

## HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use ABACAVIR, DOLUTEGRAVIR AND LAMIVUDINE TABLETS safely and effectively. See full prescribing information for ABACAVIR, DOLUTEGRAVIR AND LAMIVUDINE TABLETS.

ABACAVIR, DOLUTEGRAVIR, and LAMIVUDINE tablets, for oral use  
Initial U.S. Approval: 2014

### WARNING: HYPERSENSITIVITY REACTIONS, AND EXACERBATIONS OF HEPATITIS B

See full prescribing information for complete boxed warning.

#### Hypersensitivity Reactions

- Serious and sometimes fatal hypersensitivity reactions have occurred with abacavir-containing products. (5.1)
- Hypersensitivity to abacavir is a multi-organ clinical syndrome. (5.1)
- Patients who carry the HLA-B\*5701 allele are at a higher risk of experiencing a hypersensitivity reaction to abacavir. (5.1)
- Abacavir, dolutegravir and lamivudine is contraindicated in patients with a prior hypersensitivity reaction to abacavir and in HLA-B\*5701-positive patients. (4)
- Discontinue abacavir, dolutegravir and lamivudine as soon as a hypersensitivity reaction is suspected. Regardless of HLA-B\*5701 status, permanently discontinue abacavir, dolutegravir and lamivudine if hypersensitivity cannot be ruled out, even when other diagnoses are possible. (5.1)
- Following a hypersensitivity reaction to abacavir, dolutegravir and lamivudine, NEVER restart abacavir, dolutegravir and lamivudine, or any other abacavir-containing product. (5.1)

#### Exacerbations of Hepatitis B

- All patients with HIV-1 should be tested for the presence of hepatitis B virus (HBV) prior to or when initiating abacavir, dolutegravir and lamivudine. Emergence of lamivudine-resistant HBV variants associated with lamivudine-containing antiretroviral regimens has been reported. If abacavir, dolutegravir and lamivudine is used in patients co-infected with HIV-1 and HBV, additional treatment should be considered for appropriate treatment of chronic HBV; otherwise, consider an alternative regimen.
- Severe acute exacerbations of HBV have been reported in patients who are co-infected with HBV and HIV-1 and have discontinued lamivudine, a component of abacavir, dolutegravir and lamivudine. Closely monitor hepatic function in these patients and, if appropriate, initiate anti-HBV treatment. (5.2)

#### -----RECENT MAJOR CHANGES-----

Dosage and Administration (2.2) 4/2024  
Warnings and Precautions, Embryo Fetal Toxicity (5.5) Removed 4/2024

#### -----INDICATIONS AND USAGE-----

Abacavir, dolutegravir and lamivudine tablets are a combination of dolutegravir (integrase strand transfer inhibitor [INSTI]), abacavir, and lamivudine (both nucleoside analogue reverse transcriptase inhibitors) indicated for the treatment of HIV-1 infection in adults and in pediatric patients aged at least 3 months and weighing at least 6 kg. (1)

#### Limitations of Use:

Abacavir, dolutegravir and lamivudine tablets alone are not recommended in patients with resistance-associated integrase substitutions or clinically suspected INSTI resistance because the dose of dolutegravir in abacavir, dolutegravir and lamivudine tablets is insufficient in these subpopulations. See the dolutegravir prescribing information. (1)

#### -----DOSAGE AND ADMINISTRATION-----

- Before initiating abacavir, dolutegravir and lamivudine tablets, screen for the HLA-B\*5701 allele because abacavir, dolutegravir and lamivudine tablets contain abacavir. (2.1).
- Prior to or when initiating abacavir, dolutegravir and lamivudine tablets, test patients for HBV infection. (2.2)

- Abacavir, dolutegravir and lamivudine tablets may be taken with or without food. (2.4, 2.5)
- Adults: One tablet of abacavir, dolutegravir and lamivudine tablets daily. (2.4)

| Pediatric Population Body Weight                       | Number of Tablets (once daily) | Recommended Daily Dose                |
|--------------------------------------------------------|--------------------------------|---------------------------------------|
| Abacavir, dolutegravir and lamivudine Tablets (≥25 kg) |                                |                                       |
| ≥25 kg                                                 | 1                              | 600 mg ABC, 50 mg DTG, and 300 mg 3TC |

ABC = abacavir, DTG = dolutegravir, 3TC = lamivudine.

- Do not substitute abacavir, dolutegravir and lamivudine tablets and TRIUMEQ PD on a milligram-permilligram basis. (2.3)
- If dosing with certain UGT1A or CYP3A inducers, then the recommended dolutegravir dosage regimen should be adjusted. See Table 2 for complete dosing recommendations. (2.6)
- Because abacavir, dolutegravir and lamivudine tablets are fixed-dose tablets and cannot be dose adjusted, abacavir, dolutegravir and lamivudine tablets are not recommended in patients with creatinine clearance <30 mL/min and pediatric patients with a similar degree of renal impairment based on age-appropriate assessment of renal function, or patients with hepatic impairment. (2.7, 4)

#### -----DOSAGE FORMS AND STRENGTHS-----

- Abacavir, dolutegravir and lamivudine tablets: 600 mg of abacavir, 50 mg of dolutegravir, and 300 mg of lamivudine. (3)

#### -----CONTRAINDICATIONS-----

- Presence of HLA-B\*5701 allele. (4)
- Prior hypersensitivity reaction to abacavir, dolutegravir, or lamivudine. (4)
- Coadministration with dofetilide. (4)
- Moderate or severe hepatic impairment. (4, 8.7)

#### -----WARNINGS AND PRECAUTIONS-----

- Hepatotoxicity has been reported in patients receiving a dolutegravir-containing regimen. Monitoring for hepatotoxicity is recommended. (5.3)
- Lactic acidosis and severe hepatomegaly with steatosis, including fatal cases, have been reported with the use of nucleoside analogues. (5.4)
- Immune reconstitution syndrome has been reported in patients treated with combination antiretroviral therapy. (5.6)
- Abacavir, dolutegravir and lamivudine tablets and TRIUMEQ PD tablets for oral suspension are not substitutable. (2.3, 5.7)

#### -----ADVERSE REACTIONS-----

The most commonly reported adverse reactions of at least moderate intensity and incidence at least 2% (in those receiving abacavir, dolutegravir and lamivudine) were insomnia, headache, and fatigue. (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact Hetero Labs Limited at 1-866-495-1995 or FDA at 1-800-FDA-1088 or [www.fda.gov/medwatch](http://www.fda.gov/medwatch).

#### -----DRUG INTERACTIONS-----

Coadministration of abacavir, dolutegravir and lamivudine with other drugs can alter the concentration of other drugs and other drugs may alter the concentrations of abacavir, dolutegravir and lamivudine. The potential drug-drug interactions must be considered prior to and during therapy. (4, 7, 12.3)

#### -----USE IN SPECIFIC POPULATIONS-----

- Pediatrics: Not recommended for patients aged <3 months or weighing <6 kg. (8.4)
- Abacavir, dolutegravir and lamivudine is not recommended in patients with creatinine clearance less than 30 mL/min and pediatric patients with a similar degree of renal impairment based on age-appropriate assessment of renal function. (8.6)
- If a dose reduction of abacavir, a component of abacavir, dolutegravir and lamivudine, is required for patients with mild hepatic impairment, then the individual components should be used. (8.7)

See 17 for PATIENT COUNSELING INFORMATION and Medication Guide.

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## FULL PRESCRIBING INFORMATION

### **WARNING: HYPERSENSITIVITY REACTIONS, AND EXACERBATIONS OF HEPATITIS B**

#### **Hypersensitivity Reactions**

Serious and sometimes fatal hypersensitivity reactions, with multiple organ involvement, have occurred with abacavir, a component of abacavir, dolutegravir and lamivudine. Patients who carry the HLA-B\*5701 allele are at a higher risk of a hypersensitivity reaction to abacavir, although hypersensitivity reactions have occurred in patients who do not carry the HLA-B\*5701 allele [*see Warnings and Precautions (5.1)*].

Abacavir, dolutegravir and lamivudine is contraindicated in patients with a prior hypersensitivity reaction to abacavir and in HLA-B\*5701-positive patients [*see Contraindications (4), Warnings and Precautions (5.1)*]. All patients should be screened for the HLA-B\*5701 allele prior to initiating therapy with abacavir, dolutegravir and lamivudine or reinitiation of therapy with abacavir, dolutegravir and lamivudine, unless patients have a previously documented HLA-B\*5701 allele assessment. Discontinue abacavir, dolutegravir and lamivudine immediately if a hypersensitivity reaction is suspected, regardless of HLA-B\*5701 status and even when other diagnoses are possible [*see Contraindications (4), Warnings and Precautions (5.1)*].

Following a hypersensitivity reaction to abacavir, dolutegravir and lamivudine, NEVER restart abacavir, dolutegravir and lamivudine or any other abacavir-containing product because more severe symptoms, including death can occur within hours. Similar severe reactions have also occurred rarely following the reintroduction of abacavir-containing products in patients who have no history of abacavir hypersensitivity [*see Warnings and Precautions (5.1)*].

#### **Exacerbations of Hepatitis B**

All patients with HIV-1 should be tested for the presence of hepatitis B virus (HBV) prior to or when initiating abacavir, dolutegravir and lamivudine. Emergence of lamivudine-resistant HBV variants associated with lamivudine-containing antiretroviral regimens has been reported. If abacavir, dolutegravir and lamivudine is used in patients co-infected with HIV-1 and HBV, additional treatment should be considered for appropriate treatment of chronic HBV; otherwise, consider an alternative regimen.

Severe acute exacerbations of hepatitis B have been reported in patients who are co-infected with HBV and HIV-1 and have discontinued lamivudine, a component of abacavir, dolutegravir and lamivudine. Closely monitor hepatic function in these patients and, if appropriate, initiate anti-HBV treatment [*see Warnings and Precautions (5.2)*].

## 1 INDICATIONS AND USAGE

Abacavir, dolutegravir and lamivudine tablets are indicated for the treatment of HIV-1 infection in adults and in pediatric patients aged at least 3 months and weighing at least 6 kg.

### Limitations of Use:

Abacavir, dolutegravir and lamivudine tablets alone are not recommended in patients with resistance-associated integrase substitutions or clinically suspected integrase strand transfer inhibitor (INSTI) resistance because the dose of dolutegravir in abacavir, dolutegravir and lamivudine tablets is insufficient in these subpopulations. See full prescribing information for TIVICAY (dolutegravir).

## 2 DOSAGE AND ADMINISTRATION

### 2.1 Screening for HLA-B\*5701 Allele prior to Initiating Abacavir, Dolutegravir and Lamivudine Tablets

Screen for the HLA-B\*5701 allele prior to initiating therapy with abacavir, dolutegravir and lamivudine tablets [see *Boxed Warning, Warnings and Precautions (5.1)*].

### 2.2 Testing prior to or When Initiating Treatment with Abacavir, Dolutegravir and Lamivudine Tablets

Prior to or when initiating abacavir, dolutegravir and lamivudine tablets, test patients for HBV infection [see *Warnings and Precautions (5.2)*].

### 2.3 Overview of Abacavir, Dolutegravir and Lamivudine Dosage Forms

**Do not substitute abacavir, dolutegravir and lamivudine tablets and TRIUMEQ PD tablets for oral suspension on a milligram-per-milligram basis due to differing pharmacokinetic profiles for the dolutegravir component** [see *Warnings and Precautions (5.7), Clinical Pharmacology (12.3)*].

- Abacavir, dolutegravir and lamivudine tablets: 600 mg of abacavir, 50 mg of dolutegravir, and 300 mg of lamivudine. Abacavir, dolutegravir and lamivudine tablets are recommended in adults and pediatric patients weighing at least 25 kg [see *Dosage and Administration (2.4, 2.5)*].

### 2.4 Recommended Dosage in Adults

Abacavir, dolutegravir and lamivudine tablets are a fixed-dose combination product containing 600 mg of abacavir, 50 mg of dolutegravir, and 300 mg of lamivudine. The recommended dosage regimen of abacavir, dolutegravir and lamivudine tablets in adults is one tablet once daily orally with or without food.

## 2.5 Recommended Dosage and Administration Instructions for Pediatric Patients Weighing at Least 6 kg

The dosage and dosage form recommended for pediatric patients varies by weight as shown in Table 1 below.

**Table 1. Recommended Dosage of Abacavir, Dolutegravir and Lamivudine Tablets in Pediatric Patients**

| Body Weight     | Abacavir, Dolutegravir and Lamivudine Tablets <sup>a</sup> | Total Daily Dose                                                      |
|-----------------|------------------------------------------------------------|-----------------------------------------------------------------------|
| 6 kg to <10 kg  | Not recommended                                            | 180 mg abacavir, 15 mg dolutegravir, and 90 mg lamivudine once daily  |
| 10 kg to <14 kg | Not recommended                                            | 240 mg abacavir, 20 mg dolutegravir, and 120 mg lamivudine once daily |
| 14 kg to <20 kg | Not recommended                                            | 300 mg abacavir, 25 mg dolutegravir, and 150 mg lamivudine once daily |
| 20 kg to <25 kg | Not recommended                                            | 360 mg abacavir, 30 mg dolutegravir, and 180 mg lamivudine once daily |
| ≥25 kg          | 1 tablet once daily                                        | 600 mg of abacavir, 50 mg of dolutegravir, and 300 mg of lamivudine   |

<sup>a</sup> Abacavir, dolutegravir and lamivudine tablets are a fixed-dose combination product containing 600 mg of abacavir, 50 mg of dolutegravir, and 300 mg of lamivudine.

