazolam (Halcion®), midazolam hydrochloride oral syrup
- pimozide (Orap®)
- the cholesterol lowering medicines lovastatin (Mevacor®) or simvastatin (Zocor®)
- sildenafil (Revatio®) only when used for the treatment of pulmonary arterial hypertension. (See "Medicines that may need changes" and "What are the possible side effects of lopinavir and ritonavir tablets?" for information about the use of sildenafil for erectile problems.)
- alfuzosin (Uroxatral®)

Medicines that you should not take with lopinavir and ritonavir tablets since they may make lopinavir and ritonavir tablets not work as well:

- the herbal supplement St Johns Wort (hypericum perforatum)
- rifampin (Rimactane®, Rifadin®, Rifater® or Rifamate®)

Medicines that may need changes:

- birth control pills that contain estrogen ("the pill") or the birth control (contraceptive) patches
- certain anticancer medicines, such as nilotinib (Tasigna®) and dasatinib (Sprycel®)
- certain cholesterol lowering medicines, such as atorvastatin (Lipitor®) or rosuvastatin (Crestor®)
- certain other antiretroviral medicines, such as efavirenz (Atripla® and Sustiva®), nevirapine (Viramune®), amprenavir (Agenerase®), fosamprenavir calcium (Lexiva®) and nelfinavir (Viracept®)
- anti-seizure medicines, such as phenytoin (Dilantin®) carbamazepine, (Tegretol®), phenobarbital
- medicines for erectile problems, such as sildenafil (Viagra®), tadalafil (Cialis®) or vardenafil (Levitra®)
- medicines for tuberculosis (TB), such as rifabutin (Mycobutin®)
- inhaled steroid medicines, such as fluticasone propionate (Flonase®)
- inhaled medicines such as salmeterol (Serevent®) or salmeterol in combination with fluticasone propionate (Advair®). Your doctor may need to change to a different medicine.
- medicines for gout, such as colchicine (Colcrys®)
- medicines to treat pulmonary arterial hypertension (PAH), such as bosentan (Tracleer®) or tadalafil (Adcirca®)
- pain medicines, such an fentanyl (Duragesic®, Ionsys™, Fentora®) and methadone

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.
- 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 Videx® (didanosine) and lopinavir and ritonavir tablets:
  - didanosine can be taken at the same time as lopinavir and ritonavir tablets, without food.

MEDICATION GUIDE
LOPINAVIR AND RITONAVIR TABLETS
200 mg/50 mg and 100 mg/25 mg

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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. Read the section "What should I tell my doctor before taking 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
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See the section below "What are the possible side effects of lopinavir and ritonavir tablets?" for more information about serious side effects.

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

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- have any heart problems, including if you have a condition called Congenital Long QT Syndrome.
- 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. It is not known if lopinavir and ritonavir tablets will harm your unborn baby. Birth control pills or patches may not work as well while you take lopinavir and ritonavir tablets. To prevent pregnancy while taking lopinavir and ritonavir tablets, women who take birth control pills or use estrogen patch for birth control should either use a different type of birth control or an extra form of birth control. Talk to your doctor about how to prevent pregnancy while taking lopinavir and ritonavir tablets.
- take lopinavir and ritonavir tablets during pregnancy, talk with your doctor about how you can take part in an antiretroviral pregnancy registry. The purpose of the pregnancy registry is to follow the health of you and your baby.
- are breast-feeding. Do not breast-feed if you are taking lopinavir and ritonavir tablets. You should not breast-feed if you have HIV-1. If you are a woman who has or will have a baby while taking lopinavir and ritonavir tablets, talk with your doctor about the best way to feed your baby. If your baby does not already have HIV-1, there is a chance that HIV-1 can be passed to your baby through your breast milk.