Administer abacavir, dolutegravir and lamivudine tablet with or without food. Do not chew, cut, or crush the tablet.

## 2.6 Dosage Recommendation with Certain Concomitant Medications

The dolutegravir dose in abacavir, dolutegravir and lamivudine tablets (50 mg) is insufficient when coadministered with medications listed in Table 2 that may decrease dolutegravir concentrations; the following dolutegravir dosage regimen is recommended.

**Table 2. Dosing Recommendations for Abacavir, Dolutegravir and Lamivudine tablets with Coadministered Medications**

| Coadministered Drug                                                                  | Dosing Recommendation                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Efavirenz, fosamprenavir/ritonavir, tipranavir/ritonavir, carbamazepine, or rifampin | In adults and in pediatric patients <b>weighing at least 25 kg</b> , the recommended dolutegravir dosage regimen is 50 mg twice daily. Thus, an additional TIVICAY 50-mg tablet, separated by 12 hours from abacavir, dolutegravir and lamivudine tablets, should be taken. |

## 2.7 Not Recommended Due to Lack of Dosage Adjustment

Because abacavir, dolutegravir and lamivudine tablets are fixed-dose tablets and cannot be dose adjusted, abacavir, dolutegravir and lamivudine tablets are not recommended in:

- patients with creatinine clearance <30 mL/min and pediatric patients with a similar degree of renal impairment based on age-appropriate renal function assessment. There are no data

available on the use of lamivudine, a component of abacavir, dolutegravir and lamivudine tablets, in pediatric patients with renal impairment [see *Use in Specific Populations* (8.4, 8.6)].

- patients with mild hepatic impairment. Abacavir, dolutegravir and lamivudine tablets are contraindicated in patients with moderate or severe hepatic impairment [see *Contraindications* (4), *Use in Specific Populations* (8.7)].

### **3 DOSAGE FORMS AND STRENGTHS**

Abacavir, dolutegravir and lamivudine tablets are beige colored, oval shaped, biconvex, film coated tablets debossed with 'H' on one side and 'A60' on the other side. Each film-coated tablet contains abacavir sulfate equivalent to 600 mg of abacavir, dolutegravir sodium equivalent to 50 mg of dolutegravir, and 300 mg of lamivudine [see *Description* (11)].

### **4 CONTRAINDICATIONS**

Abacavir, dolutegravir and lamivudine is contraindicated in patients:

- who have the HLA-B\*5701 allele [see *Warnings and Precautions* (5.1)].
- with prior hypersensitivity reaction to abacavir, dolutegravir [see *Warnings and Precautions* (5.1)], or lamivudine.
- receiving dofetilide due to the potential for increased dofetilide plasma concentrations and the risk for serious and/or life-threatening events with concomitant use of dolutegravir [see *Drug Interactions* (7)].
- with moderate or severe hepatic impairment [see *Use in Specific Populations* (8.7)].

### **5 WARNINGS AND PRECAUTIONS**

#### **5.1 Hypersensitivity Reactions**

Hypersensitivity reactions have been reported with the use of abacavir or dolutegravir, components of abacavir, dolutegravir and lamivudine.

##### Abacavir

Serious and sometimes fatal hypersensitivity reactions have occurred with abacavir-containing regimens. See full prescribing information for ZIAGEN (abacavir).

Abacavir hypersensitivity reactions have included multi-organ failure and anaphylaxis and typically occurred within the first 6 weeks of treatment with abacavir (median time to onset was 9 days); although abacavir hypersensitivity reactions have occurred any time during treatment [see *Adverse Reactions* (6.1)]. Patients who carry the HLA-B\*5701 allele are at a higher risk of abacavir hypersensitivity reactions; although, patients who do not carry the HLA-B\*5701 allele have developed hypersensitivity reactions. Hypersensitivity to abacavir was reported in approximately 206 (8%) of 2,670 patients in 9 clinical trials with abacavir-containing products where HLA-B\*5701 screening was not performed. The incidence of suspected abacavir hypersensitivity reactions in clinical trials was 1% when subjects carrying the HLA-B\*5701 allele were excluded. In any patient treated with abacavir, the clinical diagnosis of hypersensitivity reaction must remain the basis of clinical decision making.

Due to the potential for severe, serious, and possibly fatal hypersensitivity reactions with abacavir:

- All patients should be screened for the HLA-B\*5701 allele prior to initiating therapy with abacavir, dolutegravir and lamivudine or reinitiation of therapy with abacavir, dolutegravir and lamivudine, unless patients have a previously documented HLA-B\*5701 allele assessment.
- Abacavir, dolutegravir and lamivudine is contraindicated in patients with a prior hypersensitivity reaction to abacavir and in HLA-B\*5701-positive patients.
- Before starting abacavir, dolutegravir and lamivudine, review medical history for prior exposure to any abacavir-containing product. NEVER restart abacavir, dolutegravir and lamivudine or any other abacavir-containing product following a hypersensitivity reaction to abacavir, regardless of HLA-B\*5701 status.
- To reduce the risk of a life-threatening hypersensitivity reaction, regardless of HLA-B\*5701 status, discontinue abacavir, dolutegravir and lamivudine immediately if a hypersensitivity reaction is suspected, even when other diagnoses are possible (e.g., acute onset respiratory diseases such as pneumonia, bronchitis, pharyngitis, or influenza; gastroenteritis; or reactions to other medications). Clinical status, including liver chemistries, should be monitored and appropriate therapy initiated.
- If a hypersensitivity reaction cannot be ruled out, do not restart abacavir, dolutegravir and lamivudine or any other abacavir-containing products because more severe symptoms, which may include life-threatening hypotension and death, can occur within hours.
- Clinically, it is not possible to determine whether a hypersensitivity reaction with abacavir, dolutegravir and lamivudine would be caused by abacavir or dolutegravir. Therefore, never restart abacavir, dolutegravir and lamivudine or any other abacavir- or dolutegravir-containing product in patients who have stopped therapy with abacavir, dolutegravir and lamivudine due to a hypersensitivity reaction.
- If a hypersensitivity reaction is ruled out, patients may restart abacavir, dolutegravir and lamivudine. Rarely, patients who have stopped abacavir for reasons other than symptoms of hypersensitivity have also experienced life-threatening reactions within hours of reinitiating abacavir therapy. Therefore, reintroduction of abacavir, dolutegravir and lamivudine, or any other abacavir-containing product, is recommended only if medical care can be readily accessed.
- A Medication Guide and Warning Card that provide information about recognition of abacavir hypersensitivity reactions should be dispensed with each new prescription and refill.

### Dolutegravir

Hypersensitivity reactions have been reported and were characterized by rash, constitutional findings, and sometimes organ dysfunction, including liver injury. The events were reported in <1% of subjects receiving TIVICAY in Phase 3 clinical trials. Discontinue abacavir, dolutegravir and lamivudine and other suspect agents immediately if signs or symptoms of hypersensitivity reactions develop (including, but not limited to, severe rash or rash accompanied by fever, general malaise, fatigue, muscle or joint aches, blisters or peeling of the skin, oral blisters or lesions, conjunctivitis, facial edema, hepatitis, eosinophilia, angioedema, difficulty breathing). Clinical

status, including liver aminotransferases, should be monitored and appropriate therapy initiated. Delay in stopping treatment with abacavir, dolutegravir and lamivudine or other suspect agents after the onset of hypersensitivity may result in a life-threatening reaction.

Clinically, it is not possible to determine whether a hypersensitivity reaction with abacavir, dolutegravir and lamivudine would be caused by abacavir or dolutegravir. Therefore, never restart abacavir, dolutegravir and lamivudine or any other abacavir- or dolutegravir-containing product in patients who have stopped therapy with abacavir, dolutegravir and lamivudine due to a hypersensitivity reaction.

## **5.2 Patients Co-infected with HIV-1 and HBV: Emergence of Lamivudine-Resistant HBV and the Risk of Posttreatment Exacerbations of HBV**

All patients with HIV-1 should be tested for the presence of HBV prior to or when initiating abacavir, dolutegravir and lamivudine.

### **Emergence of Lamivudine Resistant HBV**

Safety and efficacy of lamivudine have not been established for treatment of chronic HBV in subjects dually infected with HIV-1 and HBV. Emergence of HBV variants associated with resistance to lamivudine has been reported in HIV-1–infected subjects who have received lamivudine-containing antiretroviral regimens in the presence of concurrent infection with HBV. If a decision is made to administer abacavir, dolutegravir and lamivudine to patients co-infected with HIV-1 and HBV, additional treatment should be considered for appropriate treatment of chronic HBV; otherwise, consider an alternative regimen.

### **Severe Acute Exacerbations of HBV in Patients Co-infected with HIV-1 and HBV**

Severe acute exacerbations of HBV have been reported in patients who are co-infected with HIV-1 and HBV and have discontinued products containing lamivudine, and may occur with discontinuation of abacavir, dolutegravir and lamivudine. Patients who are co-infected with HIV-1 and HBV who discontinue abacavir, dolutegravir and lamivudine should be closely monitored with both clinical and laboratory follow-up for at least several months after stopping treatment with abacavir, dolutegravir and lamivudine. If appropriate, initiation of anti-HBV therapy may be warranted, especially in patients with advanced liver disease or cirrhosis since posttreatment exacerbation of hepatitis may lead to hepatic decompensation and liver failure.

## **5.3 Hepatotoxicity**

Hepatic adverse events have been reported in patients receiving a dolutegravir-containing regimen [see *Adverse Reactions* (6.1, 6.2)]. Patients with underlying hepatitis B or C may be at increased risk for worsening or development of transaminase elevations with use of abacavir, dolutegravir and lamivudine [see *Adverse Reactions* (6.1)]. In some cases, the elevations in transaminases were consistent with immune reconstitution syndrome or hepatitis B reactivation particularly in the setting where anti-hepatitis therapy was withdrawn. Cases of hepatic toxicity, including elevated serum liver biochemistries, hepatitis, and acute liver failure, have also been reported in patients, including pediatric patients receiving a dolutegravir-containing regimen who had no pre-existing hepatic disease or other identifiable risk factors. Drug-induced liver injury



leading to liver transplant has been reported with abacavir, dolutegravir and lamivudine. Monitoring for hepatotoxicity is recommended.

#### **5.4 Lactic Acidosis and Severe Hepatomegaly with Steatosis**

Lactic acidosis and severe hepatomegaly with steatosis, including fatal cases, have been reported with the use of nucleoside analogues, including abacavir and lamivudine (components of abacavir, dolutegravir and lamivudine). A majority of these cases have been in women. Female sex and obesity may be risk factors for the development of lactic acidosis and severe hepatomegaly with steatosis in patients treated with antiretroviral nucleoside analogues. See full prescribing information for ZIAGEN (abacavir) and EPIVIR (lamivudine). Treatment with abacavir, dolutegravir and lamivudine should be suspended in any patient who develops clinical or laboratory findings suggestive of lactic acidosis or pronounced hepatotoxicity, which may include hepatomegaly and steatosis even in the absence of marked transaminase elevations.

#### **5.5 Risk of Adverse Reactions or Loss of Virologic Response Due to Drug Interactions**

The concomitant use of abacavir, dolutegravir and lamivudine and other drugs may result in known or potentially significant drug interactions, some of which may lead to [see *Contraindications (4)*, *Drug Interactions (7.3)*]:

- Loss of therapeutic effect of abacavir, dolutegravir and lamivudine and possible development of resistance.
- Possible clinically significant adverse reactions from greater exposures of concomitant drugs.

See Table 6 for steps to prevent or manage these possible and known significant drug interactions, including dosing recommendations. Consider the potential for drug interactions prior to and during therapy with abacavir, dolutegravir and lamivudine, review concomitant medications during therapy with abacavir, dolutegravir and lamivudine, and monitor for the adverse reactions associated with the concomitant drugs.

#### **5.6 Immune Reconstitution Syndrome**

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

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

#### **5.7 Different Formulations Are Not Substitutable**

Abacavir, dolutegravir and lamivudine tablets and TRIUMEQ PD are not bioequivalent and are not substitutable on a milligram-per-milligram basis [see *Clinical Pharmacology (12.3)*]. If a

pediatric patient switches from the tablets for oral suspension to the tablets, the dosage must be adjusted [see *Dosage and Administration* (2.3, 2.5)]. Incorrect dosing of a given formulation may result in underdosing and loss of therapeutic effect and possible development of resistance or possible clinically significant adverse reactions from greater exposure to the individual components.

## 5.8 Myocardial Infarction

Several prospective, observational, epidemiological studies have reported an association with the use of abacavir and the risk of myocardial infarction (MI). Meta-analyses of randomized, controlled clinical trials have observed no excess risk of MI in abacavir-treated subjects as compared with control subjects. To date, there is no established biological mechanism to explain a potential increase in risk. In totality, the available data from the observational studies and from controlled clinical trials show inconsistency; therefore, evidence for a causal relationship between abacavir and the risk of MI is inconclusive.

As a precaution, the underlying risk of coronary heart disease should be considered when prescribing antiretroviral therapies, including abacavir, and action taken to minimize all modifiable risk factors (e.g., hypertension, hyperlipidemia, diabetes mellitus, smoking).

## 6 ADVERSE REACTIONS

The following adverse reactions are discussed in other sections of the labeling:

- Serious and sometimes fatal hypersensitivity reaction [see *Boxed Warning, Warnings and Precautions* (5.1)].
- Exacerbations of hepatitis B [see *Boxed Warning, Warnings and Precautions* (5.3)].
- Hepatotoxicity [see *Warnings and Precautions* (5.3)].
- Lactic acidosis and severe hepatomegaly with steatosis [see *Warnings and Precautions* (5.4)].
- Immune reconstitution syndrome [see *Warnings and Precautions* (5.6)].
- Myocardial infarction [see *Warnings and Precautions* (5.8)].

### 6.1 Clinical Trials Experience

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

#### Clinical Trials in Adults

*Serious and Fatal Abacavir-Associated Hypersensitivity Reactions:* In clinical trials, serious and sometimes fatal hypersensitivity reactions have occurred with abacavir, a component of abacavir, dolutegravir and lamivudine [see *Boxed Warning, Warnings and Precautions* (5.1)]. These reactions have been characterized by 2 or more of the following signs or symptoms: (1) fever; (2) rash; (3) gastrointestinal symptoms (including nausea, vomiting, diarrhea, or abdominal pain); (4) constitutional symptoms (including generalized malaise, fatigue, or achiness); (5) respiratory symptoms (including dyspnea, cough, or pharyngitis). Almost all abacavir hypersensitivity reactions include fever and/or rash as part of the syndrome.

Other signs and symptoms have included lethargy, headache, myalgia, edema, arthralgia, and paresthesia. Anaphylaxis, liver failure, renal failure, hypotension, adult respiratory distress syndrome, respiratory failure, myolysis, and death have occurred in association with these hypersensitivity reactions. Physical findings have included lymphadenopathy, mucous membrane lesions (conjunctivitis and mouth ulcerations), and maculopapular or urticarial rash (although some patients had other types of rashes and others did not have a rash). There were reports of erythema multiforme. Laboratory abnormalities included elevated liver chemistries, elevated creatine phosphokinase, elevated creatinine, and lymphopenia and abnormal chest x-ray findings (predominantly infiltrates, which were localized).

**Serious Dolutegravir Hypersensitivity Reactions:** In clinical trials, hypersensitivity reactions have occurred with dolutegravir, a component of abacavir, dolutegravir and lamivudine [see *Warnings and Precautions* (5.1)]. These hypersensitivity reactions have been characterized by rash, constitutional findings, and sometimes organ dysfunction, including liver injury.

**Additional Treatment-Emergent Adverse Drug Reactions (ADRs) with Use of Abacavir, Dolutegravir and Lamivudine :** The safety assessment of abacavir, dolutegravir and lamivudine is primarily based on the analyses of data from a randomized, international, multicenter, double-blind, active-controlled trial, SINGLE (ING114467) and supported by data in treatment-experienced, INSTI-naïve subjects from SAILING (ING111762) and by data from other treatment-naïve trials. See full prescribing information for TIVICAY.

**Treatment-Naïve Subjects:** In SINGLE, 833 adult subjects were randomized and received at least one dose of either dolutegravir (TIVICAY) 50 mg with fixed-dose abacavir and lamivudine (EPZICOM) once daily (n = 414) or fixed-dose efavirenz/emtricitabine/tenofovir (ATRIPLA) once daily (n = 419) (study treatment was blinded through Week 96 and open-label from Week 96 through Week 144). Through 144 weeks, the rate of adverse events leading to discontinuation was 4% in subjects receiving TIVICAY + EPZICOM and 14% in subjects receiving ATRIPLA once daily.

Treatment-emergent ADRs of moderate to severe intensity observed in at least 2% of subjects in either treatment arm of SINGLE are provided in Table 3.

**Table 3. Treatment-Emergent Adverse Drug Reactions of at Least Moderate Intensity (Grades 2 to 4) and at Least 2% Frequency in Treatment-Naïve Subjects in SINGLE (Week 144 Analysis)**

| Adverse Reaction        | TIVICAY + EPZICOM<br>Once Daily<br>(n = 414) | ATRIPLA<br>Once Daily<br>(n = 419) |
|-------------------------|----------------------------------------------|------------------------------------|
| <b>Psychiatric</b>      |                                              |                                    |
| Insomnia                | 3%                                           | 3%                                 |
| Depression              | 1%                                           | 2%                                 |
| Abnormal dreams         | <1%                                          | 2%                                 |
| <b>Nervous System</b>   |                                              |                                    |
| Dizziness               | <1%                                          | 5%                                 |
| Headache                | 2%                                           | 2%                                 |
| <b>Gastrointestinal</b> |                                              |                                    |
| Nausea                  | <1%                                          | 3%                                 |

|                                     |     |    |
|-------------------------------------|-----|----|
| Diarrhea                            | <1% | 2% |
| <b>General Disorders</b>            |     |    |
| Fatigue                             | 2%  | 2% |
| <b>Skin and Subcutaneous Tissue</b> |     |    |
| Rash <sup>a</sup>                   | <1% | 6% |
| <b>Ear and Labyrinth</b>            |     |    |
| Vertigo                             | 0   | 2% |

<sup>a</sup> Includes pooled terms: rash, rash generalized, rash macular, rash maculo-papular, rash pruritic, and drug eruption.

*Treatment-Experienced Subjects:* SAILING is an international, double-blind trial in INSTI-naïve, antiretroviral treatment-experienced adult subjects. Subjects were randomized and received either TIVICAY 50 mg once daily or raltegravir 400 mg twice daily with investigator-selected background regimen consisting of up to 2 agents, including at least one fully active agent. At 48 weeks, the rate of adverse events leading to discontinuation was consistent with that seen in the overall treatment-naïve patient population. See full prescribing information for TIVICAY.

The ADRs observed in the subset of subjects who received TIVICAY + EPZICOM were generally consistent with those seen in the overall treatment-naïve patient population.

*Less Common Adverse Reactions Observed in Clinical Trials:* The following adverse reactions occurred in <2% of treatment-naïve or treatment-experienced subjects in any one trial. These events have been included because of their seriousness and/or assessment of potential causal relationship.

*Gastrointestinal Disorders:* Abdominal pain, abdominal distention, abdominal discomfort, dyspepsia, flatulence, gastroesophageal reflux disease, upper abdominal pain, vomiting.

*General Disorders:* Fever, lethargy.

*Hepatobiliary Disorders:* Hepatitis.

*Metabolism and Nutrition Disorders:* Anorexia, hypertriglyceridemia.

*Musculoskeletal Disorders:* Arthralgia, myositis.

*Nervous System Disorders:* Somnolence.

*Psychiatric Disorders:* Suicidal ideation, attempt, behavior, or completion. These events were observed primarily in subjects with a pre-existing history of depression or other psychiatric illness. Nightmare and sleep disorder.

*Renal and Urinary Disorders:* Renal impairment.

*Skin and Subcutaneous Tissue Disorders:* Pruritus.

*Laboratory Abnormalities: Treatment-Naïve Subjects:* Selected laboratory abnormalities (Grades 2 to 4) with a worsening grade from baseline and representing the worst-grade toxicity in at least 2% of subjects in SINGLE are presented in Table 4. The mean change from baseline observed for selected lipid values is presented in Table 5.

**Table 4. Selected Laboratory Abnormalities (Grades 2 to 4) in Treatment-Naïve Subjects in SINGLE (Week 144 Analysis)**

| Laboratory Abnormality                   | TIVICAY + EPZICOM<br>Once Daily<br>(n = 414) | ATRIPLA<br>Once Daily<br>(n = 419) |
|------------------------------------------|----------------------------------------------|------------------------------------|
| ALT                                      |                                              |                                    |
| Grade 2 (>2.5 to 5.0 x ULN)              | 3%                                           | 5%                                 |
| Grade 3 to 4 (>5.0 x ULN)                | 1%                                           | <1%                                |
| AST                                      |                                              |                                    |
| Grade 2 (>2.5 to 5.0 x ULN)              | 3%                                           | 4%                                 |
| Grade 3 to 4 (>5.0 x ULN)                | 1%                                           | 3%                                 |
| Creatine kinase                          |                                              |                                    |
| Grade 2 (6.0 to 9.9 x ULN)               | 5%                                           | 3%                                 |
| Grade 3 to 4 ( $\geq 10.0$ x ULN)        | 7%                                           | 8%                                 |
| Hyperglycemia                            |                                              |                                    |
| Grade 2 (126 to 250 mg/dL)               | 9%                                           | 6%                                 |
| Grade 3 (>250 mg/dL)                     | 2%                                           | <1%                                |
| Lipase                                   |                                              |                                    |
| Grade 2 (>1.5 to 3.0 x ULN)              | 11%                                          | 11%                                |
| Grade 3 to 4 (>3.0 ULN)                  | 5%                                           | 4%                                 |
| Total neutrophils                        |                                              |                                    |
| Grade 2 ( $0.75$ to $0.99 \times 10^9$ ) | 4%                                           | 5%                                 |
| Grade 3 to 4 ( $<0.75 \times 10^9$ )     | 3%                                           | 3%                                 |

ALT = Alanine aminotransferase, AST = Aspartate aminotransferase, ULN = upper limit of normal.

**Table 5. Mean Change from Baseline in Fasted Lipid Values in Treatment-Naïve Subjects in SINGLE (Week 144 Analysis<sup>a</sup>)**

| Lipid                   | TIVICAY + EPZICOM<br>Once Daily<br>(n = 414) | ATRIPLA<br>Once Daily<br>(n = 419) |
|-------------------------|----------------------------------------------|------------------------------------|
| Cholesterol (mg/dL)     | 24.0                                         | 26.7                               |
| HDL cholesterol (mg/dL) | 5.4                                          | 7.2                                |
| LDL cholesterol (mg/dL) | 16.0                                         | 14.6                               |
| Triglycerides (mg/dL)   | 13.6                                         | 31.9                               |

HDL = High-density lipoprotein, LDL = Low-density lipoprotein.

<sup>a</sup> Subjects on lipid-lowering agents at baseline were excluded from these analyses (TIVICAY + EPZICOM: n = 30 and ATRIPLA: n = 27). Seventy-two subjects initiated a lipid-lowering agent post-baseline; their last fasted on-treatment values (prior to starting the agent) were used regardless of whether they discontinued the agent (TIVICAY + EPZICOM: n = 36 and ATRIPLA: n = 36).

*Treatment-Experienced Subjects:* Laboratory abnormalities observed in SAILING were generally similar compared with observations seen in the treatment-naïve trials.

*Hepatitis C Virus Co-infection:* In SINGLE, the pivotal Phase 3 trial, subjects with hepatitis C virus co-infection were permitted to enroll provided that baseline liver chemistry tests did not exceed 5 times the upper limit of normal; subjects with hepatitis B co-infection were excluded. Overall, the safety profile in subjects with hepatitis C virus co-infection was similar to that observed in subjects without hepatitis C co-infection, although the rates of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) abnormalities were higher in the subgroup with hepatitis C virus co-infection for both treatment groups. Grades 2 to 4 ALT

abnormalities in hepatitis C co-infected compared with HIV mono-infected subjects receiving abacavir, dolutegravir and lamivudine were observed in 15% and 2% (vs. 24% and 4% of subjects treated with ATRIPLA) (Week 96 analysis), respectively [see *Warnings and Precautions (5.2)*]. See also full prescribing information for TIVICAY.

*Changes in Serum Creatinine:* Dolutegravir has been shown to increase serum creatinine due to inhibition of tubular secretion of creatinine without affecting renal glomerular function [see *Clinical Pharmacology (12.2)*]. Increases in serum creatinine occurred within the first 4 weeks of treatment and remained stable through 144 weeks. In SINGLE, a mean change from baseline of 0.14 mg/dL (range: -0.25 mg/dL to 0.81 mg/dL) was observed after 144 weeks of treatment. Creatinine increases were similar in treatment-experienced subjects.

*Abacavir and Lamivudine:* Laboratory abnormalities observed in clinical trials of ZIAGEN (in combination with other antiretroviral treatment) were anemia, neutropenia, liver function test abnormalities, and elevations of creatine phosphokinase (CPK), blood glucose, and triglycerides. Additional laboratory abnormalities observed in clinical trials of EPIVIR (in combination with other antiretroviral treatment) were thrombocytopenia and elevated levels of bilirubin, amylase, and lipase.