Tell your doctor about all the medicines you take, including prescription and non-prescription 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.
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  - dihydroergotamine mesylate (D.H.E. 45®, Embolex, Migranal®)
  - ergonovine, ergonovine and methylergonovine (Ergotrate, Methergine), ergotamine and methylergonovine
  - Ergotrate Maleate, methylergonovine maleate (Methergine)
- triazolam (Halcion®), midazolam hydrochloride oral syrup
- pimozide (Orap®)
- the cholesterol lowering medicines lovastatin (Mevacor®) or simvastatin (Zocor®)
- sildenafil (Revatio®) only when used for the treatment of pulmonary arterial hypertension. (See "Medicines that may need changes" and "What are the possible side effects of lopinavir and ritonavir tablets?" for information about the use of sildenafil for erectile problems.)
- alfuzosin (Uroxatral®)
Medicines that you should not take with lopinavir and ritonavir tablets since they may make lopinavir and ritonavir tablets not work as well:
- the herbal supplement St Johns Wort (hypericum perforatum)
- rifampin (Rimactane®, Rifadin®, Rifater® or Rifamate®)
Medicines that may need changes:
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- certain other antiretroviral medicines, such as efavirenz (Atripla® and Sustiva®), nevirapine (Viramune®), amprenavir (Agenerase®), fosamprenavir calcium (Lexiva®) and nelfinavir (Viracept®)
- anti-seizure medicines, such as phenytoin (Dilantin®) carbamazepine, (Tegretol®), phenobarbital
- medicines for erectile problems, such as sildenafil (Viagra®), tadalafil (Cialis®) or vardenafil (Levitra®)
- medicines for tuberculosis (TB), such as rifabutin (Mycobutin®)
- inhaled steroid medicines, such as fluticasone propionate (Flonase®)
- inhaled medicines such as salmeterol (Serevent®) or salmeterol in combination with fluticasone propionate (Advair®). Your doctor may need to change to a different medicine.
- medicines for gout, such as colchicine (Colcrys®)
- medicines to treat pulmonary arterial hypertension (PAH), such as bosentan (Tracleer®) or tadalafil (Adcirca®)
- pain medicines, such an fentanyl (Duragesic®, Ionsys™, Fentora®) and methadone
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.
- 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 Videx® (didanosine) and lopinavir and ritonavir tablets:
  - didanosine can be taken at the same time as lopinavir and ritonavir tablets, without food.

Antiretroviral Pregnancy Registry: To monitor maternal-fetal outcomes of pregnant women exposed to lopinavir and ritonavir, an Antiretroviral Pregnancy Registry has been established. Physicians are encouraged to register patients by calling 1-800-258-4263.

8.2 Nursing Mothers

The Centers for Disease Control and Prevention recommend that HIV-1 infected mothers not breast-feed their infants to avoid risking postnatal transmission of HIV-1. Studies in rats have demonstrated that lopinavir is secreted in milk. It is not known whether lopinavir is secreted in human milk. Because of both the potential for HIV-1 transmission and the potential for serious adverse reactions in nursing infants, mothers should be instructed not to breast-feed if they are receiving lopinavir and ritonavir.

8.3 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 once daily has not been evaluated 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 with 300/75 mg/m^2 twice daily plus two NRTIs in HIV-infected infants ≥14 days and < 6 months of age. Results revealed that infants younger than 6 months of age generally had lower lopinavir AUC_{12} 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-RNA <400 copies/mL at Week 24 *[see Adverse Reactions (6.2), Clinical Pharmacology (12.3), Clinical Studies (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 mg/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 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)]*.

8.4 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.

8.5 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 (5.3) and Clinical Pharmacology (12.3)]*.

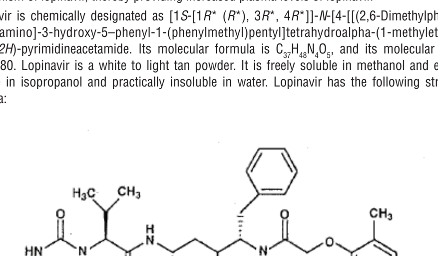
10 OVERDOSAGE

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 emesis or gastric lavage. Administration of activated charcoal may also be used to aid in removal of unabsorbed drug. Since lopinavir and ritonavir is highly protein bound, dialysis is unlikely to be beneficial in significant removal of the drug.

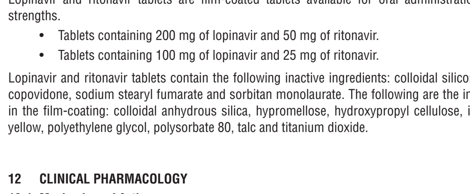
11 DESCRIPTION

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

Lopinavir 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]tetrahydroalpha-(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 are film-coated tablets available for oral administration in two strengths.

- Tablets containing 200 mg of lopinavir and 50 mg of ritonavir.
- Tablets containing 100 mg of lopinavir and 25 mg of ritonavir.

Lopinavir and ritonavir tablets contain the following inactive ingredients: colloidal silicon dioxide, copovidone, sodium stearyl fumarate and sorbitan monolaurate. The following are the ingredients in the film-coating: colloidal anhydrous silica, hypromellose, hydroxypropyl cellulose, iron oxide yellow, polyethylene glycol, polysorbate 80, talc and titanium dioxide.

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

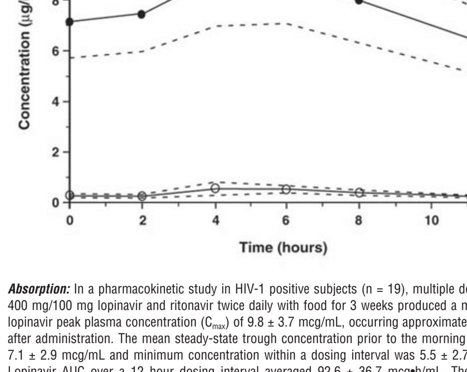
Lopinavir is an antiviral drug *[see Clinical Pharmacology (12.4)]*.