#### Clinical Trials Experience in Pediatric Subjects

*Abacavir, Dolutegravir and Lamivudine:* The safety of abacavir, dolutegravir and lamivudine in pediatric subjects with HIV-1 infection weighing at least 6 kg was evaluated in the IMPAACT 2019 trial. This was a multicenter, open-label, non-comparative trial of pediatric subjects with HIV-1 infection, younger than 12 years of age. Fifty-seven subjects weighing at least 6 kg to less than 40 kg were enrolled in this trial [see *Use in Specific Populations (8.4)*, *Clinical Pharmacology (12.3)*, *Clinical Studies (14.2)*]. Overall, the safety data in this pediatric study was similar to that seen in adults.

The safety analysis through Week 48 included 57 subjects weighing at least 6 kg at enrollment who received the recommended dose (determined by weight) and formulation. This analysis showed that 26% of subjects experienced clinical adverse reactions. The most common adverse reactions were classified as laboratory abnormalities and included decreased glomerular filtration rate (n = 13, 23%), increased blood creatinine (n = 10, 18%), and increased ALT (n = 3, 5%). All other adverse reactions occurred at a rate of <2% of participants. Two subjects reported Grade 3 or 4 adverse reactions. One subject, an 8-year-old female who weighed 22 kg at baseline, experienced Grade 3 increased blood creatinine and Grade 3 decreased glomerular filtration rate. By Week 48, the glomerular filtration rate was improving, and the events did not lead to drug discontinuation. Another subject, a 7-year-old male who weighed 20 kg at baseline, experienced drug-induced liver injury with Grade 4 increased ALT and AST following 36 weeks of treatment with TRIUMEQ PD. Clinical signs or symptoms of hepatitis were not reported, and ALT and AST values normalized after TRIUMEQ PD was discontinued.

*Abacavir and Lamivudine:* The safety of once-daily compared with twice-daily dosing of abacavir and lamivudine, administered as either single products or as EPZICOM, was assessed in the ARROW trial (n = 336). Primary safety assessment in the ARROW (COL105677) trial was based on Grade 3 and Grade 4 adverse events. One event of Grade 4 hepatitis in the once-daily cohort was considered as uncertain causality by the investigator and all other Grade 3 or 4 adverse events

were considered not related by the investigator. No additional safety issues were identified in pediatric subjects compared with historical data in adults.

*Dolutegravir*: The safety of dolutegravir in pediatric subjects with HIV-1 infection weighing at least 6 kg was evaluated in the IMPAACT P1093 trial [see *Use in Specific Populations* (8.4), *Clinical Pharmacology* (12.3)]. Overall, the safety data in this pediatric study was similar to that seen in adults.

IMPAACT P1093 is an ongoing multicenter, open-label, non-comparative trial of pediatric subjects with HIV-1 infection, aged <18 years. One hundred and forty-two subjects weighing at least 6 kg were enrolled in this trial [see *Use in Specific Populations* (8.4), *Clinical Pharmacology* (12.3), *Clinical Studies* (14.2)].

The safety analysis through Week 24 included 60 subjects weighing at least 6 kg at enrollment who received the recommended dose (determined by weight and age) and formulation. This analysis showed that 13% of subjects experienced adverse reactions. Grade 1 to 2 adverse reactions reported by more than one subject was immune reconstitution inflammatory syndrome (n = 2). There were no Grade 3 or 4 adverse reactions reported. No adverse reactions led to discontinuation.

The Grade 3 or 4 laboratory abnormalities reported in more than one subject weighing at least 6 kg at enrollment were decreased neutrophil count (n = 5), decreased blood bicarbonate (n = 3), increased lipase (n = 2), and increased blood potassium (n = 2). These laboratory events were not considered to be drug related. Changes in median serum creatinine were similar to those observed in adults.

## **6.2 Postmarketing Experience**

In addition to adverse reactions reported from clinical trials, the following adverse reactions have been identified during postmarketing use with one or more of the components of abacavir, dolutegravir and lamivudine. Because these reactions are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

### Blood and Lymphatic Systems

Aplastic anemia, anemia (including pure red cell aplasia and severe anemias progressing on therapy), lymphadenopathy, splenomegaly.

### Digestive

Stomatitis.

### Gastrointestinal

Pancreatitis.

### General

Weakness.

### Hepatobiliary Disorders

Acute liver failure, liver transplant [see *Warnings and Precautions* (5.3)].

### Hypersensitivity

Sensitization reactions (including anaphylaxis), urticaria [see *Warnings and Precautions* (5.1), *Adverse Reactions* (6.1)].

### Investigations

Weight increased.

### Metabolism and Nutrition Disorders

Hyperlactemia.

### Musculoskeletal

CPK elevation, muscle weakness, myalgia, rhabdomyolysis.

### Nervous

Paresthesia, peripheral neuropathy, seizures.

### Psychiatric

Anxiety.

### Respiratory

Abnormal breath sounds/wheezing.

### Skin

Alopecia, erythema multiforme. Suspected Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) have been reported in patients receiving abacavir primarily in combination with medications known to be associated with SJS and TEN, respectively. Because of the overlap of clinical signs and symptoms between hypersensitivity to abacavir and SJS and TEN, and the possibility of multiple drug sensitivities in some patients, abacavir should be discontinued and not restarted in such cases [see *Adverse Reactions* (6.1)].

## **7 DRUG INTERACTIONS**

### **7.1 Effect of Dolutegravir on the Pharmacokinetics of Other Agents**

*In vitro*, dolutegravir inhibited the renal organic cation transporters (OCT)2 ( $IC_{50}$  = 1.93 microM) and multidrug and toxin extrusion transporter (MATE)1 ( $IC_{50}$  = 6.34 microM). *In vivo*, dolutegravir inhibits tubular secretion of creatinine by inhibiting OCT2 and potentially MATE1. Dolutegravir may increase plasma concentrations of drugs eliminated via OCT2 or MATE1 (dofetilide, dalfampridine, and metformin) [see *Contraindications* (4), *Drug Interactions* (7.3)].

*In vitro*, dolutegravir inhibited the basolateral renal transporters, organic anion transporter (OAT) 1 ( $IC_{50}$  = 2.12 microM) and OAT3 ( $IC_{50}$  = 1.97 microM). However, *in vivo*, dolutegravir did not alter the plasma concentrations of tenofovir or para-amino hippurate, substrates of OAT1 and OAT3.



*In vitro*, dolutegravir did not inhibit ( $IC_{50} > 50$  microM) the following: cytochrome P450 (CYP)1A2, CYP2A6, CYP2B6, CYP2C8, CYP2C9, CYP2C19, CYP2D6, CYP3A, uridine diphosphate (UDP)-glucuronosyl transferase (UGT)1A1, UGT2B7, P-glycoprotein (P-gp), breast cancer resistance protein (BCRP), bile salt export pump (BSEP), organic anion transporter polypeptide (OATP)1B1, OATP1B3, OCT1, or multidrug resistance protein (MRP)2, or MRP4. *In vitro*, dolutegravir did not induce CYP1A2, CYP2B6, CYP3A4. Based on these data and the results of drug interaction trials, dolutegravir is not expected to affect the pharmacokinetics of drugs that are substrates of these enzymes or transporters.

In drug interaction trials, dolutegravir did not have a clinically relevant effect on the pharmacokinetics of the following drugs: tenofovir, methadone, midazolam, rilpivirine, and oral contraceptives containing norgestimate and ethinyl estradiol. Using cross-study comparisons to historical pharmacokinetic data for each interacting drug, dolutegravir did not appear to affect the pharmacokinetics of the following drugs: atazanavir, darunavir, efavirenz, etravirine, fosamprenavir, lopinavir, ritonavir, and boceprevir.

## **7.2 Effect of Other Agents on the Pharmacokinetics of Dolutegravir**

Dolutegravir is metabolized by UGT1A1 with some contribution from CYP3A. Dolutegravir is also a substrate of UGT1A3, UGT1A9, BCRP, and P-gp *in vitro*. Drugs that induce those enzymes and transporters may decrease dolutegravir plasma concentrations and reduce the therapeutic effect of dolutegravir.

Coadministration of dolutegravir and other drugs that inhibit these enzymes may increase dolutegravir plasma concentrations.

Etravirine significantly reduced plasma concentrations of dolutegravir, but the effect of etravirine was mitigated by coadministration of lopinavir/ritonavir or darunavir/ritonavir and is expected to be mitigated by atazanavir/ritonavir (Table 6) [see *Drug Interactions* (7.3), *Clinical Pharmacology* (12.3)].

*In vitro*, dolutegravir was not a substrate of OATP1B1 or OATP1B3.

Darunavir/ritonavir, lopinavir/ritonavir, rilpivirine, tenofovir, boceprevir, prednisone, rifabutin, and omeprazole had no clinically significant effect on the pharmacokinetics of dolutegravir.

## **7.3 Established and Other Potentially Significant Drug Interactions**

There were no drug-drug interaction trials conducted with the abacavir, dolutegravir, and lamivudine fixed-dose combination tablets.

Information regarding potential drug interactions with the individual components of abacavir, dolutegravir and lamivudine is provided below. These recommendations are based on either drug interaction trials or predicted interactions due to the expected magnitude of interaction and potential for serious adverse events or loss of efficacy. [See *Contraindications* (4), *Clinical Pharmacology* (12.3).]

**Table 6. Established and Other Potentially Significant Drug Interactions for Dolutegravir: Alterations in Dose May Be Recommended Based on Drug Interaction Trials or Predicted Interactions**

| Concomitant Drug Class:<br>Drug Name                                                                                                                             | Effect on<br>Concentration | Clinical Comment                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>HIV-1 Antiviral Agents</b>                                                                                                                                    |                            |                                                                                                                                                                                                                                                                                                                       |
| <b>Non-nucleoside reverse transcriptase inhibitor:</b><br>Etravirine <sup>a</sup>                                                                                | ↓Dolutegravir              | Use of abacavir, dolutegravir and lamivudine with etravirine without coadministration of atazanavir/ritonavir, darunavir/ritonavir, or lopinavir/ritonavir is not recommended.                                                                                                                                        |
| <b>Non-nucleoside reverse transcriptase inhibitor:</b><br>Efavirenz <sup>a</sup>                                                                                 | ↓Dolutegravir              | In adults and in pediatric patients <b>weighing at least 25 kg</b> , adjust dolutegravir dose to 50 mg twice daily. An additional 50 mg dose of TIVICAY should be taken, separated by 12 hours from abacavir, dolutegravir and lamivudine.                                                                            |
| <b>Non-nucleoside reverse transcriptase inhibitor:</b><br>Nevirapine                                                                                             | ↓Dolutegravir              | Avoid coadministration with abacavir, dolutegravir and lamivudine because there are insufficient data to make dosing recommendations.                                                                                                                                                                                 |
| <b>Protease inhibitor:</b><br>Fosamprenavir/ritonavir <sup>a</sup><br>Tipranavir/ritonavir <sup>a</sup>                                                          | ↓Dolutegravir              | In adults and in pediatric patients <b>weighing at least 25 kg</b> , adjust dolutegravir dose to 50 mg twice daily. An additional TIVICAY 50 mg dose should be taken, separated by 12 hours from abacavir, dolutegravir and lamivudine.                                                                               |
| <b>Other Agents</b>                                                                                                                                              |                            |                                                                                                                                                                                                                                                                                                                       |
| <b>Antiarrhythmic:</b><br>Dofetilide                                                                                                                             | ↑Dofetilide                | Coadministration is contraindicated with abacavir, dolutegravir and lamivudine [see <i>Contraindications (4)</i> ].                                                                                                                                                                                                   |
| <b>Potassium channel blocker:</b><br>Dalfampridine                                                                                                               | ↑Dalfampridine             | Elevated levels of dalfampridine increase the risk of seizures. The potential benefits of taking dalfampridine concurrently with abacavir, dolutegravir and lamivudine should be considered against the risk of seizures in these patients.                                                                           |
| Carbamazepine <sup>a</sup>                                                                                                                                       | ↓Dolutegravir              | In adults and in pediatric patients <b>weighing at least 25 kg</b> , adjust dolutegravir dose to 50 mg twice daily. An additional TIVICAY 50 mg dose should be taken, separated by 12 hours from abacavir, dolutegravir and lamivudine.                                                                               |
| Oxcarbazepine<br>Phenytoin<br>Phenobarbital<br>St. John's wort ( <i>Hypericum perforatum</i> )                                                                   | ↓Dolutegravir              | Avoid coadministration with abacavir, dolutegravir and lamivudine because there are insufficient data to make dosing recommendations.                                                                                                                                                                                 |
| <b>Medications containing polyvalent cations (e.g., Mg or Al):</b><br>Cation-containing antacids <sup>a</sup> or laxatives<br>Sucralfate<br>Buffered medications | ↓Dolutegravir              | Administer abacavir, dolutegravir and lamivudine 2 hours before or 6 hours after taking medications containing polyvalent cations.                                                                                                                                                                                    |
| <b>Oral calcium and iron supplements, including multivitamins containing calcium or iron<sup>a</sup></b>                                                         | ↓Dolutegravir              | When taken with food, abacavir, dolutegravir and lamivudine and supplements or multivitamins containing calcium or iron can be taken at the same time. Under fasting conditions, abacavir, dolutegravir and lamivudine should be taken 2 hours before or 6 hours after taking supplements containing calcium or iron. |

|                        |               |                                                                                                                                                                                                                                            |
|------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Metformin <sup>a</sup> | ↑Metformin    | Refer to the prescribing information for metformin for assessing the benefit and risk of concomitant use of abacavir, dolutegravir and lamivudine and metformin.                                                                           |
| Rifampin <sup>a</sup>  | ↓Dolutegravir | In adults and in pediatric patients <b>weighing at least 25 kg</b> , adjust dolutegravir dose to 50 mg twice daily. An additional 50 mg dose of TIVICAY should be taken, separated by 12 hours from abacavir, dolutegravir and lamivudine. |

<sup>a</sup> See *Clinical Pharmacology (12.3) Table 8 or Table 10 for magnitude of interaction.*

### Methadone

**Abacavir:** In a trial of 11 HIV-1–infected subjects receiving methadone-maintenance therapy with 600 mg of abacavir twice daily (twice the currently recommended dose), oral methadone clearance increased [see *Clinical Pharmacology (12.3)*]. This alteration will not result in a methadone dose modification in the majority of patients; however, an increased methadone dose may be required in a small number of patients.