12.3 Pharmacokinetics

The pharmacokinetic properties of lopinavir coadministered 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 mg/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 EC_{50} 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 mg/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 mg/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 mcg/mL, occurring approximately 4 hours after administration. The mean steady-state trough concentration prior to the morning dose was 7.1 ± 2.9 mcg/mL and minimum concentration within a dosing interval was 5.5 ± 2.7 mcg/mL. Lopinavir AUC over a 12 hour dosing interval averaged 92.6 ± 36.7 mcg•h/mL. The absolute bioavailability of lopinavir co-formulated with ritonavir in humans has not been established.

Plasma concentrations of lopinavir and ritonavir after administration of two 200 mg/50 mg lopinavir and ritonavir tablets are similar to three 133.3 mg/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 C_{max} and AUC were observed following administration of lopinavir and ritonavir tablets under fed conditions compared to fasted conditions. Relative to fasting, administration of lopinavir and ritonavir tablets with a moderate fat meal (500 to 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.

Distribution: At steady-state, lopinavir is approximately 98% to 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 mg/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}C-lopinavir study in humans showed that 89% of the plasma radioactivity after a single 400 mg/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 mg/100 mg ^{14}C-lopinavir and 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 has been evaluated in HIV-1 infected subjects naïve to antiretroviral treatment. Lopinavir and ritonavir 800 mg/ 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 mg/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 mcg/mL, occurring approximately 6 hours after administration. The mean steady-state lopinavir trough concentration prior to the morning dose was 3.2 ± 2.1 mcg/mL and minimum concentration within a dosing interval was 1.7 ± 1.6 mcg/mL. Lopinavir AUC over a 24 hour dosing interval averaged 154.1 ± 61.4 mcg•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}, $AUC_{(0\ to\ 24h)}$, 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 of Electrocardiogram: QTcF interval was evaluated in a randomized, placebo and active (moxifloxacin 400 mg once daily) controlled crossover study in 39 healthy adults, with ten 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) mseconds (msec) for 400 mg/100 mg twice daily and supratherapeutic 800 mg / 200 mg twice daily lopinavir and ritonavir, respectively. Lopinavir and ritonavir 800 mg/ 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 mg/100 mg twice daily and supratherapeutic 800 mg/200 mg twice daily lopinavir and ritonavir respectively *[see Warnings 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: Lopinavir and ritonavir once daily has not been evaluated in pediatric patients.

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 mg/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 (5.3) and Use in Specific Populations (8.6)]*.

Drug Interactions

Lopinavir and ritonavir is an inhibitor of the P450 isoform CYP3A *in vitro*. Coadministration 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, coadministration 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 coadministration of lopinavir and ritonavir on the AUC, C_{max} and C_{min} are summarized in Table 10 (effect of other drugs on lopinavir) and Table 11 (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 9 in *Drug Interactions (7)*.

Table 10. Drug Interactions: Pharmacokinetic Parameters for Lopinavir in the Presence of the Coadministered Drug for Recommended Alterations in Dose or Regimen

Coadministered Drug	Dose of Coadministered Drug (mg)	Dose of Lopinavir and Ritonavir (mg)	Ratio (in combination with coadministered drug-/alone) of Lopinavir Pharmacokinetic Parameters (90% CI); No Effect = 1			
			n	C_{max}	AUC	C_{min}
Amprenavir	750 twice daily, 10 d	400/100 capsule twice daily, 21 d	12	0.72 (0.65, 0.79)	0.62 (0.56, 0.7)	0.43 (0.34, 0.56)
Efavirenz[1, 9]	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)	0.9 (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)
Fosamprenavir[2]	700 twice daily plus ritonavir 100 twice daily, 14 d	400/100 capsule twice daily, 14 d	18	1.3 (0.85, 1.47)	1.37 (0.8, 1.55)	1.52 (0.72, 1.82)
Ketoconazole	200 single dose	400/100 capsule twice daily, 16 d	12	0.89 (0.8, 0.99)	0.87 (0.75, 1)	0.75 0.55, 1)
Nelfinavir	1000 twice daily, 10 d	400/100 capsule twice daily, 21 d	13	0.79 (0.7, 0.89)	0.73 (0.63, 0.85)	0.62 (0.49, 0.78)
Nevirapine	200 twice daily, steady-state (> 1 yr)[3]#	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)
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)	0.92 (0.86, 0.99)	0.71 (0.57, 0.89)
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)	1.2 (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)	0.9 (0.85, 0.95)
	150 single dose	800/200 tablet once daily, 10 d	10	0.97 (0.95, 1)	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 (0.4, 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[4]	10	1.02 (0.85, 1.23)	0.84 (0.64, 1.1)	0.43 (0.19, 0.96)
	600 once daily, 14 d	400/400 capsule twice daily, 9 d[5]	9	0.93 (0.81, 1.07)	0.98 (0.81, 1.17)	1.03 (0.68, 1.56)
					Coadministration of lopinavir and ritonavir and rifampin is contraindicated. *[See Contraindications (4).]*	
Ritonavir[3]	100 twice daily, 3 to 4 wk#	400/100 capsule twice daily, 3 to 4 wk	8, 21*	1.28 (0.94, 1.76)	1.46 (1.04, 2.06)	2.16 (1.29, 3.62)
Tenofovir[6]	300 once daily, 14 d	400/100 capsule twice daily, 14 d	24	NC†	NC†	NC†
Tipranavir/ ritonavir[3]	500/200 twice daily (28 doses)#	400/100 capsule twice daily (27 doses)	21 69	0.53 (0.4,0.69)[7]	0.45 (0.32,0.63)[7]	0.3 (0.17,0.51)[7] 0.48 (0.4,0.58)[8]