### Sorbitol

**Lamivudine:** Coadministration of single doses of lamivudine and sorbitol resulted in a sorbitol dose-dependent reduction in lamivudine exposures. When possible, avoid use of sorbitol-containing medicines with lamivudine-containing medicines [see *Clinical Pharmacology (12.3)*].

### Riociguat

**Abacavir:** Coadministration with abacavir, dolutegravir and lamivudine resulted in increased riociguat exposure, which may increase the risk of riociguat adverse reactions [see *Clinical Pharmacology (12.3)*]. The riociguat dose may need to be reduced. See full prescribing information for ADEMPAS (riociguat).

## **8 USE IN SPECIFIC POPULATIONS**

### **8.1 Pregnancy**

#### Pregnancy Exposure Registry

There is a pregnancy exposure registry that monitors pregnancy outcomes in individuals exposed to abacavir, dolutegravir and lamivudine during pregnancy. Healthcare providers are encouraged to register patients by calling the Antiretroviral Pregnancy Registry (APR) at 1-800-258-4263.

#### Risk Summary

Data from two, ongoing birth outcome surveillance studies in Botswana and Eswatini which together include over 14,000 individuals evaluated during pregnancy show similar prevalence of neural tube defects among infants born to individuals taking dolutegravir at the time of conception compared to those born to individuals taking non-dolutegravir-containing regimens at conception or infants born to HIV-negative individuals (*see Data*).

There are insufficient human data on the use of abacavir, dolutegravir and lamivudine during pregnancy to definitively assess a drug-associated risk for birth defects and miscarriage. However, available human data from the APR with the individual components of abacavir, dolutegravir and lamivudine do not indicate an increased risk of birth defects (*see Data*). The background risk for

major birth defects for the indicated population is unknown. In the U.S. general population, the estimated background rate for major birth defects and miscarriage in clinically recognized pregnancies is 2% to 4% and 15% to 20%, respectively.

In animal reproduction studies, no evidence of adverse developmental outcomes (including neural tube defects) was observed with dolutegravir at systemic exposures (AUC) less than (rabbits) and approximately 50 times (rats) the exposure in humans at the recommended human dose (RHD) (*see Data*). Oral administration of abacavir to pregnant rats during organogenesis resulted in fetal malformations and other embryonic and fetal toxicities at exposures 35 times the human exposure (AUC) at the RHD. No adverse developmental effects were observed following oral administration of abacavir to pregnant rabbits during organogenesis at exposures approximately 9 times the human exposure (AUC) at the RHD. Oral administration of lamivudine to pregnant rabbits during organogenesis resulted in embryoletality at a human exposure (AUC) similar to the RHD; however, no adverse development effects were observed with oral administration of lamivudine to pregnant rats during organogenesis at plasma concentrations ( $C_{max}$ ) 35 times the RHD (*see Data*).

## Data

### *Human Data:*

#### *Dolutegravir:*

*Observational studies:* The first interim analysis from an ongoing birth outcome surveillance study in Botswana identified an association between dolutegravir and an increased risk of neural tube defects when dolutegravir was administered at the time of conception and in early pregnancy. A subsequent analysis was conducted based on a larger cohort from the birth outcome surveillance study in Botswana and included over 9,460 individuals exposed to dolutegravir at conception, 23,664 individuals exposed to non-dolutegravir-containing regimens, and 170,723 HIV-negative pregnant individuals. The prevalence of neural tube defects in infants delivered to individuals taking dolutegravir at conception was 0.11% (95% CI: 0.05 to 0.19%). The observed prevalence rate did not differ significantly from that of infants delivered to individuals taking non-dolutegravir-containing regimens (0.11%, 95% CI: 0.07-0.16%), or to HIV-negative individuals (0.06%, 95% CI: 0.05 to 0.08%).

The Eswatini birth outcome surveillance study includes 9,743 individuals exposed to dolutegravir at conception, 1,838 individuals exposed to non-dolutegravir-containing regimens, and 32,259 HIV-negative pregnant individuals. The prevalence of neural tube defects in infants delivered to individuals taking dolutegravir at conception was 0.08% (95% CI: 0.04 to 0.16%). The observed prevalence rate did not differ significantly from that of infants delivered to individuals taking non-dolutegravir-containing regimens (0.22%, 95% CI: 0.06 to 0.56%) or to HIV-negative individuals (0.08%, 95% CI: 0.06 to 0.12%). The observed prevalence of neural tube defects in infants delivered to individuals taking non-dolutegravir-containing regimens had a wide confidence interval due to low sample size.

Limitations of these birth outcome surveillance studies include insufficient data to determine if baseline characteristics were balanced between the study groups or to assess other factors such as the use of folic acid during the preconception or first trimester periods.

*Antiretroviral Pregnancy Registry:* Based on prospective reports to the APR, of over 1,300 exposures to dolutegravir during pregnancy resulting in live births (including 874 exposed in the first trimester), the prevalence of defects in live births was 3.3% (95% CI: 2.2% to 4.7%) following first-trimester exposure to dolutegravir-containing regimens and 5.0% (95% CI: 3.2% to 7.3%) following second-/third-trimester exposure to dolutegravir-containing regimens. In the U.S. reference population of the Metropolitan Atlanta Congenital Defects Program (MACDP), the background birth defect rate was 2.7%.

Dolutegravir has been shown to cross the placenta. In a clinical trial in Uganda and South Africa in women during the last trimester of pregnancy receiving dolutegravir 50 mg once daily, the ratio of median dolutegravir concentration in fetal umbilical cord to that in maternal peripheral plasma was 1.21 (range 0.51 to 2.11) (n = 15).

*Abacavir:* Based on prospective reports to the APR of over 2,800 exposures to abacavir during pregnancy resulting in live births (including 1,455 exposed in the first trimester), there was no difference between the overall risk of birth defects for abacavir compared with the background birth defect rate of 2.7% in the U.S. reference population of the MACDP. The prevalence of defects in live births was 3.2% (95% CI: 2.4% to 4.3%) following first trimester exposure to abacavir-containing regimens and 3.0% (95% CI: 2.2% to 4.1%) following second/third trimester exposure to abacavir-containing regimens.

Abacavir has been shown to cross the placenta and concentrations in neonatal plasma at birth were essentially equal to those in maternal plasma at delivery [*see Clinical Pharmacology (12.3)*].

*Lamivudine:* Based on prospective reports to the APR of over 13,000 exposures to lamivudine during pregnancy resulting in live births (including 5,613 exposed in the first trimester), there was no difference between the overall risk of birth defects for lamivudine compared with the background birth defect rate of 2.7% in the U.S. reference population of the MACDP. The prevalence of birth defects in live births was 3.1% (95% CI: 2.6% to 3.6%) following first trimester exposure to lamivudine-containing regimens and 2.9% (95% CI: 2.5%, 3.3%) following second/third trimester exposure to lamivudine-containing regimens.

Lamivudine pharmacokinetics were studied in pregnant women during 2 clinical trials conducted in South Africa. The trials assessed pharmacokinetics in 16 women at 36 weeks' gestation using 150 mg lamivudine twice daily with zidovudine, 10 women at 38 weeks' gestation using 150 mg lamivudine twice daily with zidovudine, and 10 women at 38 weeks' gestation using lamivudine 300 mg twice daily without other antiretrovirals. These trials were not designed or powered to provide efficacy information. Lamivudine concentrations were generally similar in maternal, neonatal, and umbilical cord serum samples. In a subset of subjects, amniotic fluid specimens were collected following natural rupture of membranes and confirmed that lamivudine crosses the placenta in humans. Based on limited data at delivery, median (range) amniotic fluid concentrations of lamivudine were 3.9-fold (1.2- to 12.8-fold) greater compared with paired maternal serum concentration (n = 8).

#### *Animal Data:*

##### *Dolutegravir:*

Dolutegravir was administered orally to pregnant rats and rabbits (up to 1,000 mg/kg/day) on Gestation Days 6 to 17 and 6 to 18, respectively, and to rats on Gestation Day 6 to lactation/post-

partum Day 20. No adverse effects on embryo-fetal (rats and rabbits) or pre/post-natal (rats) development were observed up to the highest dose tested. During organogenesis, systemic exposures (AUC) to dolutegravir in rabbits were less than the exposure in humans at the RHD and in rats were approximately 50 times the exposure in humans at the RHD. In the rat pre/post-natal development study, decreased body weight of the developing offspring was observed during lactation at a maternally toxic dose (approximately 50 times human exposure at the RHD).

*Abacavir:* Abacavir was administered orally to pregnant rats (at 100, 300, and 1,000 mg/kg/day) and rabbits (at 125, 350, or 700 mg/kg/day) during organogenesis (on Gestation Days 6 through 17 and 6 through 20, respectively). Fetal malformations (increased incidences of fetal anasarca and skeletal malformations) or developmental toxicity (decreased fetal body weight and crown-rump length) were observed in rats at doses up to 1,000 mg/kg/day, resulting in exposures approximately 35 times the human exposure (AUC) at the RHD. No developmental effects were observed in rats at 100 mg/kg/day, resulting in exposures (AUC) 3.5 times the human exposure at the recommended daily dose. In a fertility and early embryo-fetal development study conducted in rats (at 60, 160, or 500 mg/kg/day), embryonic and fetal toxicities (increased resorptions, decreased fetal body weights) or toxicities to the offspring (increased incidence of stillbirth and lower body weights) occurred at doses up to 500 mg/kg/day. No developmental effects were observed in rats at 60 mg/kg/day, resulting in exposures (AUC) approximately 4 times the human exposure at the RHD. Studies in pregnant rats showed that abacavir is transferred to the fetus through the placenta. In pregnant rabbits, no developmental toxicities and no increases in fetal malformations occurred at up to the highest dose evaluated, resulting in exposures (AUC) approximately 9 times the human exposure at the RHD.

*Lamivudine:* Lamivudine was administered orally to pregnant rats (at 90, 600, and 4,000 mg/kg/day) and rabbits (at 90, 300 and 1,000 mg/kg/day and at 15, 40, and 90 mg/kg/day) during organogenesis (on Gestation Days 7 through 16 [rat] and 8 through 20 [rabbit]). No evidence of fetal malformations due to lamivudine was observed in rats and rabbits at doses producing plasma concentrations ( $C_{max}$ ) approximately 35 times higher than human exposure at the recommended daily dose. Evidence of early embryolethality was seen in the rabbit at systemic exposures (AUC) similar to those observed in humans, but there was no indication of this effect in the rat at plasma concentrations ( $C_{max}$ ) 35 times higher than human exposure at the recommended daily dose. Studies in pregnant rats showed that lamivudine is transferred to the fetus through the placenta. In the fertility/pre- and postnatal development study in rats, lamivudine was administered orally at doses of 180, 900, and 4,000 mg/kg/day (from prior to mating through postnatal Day 20). In the study, development of the offspring, including fertility and reproductive performance, were not affected by the maternal administration of lamivudine.

## **8.2 Lactation**

### **Risk Summary**

Abacavir, dolutegravir and lamivudine are present in human milk. There is no information on the effects of abacavir, dolutegravir and lamivudine or its components on the breastfed infant or the effects of the drug on milk production.

Potential risks of breastfeeding include: (1) HIV-1 transmission (in HIV-1-negative infants), (2) developing viral resistance (in HIV-1-positive infants), and (3) adverse reactions in a breastfed infant similar to those seen in adults.