All interaction studies conducted in healthy, HIV-1 negative subjects unless otherwise indicated.
1 The pharmacokinetics of ritonavir are unaffected by concurrent efavirenz.
2 Data extracted from the fosamprenavir package insert.
3 Study conducted in HIV-1 positive adult subjects.
4 Titrated to 800 mg/200 mg twice daily as 533 mg/133 mg twice daily x 1 d, 667 mg/167 mg twice daily x 1 d, then 800 mg/200 mg twice daily x 7 d, compared to 400 mg/100 mg twice daily x 10 days alone.
5 Titrated to 400 mg/400 mg twice daily as 400 mg/200 mg twice daily x 1 d, 400 mg/300 mg twice daily x 1 d, then 400 mg/400 mg twice daily x 7 d, compared to 400 mg/100 mg twice daily x 10 days alone.
6 Data extracted from the tenofovir package insert.
7 Intensive PK analysis.
8 Drug levels obtained at 8 to 16 hrs post-dose.
9 Reference for comparison is lopinavir and ritonavir 400 mg/100 mg twice daily without efavirenz
* Parallel group design; n for lopinavir and ritonavir + coadministered 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 11. Drug Interactions: Pharmacokinetic Parameters for Coadministered Drug in the Presence of Lopinavir and Ritonavir for Recommended Alterations in Dose or Regimen

Coadministered Drug	Dose of Coadministered Drug (mg)	Dose of Lopinavir and Ritonavir (mg)	Ratio (in combination with Lopinavir and Ritonavir /alone) Coadministered Drug Pharmacokinetic Parameters (90% CI); No Effect = 1			
			n	C_{max}	AUC	C_{min}
Amprenavir[1]	750 twice daily, 10 d combo vs. 1200 twice daily, 14 d alone	400/100 capsule twice daily, 21 d	11	1.12 (0.91, 1.39)	1.72 (1.41, 2.09)	4.57 (3.51, 5.95)
Desipramine[2]	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, 1.2)
Ethinyl Estradiol	35 mcg 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)
Fosamprenavir[3]	700 twice daily plus ritonavir 100 twice daily, 14 d	400/100 capsule twice daily, 14 d	18	0.42 (0.3, 0.58)	0.37 (0.28, 0.49)	0.35 (0.27, 0.46)
Indinavir[1]	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, 1.1)	3.47 (2.6, 4.64)
Ketoconazole	200 single dose	400/100 capsule twice daily, 16 d	12	1.13 (0.91, 1.4)	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[1]	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)
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, 3.3)	4.9 (3.18, 5.76)
25-*O*-desacetyl rifabutin				23.6 (13.7, 25.3)	47.5 (29.3, 51.8)	94.9 (74, 122)
Rifabutin + 25-*O*-desacetyl rifabutin[4]				3.46 (3.07, 3.91)	5.73 (5.08, 6.46)	9.53 (7.56, 12.01)
Rosuvastatin[5]	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[6]	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 Ratio of parameters for amprenavir, indinavir and nelfinavir, are not normalized for dose.
2 Desipramine is a probe substrate for assessing effects on CYP2D6-mediated metabolism.
3 Data extracted from the fosamprenavir package insert.
4 Effect on the dose-normalized sum of rifabutin parent and 25- *O* -desacetyl rifabutin active metabolite.
5 Data extracted from the rosuvastatin package insert and results presented at the 2007 Conference on Retroviruses and Opportunistic Infection (Hoody, et al, abstract L-107, poster # 564).
6 Data extracted from the tenofovir package insert.
* Parallel group design; n for lopinavir and ritonavir + coadministered drug, n for coadministered 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, noninfectious 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 (EC_{50}) values of lopinavir against five different HIV-1 subtype B laboratory strains ranged from 10 to 27 nM (0.006 to 0.017 mcg/mL, 1 mcg/mL = 1.6 µM) and ranged from 4 to 11 nM (0.003 to 0.007 mcg/mL) against several HIV-1 subtype B clinical isolates (n = 6). In the presence of 50% human serum, the mean EC_{50} values of lopinavir against these five HIV-1 laboratory strains ranged from 65 to 289 nM (0.04 to 0.18 mcg/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 EC_{50} values of lopinavir against three different HIV-2 strains ranged from 12 to180 nM (0.008 to 113 mg/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 four 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 12 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 12. 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 inhibitor-experienced[2], NNRTI-naïve) n = 130	Study 765 (Single protease inhibitor-experienced[3], NNRTI-naïve) n = 56	Study 957 (Multiple protease inhibitor-experienced[4], NNRTI-naïve) n = 50
0 to 2	76/103 (74%)	34/45 (76%)	19/20 (95%)
3 to 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 L10/F/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-naive 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 EC_{50} values of lopinavir against the 56 baseline viral isolates ranged from 0.5- to 96-fold the wild-type EC_{50} 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 13.

Table 13. HIV-1 RNA Response at Week 48 by Baseline Lopinavir Susceptibility[1]

Lopinavir susceptibility[2] 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

Lopinavir and 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 to 2.2 times (mice) and 0.5 times (rats) the human exposure (based on AUC_{0-24hr} measurement) at the recommended dose of 400 mg/100 mg lopinavir and ritonavir twice daily. Administration of lopinavir and 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 mg/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 mg/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. However, 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.

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 mg/100 mg twice daily).

14 CLINICAL STUDIES

14.1 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 mg/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/mm^3 (range: 2 to 949 cells/mm^3) and mean baseline plasma HIV-1 RNA was 4.9 log_{10} copies/mL (range: 2.6 to 6.8 log_{10} copies/mL).

Treatment response and outcomes of randomized treatment are presented in Table 14.

Table 14. Outcomes of Randomized Treatment Through Week 48 (Study 863)

Outcome	Lopinavir and Ritonavir + d4T + 3TC (n = 326)	Nelfinavir + d4T + 3TC (n = 327)
Responder[1]	75%	62%
Virologic failure[2]	9%	25%
Rebound	7%	15%
Never suppressed through Week 48	2%	9%
Death	2%	1%
Discontinued due to adverse events	4%	4%
Discontinued for other reasons[3]	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 15.

Table 15. 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 800 mg/200 mg once daily plus tenofovir DF and emtricitabine versus lopinavir and ritonavir 400 mg/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 800 mg/200 mg once daily (n = 333) or lopinavir and ritonavir 400 mg/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 log_{10} copies/mL (range: 1.7 to 7 log_{10} copies/mL).

Treatment response and outcomes of randomized treatment through week 48 are presented in Table 16.

Table 16. 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]	10%	8%
Rebound	5%	5%
Never suppressed through Week 48	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 Patients with Prior Antiretroviral Therapy

Study 888: Lopinavir and ritonavir capsules twice daily + nevirapine + NRTIs compared to investigator-selected protease inhibitor(s) + nevirapine + NRTIs

Study 888 was a randomized, open-label, multicenter trial comparing treatment with lopinavir and ritonavir capsules (400 mg/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)-naive 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 log_{10} copies/mL).

Treatment response and outcomes of randomized treatment through Week 48 are presented in Table 17.

Table 17. 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)
Responder[1]	57%	33%
Virologic failure[2]	24%	41%
Rebound	11%	19%
Never suppressed through Week 48	13%	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 mg/200 mg once daily vs. 400 mg/100 mg twice daily when coadministered 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% to 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 800 mg/200 mg once daily (n = 300) or lopinavir and ritonavir 400 mg/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 log_{10} copies/mL (range: 1.7 to 6.6 log_{10} copies/mL).

Treatment response and outcomes of randomized treatment through Week 48 are presented in Table 18.

Table 18. 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

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 mg/100 mg twice daily [720 only], 400 mg/100 mg twice daily, and 400 mg/200 mg twice daily). In Study 720, all patients switched to 400 mg/100 mg twice daily between Weeks 48 to 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 to 918) and 372 (72 to 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 (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 one (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 five (7%) discontinuations secondary to adverse reactions and two (3%) deaths.

14.4 Pediatric Studies

Study 940 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 (44%) and experienced (56%) pediatric patients. All patients were non-nucleoside reverse transcriptase inhibitor naïve. Patients were randomized to either 230 mg lopinavir/57.5 mg ritonavir per m^2 or 300 mg lopinavir/75 mg ritonavir per m^2. Naïve patients also received lamivudine and stavudine. Experienced patients received nevirapine plus up to two nucleoside reverse transcriptase inhibitors.