## 8.4 Pediatric Use

The clinical data supporting use of abacavir, dolutegravir and lamivudine in pediatric patients with HIV-1 infection aged at least 3 months old weighing at least 6 kg is derived from the following previously conducted pediatric trials using abacavir, dolutegravir and lamivudine the individual components:

- The safety, pharmacokinetics, and antiviral activity (efficacy) of abacavir, dolutegravir and lamivudine were established through an open-label, multicenter clinical trial (IMPAACT 2019), in which HIV-1–infected, treatment-naïve, or treatment-experienced, pediatric subjects younger than 12 years and weighing at least 6 kg to less than 40 kg were treated with abacavir, dolutegravir and lamivudine [*see Adverse Reactions (6.1), Clinical Pharmacology (12.3), Clinical Studies (14.2)*].
- The safety and efficacy of once-daily abacavir and lamivudine were established with a randomized, multicenter trial (ARROW [COL105677]) in HIV-1–infected, treatment-naïve subjects aged 3 months to 17 years with a first-line regimen containing abacavir and lamivudine, using either the combination of EPIVIR and ZIAGEN or EPZICOM [*see Adverse Reactions (6.1), Clinical Studies (14.2)*].
- The safety, pharmacokinetics, and antiviral activity (efficacy) of TIVICAY and TIVICAY PD were established through an ongoing, open-label, multicenter, dose-finding clinical trial (IMPAACT P1093), in which HIV-1–infected, treatment-naïve or treatment-experienced, INSTI-naïve, pediatric and adolescent subjects aged 4 weeks to <18 years and weighing at least 3 kg were treated with TIVICAY or TIVICAY PD plus optimized background therapy [*see Adverse Reactions (6.1), Clinical Pharmacology (12.3), Clinical Studies (14.2)*].
- Additional pharmacokinetics data were evaluated in 2 pharmacokinetic substudies in ODYSSEY, an ongoing open-label, randomized, non-inferiority trial to evaluate the safety, efficacy, and pharmacokinetic parameters of TIVICAY or TIVICAY PD plus two nucleoside reverse transcriptase inhibitors (NRTIs) (mainly abacavir and lamivudine) compared with standard of care in HIV-1–infected pediatric subjects younger than 18 years [*see Clinical Pharmacology (12.3)*].

Overall, the safety, and efficacy profile of abacavir, dolutegravir and lamivudine in pediatric patients is comparable to that observed in adults. There are no data available on the use of lamivudine in pediatric patients with renal impairment [*see Dosage and Administration (2.7), Warnings and Precautions (5.3), Adverse Reactions (6.1), Use in Specific Populations (8.6), Clinical Pharmacology (12.3), Clinical Studies (14.2)*].

## 8.5 Geriatric Use

Clinical trials of abacavir, dolutegravir, or lamivudine did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. In general, caution should be exercised in the administration of abacavir, dolutegravir and lamivudine in elderly patients reflecting the greater frequency of decreased hepatic, renal, or cardiac function, and of concomitant disease or other drug therapy [*see Clinical Pharmacology (12.3)*].

## 8.6 Patients with Impaired Renal Function

Abacavir, dolutegravir and lamivudine is not recommended for patients with creatinine clearance <30 mL/min and pediatric patients with a similar degree of renal impairment based on age-appropriate assessment of renal function because abacavir, dolutegravir and lamivudine is fixed-dose combinations, and the dosage of the individual components cannot be adjusted. If a dose reduction of lamivudine, a component of abacavir, dolutegravir and lamivudine, is required for patients with creatinine clearance <30 mL/min and in pediatric patients with a similar degree of renal impairment based on age-appropriate assessment of renal function, then the individual components should be used [see *Clinical Pharmacology* (12.3)].

Patients with a creatinine clearance between 30 and 49 mL/min receiving abacavir, dolutegravir and lamivudine may experience a 1.6- to 3.3-fold higher lamivudine exposure (AUC) than patients with a creatinine clearance  $\geq$ 50 mL/min. There are no safety data from randomized, controlled trials comparing abacavir, dolutegravir and lamivudine to the individual components in patients with a creatinine clearance between 30 and 49 mL/min who received dose-adjusted lamivudine. Additionally, there are no data available on the use of lamivudine in pediatric patients with renal impairment. In the original lamivudine registrational trials in combination with zidovudine, higher lamivudine exposures were associated with higher rates of hematologic toxicities (neutropenia and anemia), although discontinuations due to neutropenia or anemia each occurred in <1% of subjects.

Patients with a sustained creatinine clearance between 30 and 49 mL/min or pediatric patients with a similar degree of renal impairment based on an age-appropriate assessment of renal function who receive abacavir, dolutegravir and lamivudine should be monitored for hematologic toxicities. If new or worsening neutropenia or anemia develop, dose adjustment of lamivudine, per lamivudine prescribing information, is recommended. If lamivudine dose adjustment is indicated, abacavir, dolutegravir and lamivudine should be discontinued, and the individual components should be used to construct the treatment regimen.

## 8.7 Patients with Impaired Hepatic Function

Abacavir, dolutegravir and lamivudine is a fixed-dose combination, and the dosage of the individual components cannot be adjusted. If a dose reduction of abacavir, a component of abacavir, dolutegravir and lamivudine, is required for patients with mild hepatic impairment (Child-Pugh Score A), then the individual components should be used [see *Clinical Pharmacology* (12.3)].

The safety, efficacy, and pharmacokinetic properties of abacavir have not been established in patients with moderate (Child-Pugh Score B) or severe (Child-Pugh Score C) hepatic impairment; therefore, abacavir, dolutegravir and lamivudine is contraindicated in these patients [see *Contraindications* (4)].

## 10 OVERDOSAGE

There is no known specific treatment for overdose with abacavir, dolutegravir and lamivudine. If overdose occurs, the patient should be monitored, and standard supportive treatment applied as required.



### Dolutegravir

As dolutegravir is highly bound to plasma proteins, it is unlikely that it will be significantly removed by dialysis.

### Abacavir

It is not known whether abacavir can be removed by peritoneal dialysis or hemodialysis.

### Lamivudine

Because a negligible amount of lamivudine was removed via (4-hour) hemodialysis, continuous ambulatory peritoneal dialysis, and automated peritoneal dialysis, it is not known if continuous hemodialysis would provide clinical benefit in a lamivudine overdose event.

## **11 DESCRIPTION**

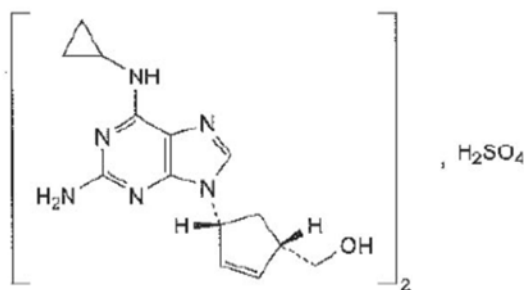
### Abacavir, dolutegravir, and lamivudine tablets

Abacavir, dolutegravir, and lamivudine tablets contain an INSTI (dolutegravir) and 2 nucleoside analogues (abacavir and lamivudine) with inhibitory activity against HIV.

Each film-coated tablet of abacavir, dolutegravir, and lamivudine, for oral use, contains 600 mg of abacavir (present as 702.762 mg of abacavir sulfate USP), 50 mg of dolutegravir (present as 52.6 mg of dolutegravir sodium), and 300 mg of lamivudine USP. The inactive ingredients of abacavir, dolutegravir, and lamivudine tablets include magnesium stearate, mannitol, microcrystalline cellulose, povidone and sodium starch glycolate. The tablet film-coating contains the inactive ingredients black iron oxide, iron oxide red, iron oxide yellow, polyethylene glycol, polyvinyl alcohol, talc and titanium dioxide.

### Abacavir Sulfate

The chemical name of abacavir sulfate is (-)-cis-4-[2-amino-6-(cyclopropylamino)-9H-purin-9-yl]2-cyclopentene-1-methanol sulfate. It has a molecular formula of  $C_{28}H_{38}N_{12}O_6S$  and a molecular weight of 670.74 g/mol. It has the following structural formula:

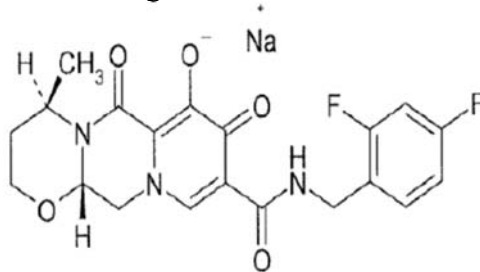


Abacavir sulfate USP is a white to an off-white powder and is soluble in water.

### Dolutegravir Sodium

The chemical name of dolutegravir sodium is Sodium (4R,12as)-9-((2,4-difluorobenzyl)carbamoyl)-4-methyl-6,8-dioxo-3,4,6,8,12,12a-hexahydro-2H-pyrido [1',2':4,5]

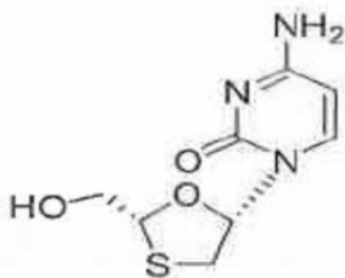
pyrazino [2,1 b] [1,3]oxazin-7-olate. The molecular formula is  $C_{20}H_{18}F_2N_3NaO_5$  and the molecular weight is 441.37 g/mol. It has the following structural formula:



Dolutegravir sodium is an off-white or white to light yellow color powder and is very slightly soluble in methanol and practically insoluble in acetonitrile.

### Lamivudine

The chemical name of lamivudine is (2R-cis)-4-Amino-1-[2-(hydroxymethyl)-1,3-oxathiolan-5-yl]-2(1H)-pyrimidinone(-)-2'-deoxy-3'-thiacytidine, 3'-thia-2',3'-dideoxycytidine. Lamivudine is the (-)-enantiomer of a dideoxy analogue of cytidine. Lamivudine has also been referred to as (-)-2',3'-dideoxy, 3'-thiacytidine. It has a molecular formula of  $C_8H_{11}N_3O_3S$  and a molecular weight of 229.26 g/mol. It has the following structural formula:



Lamivudine USP is a white to an off-white solid and is soluble in water.

## **12 CLINICAL PHARMACOLOGY**

### **12.1 Mechanism of Action**

Abacavir, dolutegravir and lamivudine is a fixed-dose combination of the HIV-1 antiretroviral agents abacavir, dolutegravir, and lamivudine [see *Microbiology* (12.4)].

### **12.2 Pharmacodynamics**

#### Effects on Electrocardiogram

A thorough QT trial has been conducted for dolutegravir. Neither the effects of abacavir nor lamivudine as single entities or the combination of abacavir, dolutegravir, and lamivudine on the QT interval have been evaluated.

In a randomized, placebo-controlled, cross-over trial, 42 healthy subjects received single-dose oral administrations of placebo, dolutegravir 250 mg suspension (exposures approximately 3-fold of

the 50 mg once-daily dose at steady state), and moxifloxacin 400 mg (active control) in random sequence. After baseline and placebo adjustment, the maximum mean QTc change based on Fridericia correction method (QTcF) for dolutegravir was 2.4 msec (1-sided 95% upper CI: 4.9 msec). Dolutegravir did not prolong the QTc interval over 24 hours postdose.

### Effects on Renal Function

The effect of dolutegravir on renal function was evaluated in an open-label, randomized, 3-arm, parallel, placebo-controlled trial in healthy subjects (n = 37) who received dolutegravir 50 mg once daily (n = 12), dolutegravir 50 mg twice daily (n = 13), or placebo once daily (n = 12) for 14 days. A decrease in creatinine clearance, as determined by 24-hour urine collection, was observed with both doses of dolutegravir after 14 days of treatment in subjects who received 50 mg once daily (9% decrease) and 50 mg twice daily (13% decrease). Neither dose of dolutegravir had a significant effect on the actual glomerular filtration rate (determined by the clearance of probe drug, iohexol) or effective renal plasma flow (determined by the clearance of probe drug, para-amino hippurate) compared with the placebo.

## **12.3 Pharmacokinetics**

### Pharmacokinetics in Adults

One abacavir, dolutegravir and lamivudine tablet was bioequivalent to one dolutegravir (TIVICAY) tablet (50 mg) plus one abacavir and lamivudine fixed-dose combination tablet (EPZICOM) under fasted conditions in healthy subjects (n = 62).

Abacavir, dolutegravir and lamivudine tablets and TRIUMEQ PD tablets for oral suspension are bioequivalent for the abacavir and lamivudine components, but not for the dolutegravir component. The relative dolutegravir bioavailability of TRIUMEQ PD is approximately 1.7-fold higher than abacavir, dolutegravir and lamivudine tablets; therefore, the 2 dosage forms are not substitutable on a milligram-per-milligram basis [see *Dosage and Administration* (2.3), *Warnings and Precautions* (5.7)]. The relative dolutegravir bioavailability is expected to be similar between TRIUMEQ PD and TIVICAY PD.