Safety, efficacy and pharmacokinetic profiles of the two dose regimens were assessed after 3 weeks of therapy in each patient. After analysis of these data, all patients were continued on the 300 mg lopinavir/75 mg ritonavir per m^2 dose. Patients had a mean age of 5 years (range 6 months to 12 years) with 14% less than 2 years. Mean baseline $CD4^+$ cell count was 838 cells/mm^3 and mean baseline plasma HIV-1 RNA was 4.7 log_{10} copies/mL.

Through 48 weeks of therapy, the proportion of patients who achieved and sustained an HIV-1 RNA < 400 copies/mL was 80% for antiretroviral naïve patients and 71% for antiretroviral experienced patients. The mean increase from baseline in $CD4^+$ cell count was 404 cells/mm^3 for antiretroviral naïve and 284 cells/mm^3 for antiretroviral experienced patients treated through 48 weeks. At 48 weeks, two patients (2%) had prematurely discontinued the study. One antiretroviral naïve patient prematurely discontinued secondary to an adverse reaction, while one antiretroviral experienced patient prematurely discontinued secondary to an HIV-1 related event.

Dose selection in pediatric patients was based on the following:

- Among patients 14 days to 6 months of age receiving 300/75 mg/m^2 twice daily without nevirapine, plasma concentrations were lower than those observed in adults or in older children. This dose resulted in HIV-1 RNA < 400 copies/mL in 55% of patients (70% in those initiating treatment at <6 weeks of age).
- Among patients 6 months to 12 years of age, 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 mg/100 mg twice daily regimen (without nevirapine). These doses resulted in treatment benefit (proportion of patients with HIV-1 RNA < 400 copies/mL) similar to that seen in the adult clinical trials.
- Among patients 12 to 18 years of age receiving 400/100 mg/m^2 or 480/120 mg/m^2 (with efavirenz) twice daily, plasma concentrations were 60% to 100% higher than among 6 to 12 year old patients receiving 230/57.5 mg/m^2. Mean apparent clearance was similar to that observed in adult patients receiving standard dose and in patients 6 to 12 years of age. Although changes in HIV-1 RNA in patients with prior treatment failure were less than anticipated, the pharmacokinetic data supports use of similar dosing as in patients 6 to 12 years of age, not to exceed the recommended adult dose.
- For all age groups, the body surface area dosing was converted to body weight dosing using the patients prescribed lopinavir dose.

16 HOW SUPPLIED/STORAGE AND HANDLING

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

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

Lopinavir and ritonavir tablets 200 mg/50 mg are light yellow to yellow colored, film-coated ovaloid tablets, debossed with **"M124"** on one side and plain on other side, and are available in the following package sizes:

NDC 65015-035-20
Bottles of 120 tablets

NDC 65015-035-08
12 (2x6) Unit-dose Tablets

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

Lopinavir and ritonavir tablets 100 mg/25 mg are light yellow to yellow colored, film-coated round biconvex tablets, debossed with **'M172'** on one side and plain on other side, and are available in the following package sizes:

NDC 65015-051-17
Bottles of 60 tablets

NDC 65015-051-20
Bottles of 120 tablets

NDC 65015-051-06
20 (2x10) Unit-dose Tablets

Recommended Storage

Store lopinavir and ritonavir film-coated tablets at 25°C (77°F); excursions permitted to 15°-30°C (59° to 86°F) (see USP controlled room temperature). Dispense in original container or USP equivalent tight container.

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.

17 PATIENT COUNSELING INFORMATION

See Medication Guide

Information For Patients

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.
- They should inform their healthcare provider if their children's weight changes in order to make sure that the child's lopinavir and ritonavir dose is the correct one.
- They should take the prescribed dose of lopinavir and ritonavir 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. Patients should be advised to take lopinavir and ritonavir and other concomitant antiretroviral therapy every day as prescribed. Lopinavir and ritonavir 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 is 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.
- Lopinavir and ritonavir is not a cure for HIV-1 infection and that they may continue to develop opportunistic infections and other complications associated with HIV-1 disease. The long-term effects of lopinavir and ritonavir are unknown at this time. Patients should be told that there are currently no data demonstrating that therapy with lopinavir and ritonavir can reduce the risk of transmitting HIV-1 to others through sexual contact, sharing needles or being exposed to their blood. For their health and the health of others, it is important that they always practice safer sex by using a latex or polyurethane condom or other barrier method to lower the chance of sexual contact with any body fluids such as semen, vaginal secretions or blood. They should also be advised to never re-use or share needles.

Drug Interactions:

- Lopinavir and ritonavir 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 sildenafil, tadalafil or vardenafil 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 receiving estrogen-based hormonal contraceptives additional or alternate contraceptive measures should be used during therapy with lopinavir and ritonavir.
- If they are taking or before they begin using Serevent® (salmeterol) and lopinavir and ritonavir, 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, 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 and Erythema multiforme have been reported in patients receiving lopinavir and ritonavir. Patients should be advised to contact their healthcare provider if they develop a rash while taking lopinavir and ritonavir. 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. Preexisting liver disease including Hepatitis B or C can worsen with use of lopinavir and ritonavir. 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 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 exacerbation of preexisting diabetes mellitus and hyperglycemia have been reported during lopinavir and ritonavir 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 as they may require a change in their diabetes treatment or new treatment.
- Lopinavir and ritonavir 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 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.

MEDICATION GUIDE
LOPINAVIR AND RITONAVIR TABLETS
200 mg/50 mg and 100 mg/25 mg

Read the Medication Guide that comes with lopinavir and ritonavir tablets before you start taking it 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.** Read the section "What should I tell my doctor before taking 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 the section below "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 anti-HIV medicine that contains two medicines: lopinavir and ritonavir. Lopinavir and ritonavir tablets are called a protease inhibitor that is used with other anti-HIV-1 medicines to treat people with human immunodeficiency virus (HIV-1) infection. HIV-1 is the virus that causes AIDS (Acquired Immune Deficiency Syndrome).

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

Who should not take lopinavir and ritonavir tablets?

- Do not take lopinavir and ritonavir tablets if you are taking certain medicines. For more information about medicines you should not take with lopinavir and ritonavir tablets, please see **"Can I take other medicines with lopinavir and ritonavir tablets?" and consult with your doctor about all other medicines you take.**
- Do not take lopinavir and ritonavir tablets if you have an allergy to lopinavir and ritonavir or any of its ingredients.

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 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. It is not known if lopinavir and ritonavir tablets will harm your unborn baby. Birth control pills or patches may not work as well while you take lopinavir and ritonavir tablets. To prevent pregnancy while taking lopinavir and ritonavir tablets, women who take birth control pills or use estrogen patch for birth control should either use a different type of birth control or an extra form of birth control. Talk to your doctor about how to prevent pregnancy while taking lopinavir and ritonavir tablets.
- take lopinavir and ritonavir tablets during pregnancy, talk with your doctor about how you can take part in an antiretroviral pregnancy registry. The purpose of the pregnancy registry is to follow the health of you and your baby.
- are breast-feeding. Do not breast-feed if you are taking lopinavir and ritonavir tablets. You should not breast-feed if you have HIV-1. If you are a woman who has or will have a baby while taking lopinavir and ritonavir tablets, talk with your doctor about the best way to feed your baby. If your baby does not already have HIV-1, there is a chance that HIV-1 can be passed to your baby through your breast milk.

Tell your doctor about all the medicines you take, including prescription and non-prescription 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.

Medicines you should not take with lopinavir and ritonavir tablets.

Serious problems or death can happen if you take these medicines with lopinavir and ritonavir tablets:

- ergot containing medicines, including:
  - ergotamine tartrate (Cafergot®, Migergot, Ergomar, Ergostat, Medihaler Ergotamine, Wigraine, Wigrettes)
  - dihydroergotamine mesylate (D.H.E. 45®, Embolex, Migranal®)
  - ergonovine, ergonovine and methylergonovine (Ergotrate, Methergine), ergotamine and methylergonovine
  - Ergotrate Maleate, methylergonovine maleate (Methergine)
- triazolam (Halcion®), midazolam hydrochloride oral syrup
- pimozide (Orap®)
- the cholesterol lowering medicines lovastatin (Mevacor®) or simvastatin (Zocor®)
- sildenafil (Revatio®) only when used for the treatment of pulmonary arterial hypertension. (See "Medicines that may need changes" and "What are the possible side effects of lopinavir and ritonavir tablets?" for information about the use of sildenafil for erectile problems.)
- alfuzosin (Uroxatral®)

Medicines that you should not take with lopinavir and ritonavir tablets since they may make lopinavir and ritonavir tablets not work as well:

- the herbal supplement St Johns Wort (hypericum perforatum)
- rifampin (Rimactane®, Rifadin®, Rifater® or Rifamate®)

Medicines that may need changes:

- birth control pills that contain estrogen ("the pill") or the birth control (contraceptive) patches
- certain anticancer medicines, such as nilotinib (Tasigna®) and dasatinib (Sprycel®)
- certain cholesterol lowering medicines, such as atorvastatin (Lipitor®) or rosuvastatin (Crestor®)
- certain other antiretroviral medicines, such as efavirenz (Atripla® and Sustiva®), nevirapine (Viramune®), amprenavir (Agenerase®), fosamprenavir calcium (Lexiva®) and nelfinavir (Viracept®)
- anti-seizure medicines, such as phenytoin (Dilantin®) carbamazepine, (Tegretol®), phenobarbital
- medicines for erectile problems, such as sildenafil (Viagra®), tadalafil (Cialis®) or vardenafil (Levitra®)
- medicines for tuberculosis (TB), such as rifabutin (Mycobutin®)
- inhaled steroid medicines, such as fluticasone propionate (Flonase®)
- inhaled medicines such as salmeterol (Serevent®) or salmeterol in combination with fluticasone propionate (Advair®). Your doctor may need to change to a different medicine.
- medicines for gout, such as colchicine (Colcrys®)
- medicines to treat pulmonary arterial hypertension (PAH), such as bosentan (Tracleer®) or tadalafil (Adcirca®)
- pain medicines, such an fentanyl (Duragesic®, Ionsys™, Fentora®) and methadone