**Abacavir:** Following oral administration, abacavir is rapidly absorbed and extensively distributed. After oral administration of a single dose of 600 mg of abacavir in 20 subjects,  $C_{max}$  was  $4.26 \pm 1.19$  mcg/mL (mean  $\pm$  SD) and  $AUC_{\infty}$  was  $11.95 \pm 2.51$  mcg•hour/mL. Binding of abacavir to human plasma proteins is approximately 50% and was independent of concentration. Total blood and plasma drug-related radioactivity concentrations are identical, demonstrating that abacavir readily distributes into erythrocytes. The primary routes of elimination of abacavir are metabolism by alcohol dehydrogenase to form the 5'-carboxylic acid and glucuronyl transferase to form the 5'-glucuronide. In single-dose trials, the observed elimination half-life ( $t_{1/2}$ ) was  $1.54 \pm 0.63$  hours. After intravenous administration, total clearance was  $0.80 \pm 0.24$  L/h/kg (mean  $\pm$  SD).

**Dolutegravir:** Following oral administration of dolutegravir, peak plasma concentrations were observed 2 to 3 hours postdose. With once-daily dosing, pharmacokinetic steady state is achieved within approximately 5 days with average accumulation ratios for AUC,  $C_{max}$ , and  $C_{24h}$  ranging from 1.2 to 1.5. Dolutegravir is a P-gp substrate *in vitro*. The absolute bioavailability of dolutegravir has not been established. Dolutegravir is highly bound ( $\geq 98.9\%$ ) to human plasma

proteins based on *in vivo* data and binding is independent of plasma concentration of dolutegravir. The apparent volume of distribution (Vd/F) following 50-mg once-daily administration is estimated at 17.4 L based on a population pharmacokinetic analysis.

Dolutegravir is primarily metabolized via UGT1A1 with some contribution from CYP3A. After a single oral dose of [<sup>14</sup>C] dolutegravir, 53% of the total oral dose is excreted unchanged in the feces. Thirty-one percent of the total oral dose is excreted in the urine, represented by an ether glucuronide of dolutegravir (18.9% of total dose), a metabolite formed by oxidation at the benzylic carbon (3.0% of total dose), and its hydrolytic N-dealkylation product (3.6% of total dose). Renal elimination of unchanged drug was <1% of the dose. Dolutegravir has a terminal half-life of approximately 14 hours and an apparent clearance (CL/F) of 1.0 L/h based on population pharmacokinetic analyses.

The pharmacokinetic properties of dolutegravir have been evaluated in healthy adult subjects and HIV-1–infected adult subjects. Exposure to dolutegravir was generally similar between healthy subjects and HIV-1–infected subjects.

**Table 7. Dolutegravir Steady-State Pharmacokinetic Parameter Estimates in HIV-1–Infected Adults**

| Parameter                        | 50 mg Once Daily<br>Geometric Mean (%CV) |
|----------------------------------|------------------------------------------|
| AUC <sub>(0-24)</sub> (mcg•h/mL) | 53.6 (27)                                |
| C <sub>max</sub> (mcg/mL)        | 3.67 (20)                                |
| C <sub>min</sub> (mcg/mL)        | 1.11 (46)                                |

*Cerebrospinal Fluid (CSF)*: In 11 treatment-naïve subjects on dolutegravir 50 mg daily plus abacavir/lamivudine, the median dolutegravir concentration in CSF was 18 ng/mL (range: 4 ng/mL to 23.2 ng/mL) 2 to 6 hours postdose after 2 weeks of treatment. The clinical relevance of this finding has not been established.

*Lamivudine*: Following oral administration, lamivudine is rapidly absorbed and extensively distributed. After multiple-dose oral administration of lamivudine 300 mg once daily for 7 days to 60 healthy subjects, steady-state C<sub>max</sub> (C<sub>max,ss</sub>) was 2.04 ± 0.54 mcg/mL (mean ± SD) and the 24-hour steady-state AUC (AUC<sub>24,ss</sub>) was 8.87 ± 1.83 mcg•hour/mL. Binding to plasma protein is low. Approximately 70% of an intravenous dose of lamivudine is recovered as unchanged drug in the urine. Metabolism of lamivudine is a minor route of elimination. In humans, the only known metabolite is the trans-sulfoxide metabolite (approximately 5% of an oral dose after 12 hours). In most single-dose trials with plasma sampling up to 48 or 72 hours after dosing, the observed mean elimination half-life (t<sub>1/2</sub>) ranged from 13 to 19 hours. In HIV-1–infected subjects, total clearance was 398.5 ± 69.1 mL/min (mean ± SD).

#### Effect of Food on Oral Absorption

Abacavir, dolutegravir and lamivudine may be taken with or without food. Overall, when compared with fasted conditions, administration of abacavir, dolutegravir and lamivudine tablets to healthy adult subjects with a high-fat meal (53% fat, 869 calories) resulted in decreased C<sub>max</sub> for

abacavir and increased  $C_{\max}$  and AUC for dolutegravir. Lamivudine exposures were not affected by food. With a high-fat meal, the  $C_{\max}$  of abacavir decreased 23% and the  $C_{\max}$  and AUC of dolutegravir increased 37% and 48%, respectively. When compared with fasted conditions, administration of TRIUMEQ PD to healthy adult subjects with a high-fat meal (50% fat, 917 calories) resulted in decreased  $C_{\max}$  for abacavir (55%), dolutegravir (29%) and lamivudine (36%). AUCs for all 3 components were not affected by food.

### Specific Populations

*Patients with Renal Impairment:* The pharmacokinetics for the individual components of abacavir, dolutegravir and lamivudine have been evaluated in patients with renal impairment (see the U.S. prescribing information for the individual abacavir, dolutegravir, and lamivudine components).

*Patients with Hepatic Impairment:* The pharmacokinetics for the individual components of abacavir, dolutegravir and lamivudine have been evaluated in patients with varying degrees of hepatic impairment (see the U.S. prescribing information for the individual abacavir, dolutegravir, and lamivudine components).

*Pregnant women: Abacavir:* Abacavir pharmacokinetics were studied in 25 pregnant women during the last trimester of pregnancy receiving abacavir 300 mg twice daily. Abacavir exposure (AUC) during pregnancy was similar to those in postpartum and in HIV-infected non-pregnant historical controls. Consistent with passive diffusion of abacavir across the placenta, abacavir concentrations in neonatal plasma cord samples at birth were essentially equal to those in maternal plasma at delivery.

*Lamivudine:* Lamivudine pharmacokinetics were studied in 36 pregnant women during 2 clinical trials conducted in South Africa. Lamivudine pharmacokinetics in pregnant women were similar to those seen in non-pregnant adults and in postpartum women. Lamivudine concentrations were generally similar in maternal, neonatal, and umbilical cord serum samples.

*Pediatric Patients:* The pharmacokinetics of abacavir, dolutegravir and lamivudine and their individual components have been evaluated in pediatric subjects.

*Abacavir, Dolutegravir and Lamivudine:* The pharmacokinetics of abacavir, dolutegravir and lamivudine were evaluated in the IMPAACT 2019 trial. Steady-state plasma exposure at doses by weight band are summarized in Table 8 [see *Use in Specific Populations (8.4), Clinical Studies (14.2)*].

Overall, exposures of abacavir, dolutegravir and lamivudine at the recommended doses for abacavir, dolutegravir and lamivudine are within the observed exposure ranges at the recommended doses of individual products in adults and pediatrics. Refer to the prescribing information for EPIVIR, TIVICAY, and ZIAGEN for pharmacokinetic information on lamivudine, dolutegravir, and abacavir, respectively, in pediatric patients.

**Table 8. Summary of Pharmacokinetic Parameters in Pediatric HIV-1–Infected Subjects (IMPAACT 2019 Trial)**

| Drug         | Weight Band  | Dose <sup>a</sup> of single entities in abacavir, dolutegravir and lamivudine | n | Pharmacokinetic Parameter    |                                    |                             |
|--------------|--------------|-------------------------------------------------------------------------------|---|------------------------------|------------------------------------|-----------------------------|
|              |              |                                                                               |   | Geometric Mean (%CV)         |                                    |                             |
|              |              |                                                                               |   | C <sub>max</sub><br>(mcg/mL) | AUC <sub>0-24h</sub><br>(mcg·h/mL) | C <sub>24h</sub><br>(ng/mL) |
| Abacavir     | 25 to <40 kg | 600 mg once daily abacavir, dolutegravir and lamivudine                       | 7 | 9.04 (22)                    | 25.7 (15)                          | 11 (229)                    |
| Dolutegravir | 25 to <40 kg | 50 mg once daily abacavir, dolutegravir and lamivudine                        | 7 | 6.25 (21)                    | 71.8 (14)                          | 980 (28)                    |
| Lamivudine   | 25 to <40 kg | 300 mg once daily abacavir, dolutegravir and lamivudine                       | 7 | 4.15 (29)                    | 21.7 (26)                          | 84 (35)                     |

%CV, coefficient of variation expressed as a percentage.

*Geriatric Patients:* Population analyses using pooled pharmacokinetic data from adult trials indicated age had no clinically relevant effect on the pharmacokinetics of dolutegravir. The pharmacokinetics of abacavir or lamivudine have not been studied in subjects older than 65 years.

*Male and Female Patients:* There are no significant or clinically relevant gender differences in the pharmacokinetics of the individual components (dolutegravir, abacavir, or lamivudine) based on the available information that was analyzed for each of the individual components.

*Racial Groups:* There are no significant or clinically relevant racial differences in pharmacokinetics of the individual components (dolutegravir, abacavir, or lamivudine) based on the available information that was analyzed for each of the individual components.

#### Drug Interaction Studies

The drug interaction trials described were conducted with dolutegravir, abacavir, and/or lamivudine as single entities; no drug interaction trials have been conducted using the combination of abacavir, dolutegravir, and lamivudine. No clinically significant drug interactions are expected between dolutegravir, abacavir, and lamivudine.

Dosing recommendations as a result of established and other potentially significant drug-drug interactions with the individual components of abacavir, dolutegravir and lamivudine are provided in Section 7.3 [see *Drug Interactions* (7)].

**Table 9. Summary of Effect of Dolutegravir on the Pharmacokinetics of Coadministered Drugs**

| Coadministered Drug(s) and Dose(s) | Dose of Dolutegravir | n               | Geometric Mean Ratio (90% CI) of Pharmacokinetic Parameters of Coadministered Drug with/without Dolutegravir<br>No Effect = 1.00 |                        |                                   |
|------------------------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------|
|                                    |                      |                 | C <sub>max</sub>                                                                                                                 | AUC                    | C <sub>τ</sub> or C <sub>24</sub> |
| Ethinyl estradiol 0.035 mg         | 50 mg twice daily    | 15              | 0.99<br>(0.91 to 1.08)                                                                                                           | 1.03<br>(0.96 to 1.11) | 1.02<br>(0.93 to 1.11)            |
| Metformin 500 mg twice daily       | 50 mg once daily     | 15 <sup>a</sup> | 1.66<br>(1.53 to 1.81)                                                                                                           | 1.79<br>(1.65 to 1.93) | —                                 |
| Metformin 500 mg twice daily       | 50 mg twice daily    | 15 <sup>a</sup> | 2.11<br>(1.91 to 2.33)                                                                                                           | 2.45<br>(2.25 to 2.66) | —                                 |

|                                                       |                      |    |                        |                        |                        |
|-------------------------------------------------------|----------------------|----|------------------------|------------------------|------------------------|
| Methadone<br>16 to 150 mg                             | 50 mg<br>twice daily | 11 | 1.00<br>(0.94 to 1.06) | 0.98<br>(0.91 to 1.06) | 0.99<br>(0.91 to 1.07) |
| Midazolam<br>3 mg                                     | 25 mg<br>once daily  | 10 | —                      | 0.95<br>(0.79 to 1.15) | —                      |
| Norelgestromin<br>0.25 mg                             | 50 mg<br>twice daily | 15 | 0.89<br>(0.82 to 0.97) | 0.98<br>(0.91 to 1.04) | 0.93<br>(0.85 to 1.03) |
| Rilpivirine<br>25 mg once daily                       | 50 mg<br>once daily  | 16 | 1.10<br>(0.99 to 1.22) | 1.06<br>(0.98 to 1.16) | 1.21<br>(1.07 to 1.38) |
| Tenofovir disoproxil<br>fumarate<br>300 mg once daily | 50 mg<br>once daily  | 15 | 1.09<br>(0.97 to 1.23) | 1.12<br>(1.01 to 1.24) | 1.19<br>(1.04 to 1.35) |

<sup>a</sup> The number of subjects represents the maximum number of subjects that were evaluated.