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.
- 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 Videx® (didanosine) and lopinavir and ritonavir tablets:
  - didanosine can be taken at the same time as lopinavir and ritonavir tablets, without food.
- Do not miss a dose of lopinavir and ritonavir tablets. This could make the virus harder to treat. If you forget to take lopinavir and ritonavir tablets, 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 tablets, call your local poison control center or emergency room right away.
- If lopinavir and ritonavir tablets is being used for your child, 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.
- 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.
- Lopinavir and ritonavir tablets can be taken with acid reducing agents used for heartburn or reflux such as omeprazole (Prilosec®) and ranitidine (Zantac®) with no dose adjustment.
- Lopinavir and ritaonvir tablets should not be administered once daily in combination with carbamazepine (Tegretol® and Epitol®), phenobarbital (Luminal®) or phenytoin (Dilantin®).

Avoid doing things that can spread HIV infection. Lopinavir and ritonavir tablets do not stop you from passing HIV infection to others. Do not share needles, other injection equipment or personal items that can have blood or body fluids on them, like toothbrushes and razor blades. Always practice safer sex by using a latex or polyurethane condom to lower the chance of sexual contact with semen, vaginal secretions or blood.

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

Lopinavir and ritonavir tablets can cause serious side effects.

- See **"What is the most important information I should know about lopinavir and ritonavir tablets?"**
- **Liver problems.** Liver problems, including death, can happen in people who take lopinavir and ritonavir tablets. Blood tests in people who take lopinavir and ritonavir tablets may show possible liver problems. People with liver disease such as Hepatitis B and Hepatitis C who take lopinavir and ritonavir tablets may have worsening liver disease. Tell your healthcare provider 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.
- **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.
- **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. The long-term chance of getting complications such as heart attacks or stroke due to increases in triglycerides and cholesterol caused by protease inhibitors is not known at this time.
- **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 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.
- **Increased risk of certain problems when you take medicines used for the treatment of erectile problems such as sildenafil (Viagra®), tadalafil (Cialis®), or vardenafil (Levitra®) with lopinavir and ritonavir tablets:**
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  - **penis erection lasting more than 4 hours.** If you are a male and have an erection that lasts longer than 4 hours, get medical help right away to avoid permanent damage to your penis. Your doctor can explain these symptoms to you.
- **Allergic reactions.** Skin rashes, some of them severe, can occur in people who take lopinavir and ritonavir tablets. Tell your healthcare provider if you had a rash when you took another medicine for your HIV 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
- stomach area (abdominal) pain
- feeling weak
- vomiting
- headache
- upset stomach

These are not all of the possible side effects of lopinavir and ritonavir tablets. For more information, ask your doctor or pharmacist. Tell your doctor about any side effect that bothers you or that does not go away.

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?

Lopinavir and ritonavir tablets:

- Lopinavir and ritonavir tablets should be stored at 25°C (77°F); excursions permitted to 15°-30°C (59° to 86°F).
- 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

Lopinavir and ritonavir tablets do not cure HIV-1 or AIDS. The long-term effects of lopinavir and ritonavir tablets are not known at this time. People taking lopinavir and ritonavir tablets may still get opportunistic infections or other conditions that happen with HIV-1 infection. Some of these conditions are pneumonia, herpes virus infections and Mycobacterium avium complex (MAC) infections.

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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 Mylan Pharmaceuticals Inc. at 1-877-4-INFO-RX (1-877-446-3679).

What are the ingredients in lopinavir and ritonavir tablets?

Active ingredient: lopinavir and ritonavir

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- Lopinavir and ritonavir tablets can be taken with acid reducing agents used for heartburn or reflux such as omeprazole (Prilosec®) and ranitidine (Zantac®) with no dose adjustment.
- Lopinavir and ritaonvir tablets should not be administered once daily in combination with carbamazepine (Tegretol® and Epitol®), phenobarbital (Luminal®) or phenytoin (Dilantin®).

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Lopinavir and ritonavir tablets can cause serious side effects.

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- **Liver problems.** Liver problems, including death, can happen in people who take lopinavir and ritonavir tablets. Blood tests in people who take lopinavir and ritonavir tablets may show possible liver problems. People with liver disease such as Hepatitis B and Hepatitis C who take lopinavir and ritonavir tablets may have worsening liver disease. Tell your healthcare provider right away if you have any of these signs and symptoms of liver problems:
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  - yellow skin and whites of eyes (jaundice)
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