**Table 10. Summary of Effect of Coadministered Drugs on the Pharmacokinetics of Dolutegravir**

| Coadministered Drug(s)<br>and Dose(s)                                  | Dose of<br>Dolutegravir | n  | Geometric Mean Ratio (90% CI) of Dolutegravir<br>Pharmacokinetic Parameters with/without<br>Coadministered Drugs<br>No Effect = 1.00 |                        |                                   |
|------------------------------------------------------------------------|-------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------|
|                                                                        |                         |    | C <sub>max</sub>                                                                                                                     | AUC                    | C <sub>r</sub> or C <sub>24</sub> |
| Atazanavir<br>400 mg once daily                                        | 30 mg<br>once daily     | 12 | 1.50<br>(1.40 to 1.59)                                                                                                               | 1.91<br>(1.80 to 2.03) | 2.80<br>(2.52 to 3.11)            |
| Atazanavir/ritonavir<br>300/100 mg once daily                          | 30 mg<br>once daily     | 12 | 1.34<br>(1.25 to 1.42)                                                                                                               | 1.62<br>(1.50 to 1.74) | 2.21<br>(1.97 to 2.47)            |
| Darunavir/ritonavir<br>600/100 mg twice daily                          | 30 mg<br>once daily     | 15 | 0.89<br>(0.83 to 0.97)                                                                                                               | 0.78<br>(0.72 to 0.85) | 0.62<br>(0.56 to 0.69)            |
| Efavirenz<br>600 mg once daily                                         | 50 mg<br>once daily     | 12 | 0.61<br>(0.51 to 0.73)                                                                                                               | 0.43<br>(0.35 to 0.54) | 0.25<br>(0.18 to 0.34)            |
| Etravirine<br>200 mg twice daily                                       | 50 mg<br>once daily     | 16 | 0.48<br>(0.43 to 0.54)                                                                                                               | 0.29<br>(0.26 to 0.34) | 0.12<br>(0.09 to 0.16)            |
| Etravirine + darunavir/ritonavir<br>200 mg + 600/100 mg twice<br>daily | 50 mg<br>once daily     | 9  | 0.88<br>(0.78 to 1.00)                                                                                                               | 0.75<br>(0.69 to 0.81) | 0.63<br>(0.52 to 0.76)            |
| Etravirine + lopinavir/ritonavir<br>200 mg + 400/100 mg twice<br>daily | 50 mg<br>once daily     | 8  | 1.07<br>(1.02 to 1.13)                                                                                                               | 1.11<br>(1.02 to 1.20) | 1.28<br>(1.13 to 1.45)            |
| Fosamprenavir/ritonavir<br>700 mg/100 mg twice daily                   | 50 mg<br>once daily     | 12 | 0.76<br>(0.63 to 0.92)                                                                                                               | 0.65<br>(0.54 to 0.78) | 0.51<br>(0.41 to 0.63)            |
| Lopinavir/ritonavir<br>400/100 mg twice daily                          | 30 mg<br>once daily     | 15 | 1.00<br>(0.94 to 1.07)                                                                                                               | 0.97<br>(0.91 to 1.04) | 0.94<br>(0.85 to 1.05)            |
| Rilpivirine<br>25 mg once daily                                        | 50 mg<br>once daily     | 16 | 1.13<br>(1.06 to 1.21)                                                                                                               | 1.12<br>(1.05 to 1.19) | 1.22<br>(1.15 to 1.30)            |
| Tenofovir<br>300 mg once daily                                         | 50 mg<br>once daily     | 15 | 0.97<br>(0.87 to 1.08)                                                                                                               | 1.01<br>(0.91 to 1.11) | 0.92<br>(0.82 to 1.04)            |

|                                                                       |                      |                 |                        |                        |                        |
|-----------------------------------------------------------------------|----------------------|-----------------|------------------------|------------------------|------------------------|
| Tipranavir/ritonavir<br>500/200 mg twice daily                        | 50 mg<br>once daily  | 14              | 0.54<br>(0.50 to 0.57) | 0.41<br>(0.38 to 0.44) | 0.24<br>(0.21 to 0.27) |
| Antacid (MAALOX)<br>simultaneous administration                       | 50 mg<br>single dose | 16              | 0.28<br>(0.23 to 0.33) | 0.26<br>(0.22 to 0.32) | 0.26<br>(0.21 to 0.31) |
| Antacid (MAALOX)<br>2 h after dolutegravir                            | 50 mg<br>single dose | 16              | 0.82<br>(0.69 to 0.98) | 0.74<br>(0.62 to 0.90) | 0.70<br>(0.58 to 0.85) |
| Boceprevir<br>800 mg every 8 h                                        | 50 mg<br>once daily  | 13              | 1.05<br>(0.96 to 1.15) | 1.07<br>(0.95 to 1.20) | 1.08<br>(0.91 to 1.28) |
| Calcium carbonate 1,200 mg<br>simultaneous administration<br>(fasted) | 50 mg<br>single dose | 12              | 0.63<br>(0.50 to 0.81) | 0.61<br>(0.47 to 0.80) | 0.61<br>(0.47 to 0.80) |
| Calcium carbonate 1,200 mg<br>simultaneous administration<br>(fed)    | 50 mg<br>single dose | 11              | 1.07<br>(0.83 to 1.38) | 1.09<br>(0.84 to 1.43) | 1.08<br>(0.81 to 1.42) |
| Calcium carbonate 1,200 mg<br>2 h after dolutegravir                  | 50 mg<br>single dose | 11              | 1.00<br>(0.78 to 1.29) | 0.94<br>(0.72 to 1.23) | 0.90<br>(0.68 to 1.19) |
| Carbamazepine<br>300 mg twice daily                                   | 50 mg<br>once daily  | 16 <sup>c</sup> | 0.67<br>(0.61 to 0.73) | 0.51<br>(0.48 to 0.55) | 0.27<br>(0.24 to 0.31) |
| Ferrous fumarate 324 mg<br>simultaneous administration<br>(fasted)    | 50 mg<br>single dose | 11              | 0.43<br>(0.35 to 0.52) | 0.46<br>(0.38 to 0.56) | 0.44<br>(0.36 to 0.54) |
| Ferrous fumarate 324 mg<br>simultaneous administration<br>(fed)       | 50 mg<br>single dose | 11              | 1.03<br>(0.84 to 1.26) | 0.98<br>(0.81 to 1.20) | 1.00<br>(0.81 to 1.23) |
| Ferrous fumarate 324 mg<br>2 h after dolutegravir                     | 50 mg<br>single dose | 10              | 0.99<br>(0.81 to 1.21) | 0.95<br>(0.77 to 1.15) | 0.92<br>(0.74 to 1.13) |
| Multivitamin (One-A-Day)<br>simultaneous administration               | 50 mg<br>single dose | 16              | 0.65<br>(0.54 to 0.77) | 0.67<br>(0.55 to 0.81) | 0.68<br>(0.56 to 0.82) |
| Omeprazole<br>40 mg once daily                                        | 50 mg<br>single dose | 12              | 0.92<br>(0.75 to 1.11) | 0.97<br>(0.78 to 1.20) | 0.95<br>(0.75 to 1.21) |
| Prednisone<br>60 mg once daily with<br>taper                          | 50 mg<br>once daily  | 12              | 1.06<br>(0.99 to 1.14) | 1.11<br>(1.03 to 1.20) | 1.17<br>(1.06 to 1.28) |
| Rifampin <sup>a</sup><br>600 mg once daily                            | 50 mg<br>twice daily | 11              | 0.57<br>(0.49 to 0.65) | 0.46<br>(0.38 to 0.55) | 0.28<br>(0.23 to 0.34) |
| Rifampin <sup>b</sup><br>600 mg once daily                            | 50 mg<br>twice daily | 11              | 1.18<br>(1.03 to 1.37) | 1.33<br>(1.15 to 1.53) | 1.22<br>(1.01 to 1.48) |
| Rifabutin<br>300 mg once daily                                        | 50 mg<br>once daily  | 9               | 1.16<br>(0.98 to 1.37) | 0.95<br>(0.82 to 1.10) | 0.70<br>(0.57 to 0.87) |

<sup>a</sup> Comparison is rifampin taken with dolutegravir 50 mg twice daily compared with dolutegravir 50 mg twice daily.

<sup>b</sup> Comparison is rifampin taken with dolutegravir 50 mg twice daily compared with dolutegravir 50 mg once daily.

<sup>c</sup> The number of subjects represents the maximum number of subjects that were evaluated.

**Abacavir or Lamivudine:** The drug interactions described are based on trials conducted with abacavir or lamivudine as single entities.

*Effect of Abacavir and Lamivudine on the Pharmacokinetics of Other Agents:* In vitro studies have shown that abacavir has potential to inhibit CYP1A1 and limited potential to inhibit metabolism mediated by CYP3A4. Lamivudine does not inhibit or induce CYP3A4. Abacavir and lamivudine do not inhibit or induce other CYP enzymes (such as CYP2C9 or CYP2D6). Based on



*in vitro* study results, abacavir and lamivudine at therapeutic drug exposures are not expected to affect the pharmacokinetics of drugs that are substrates of the following transporters: OATP1B1/3, BCRP or P-gp, OCT1, OCT2, OCT3 (lamivudine only), or MATE1 and MATE2-K.

*Abacavir, Dolutegravir, and Lamivudine:* Coadministration of a single dose of riociguat (0.5 mg) to HIV-1–infected subjects receiving abacavir, dolutegravir and lamivudine is reported to increase riociguat AUC<sub>(∞)</sub> compared with riociguat AUC<sub>(∞)</sub> reported in healthy subjects due to CYP1A1 inhibition by abacavir. The exact magnitude of increase in riociguat exposure has not been fully characterized based on findings from two studies [see *Drug Interactions* (7.3)].

*Effect of Other Agents on the Pharmacokinetics of Abacavir or Lamivudine:* *In vitro*, abacavir is not a substrate of OATP1B1, OATP1B3, OCT1, OCT2, OAT1, MATE1, MATE2-K, MRP2 or MRP4; therefore, drugs that modulate these transporters are not expected to affect abacavir plasma concentrations. Abacavir is a substrate of BCRP and P-gp *in vitro*; however, considering its absolute bioavailability (83%), modulators of these transporters are unlikely to result in a clinically relevant impact on abacavir concentrations.

Lamivudine is a substrate of MATE1, MATE2-K, and OCT2 *in vitro*. Trimethoprim (an inhibitor of these drug transporters) has been shown to increase lamivudine plasma concentrations. This interaction is not considered clinically significant as no dose adjustment of lamivudine is needed.

Lamivudine is a substrate of P-gp and BCRP; however, considering its absolute bioavailability (87%), it is unlikely that these transporters play a significant role in the absorption of lamivudine. Therefore, coadministration of drugs that are inhibitors of these efflux transporters is unlikely to affect the disposition and elimination of lamivudine.

*Ethanol:* Abacavir has no effect on the pharmacokinetic properties of ethanol. Ethanol decreases the elimination of abacavir causing an increase in overall exposure.

*Interferon Alfa:* There was no significant pharmacokinetic interaction between lamivudine and interferon alfa in a trial of 19 healthy male subjects.

*Methadone:* In a trial of 11 HIV-1–infected subjects receiving methadone-maintenance therapy (40 mg and 90 mg daily), with 600 mg of abacavir twice daily (twice the currently recommended dose), oral methadone clearance increased 22% (90% CI: 6% to 42%) [see *Drug Interactions* (7.3)]. The addition of methadone has no clinically significant effect on the pharmacokinetic properties of abacavir.

*Ribavirin:* *In vitro* data indicate ribavirin reduces phosphorylation of lamivudine, stavudine, and zidovudine. However, no pharmacokinetic (e.g., plasma concentrations or intracellular triphosphorylated active metabolite concentrations) or pharmacodynamic (e.g., loss of HIV-1/HCV [hepatitis C virus] virologic suppression) interaction was observed when ribavirin and lamivudine (n = 18), stavudine (n = 10), or zidovudine (n = 6) were coadministered as part of a multi-drug regimen to HIV-1/HCV co-infected subjects.

*Sorbitol (Excipient):* Lamivudine and sorbitol solutions were coadministered to 16 healthy adult subjects in an open-label, randomized-sequence, 4-period, crossover trial. Each subject received a single 300-mg dose of lamivudine oral solution alone or coadministered with a single dose of 3.2 g, 10.2 g, or 13.4 g of sorbitol in solution. Coadministration of lamivudine with sorbitol

resulted in dose-dependent decreases of 20%, 39%, and 44% in the AUC<sub>(0-24)</sub>; 14%, 32%, and 36% in the AUC<sub>(∞)</sub>; and 28%, 52%, and 55% in the C<sub>max</sub>; of lamivudine, respectively.

**Abacavir, Lamivudine, Zidovudine:** Fifteen HIV-1–infected subjects were enrolled in a crossover-designed drug interaction trial evaluating single doses of abacavir (600 mg), lamivudine (150 mg), and zidovudine (300 mg) alone or in combination. Analysis showed no clinically relevant changes in the pharmacokinetics of abacavir with the addition of lamivudine or zidovudine or the combination of lamivudine and zidovudine. Lamivudine exposure (AUC decreased 15%) and zidovudine exposure (AUC increased 10%) did not show clinically relevant changes with concurrent abacavir.

**Lamivudine and Zidovudine:** No clinically significant alterations in lamivudine or zidovudine pharmacokinetics were observed in 12 asymptomatic HIV-1–infected adult patients given a single dose of zidovudine (200 mg) in combination with multiple doses of lamivudine (300 mg every 12 hours).

The effects of other coadministered drugs on abacavir or lamivudine are provided in Table 11.

**Table 11. Effect of Coadministered Drugs on Abacavir or Lamivudine**

| Coadministered Drug and Dose                                      | Drug and Dose               | n  | Concentrations of Abacavir or Lamivudine |                       | Concentration of Coadministered Drug |
|-------------------------------------------------------------------|-----------------------------|----|------------------------------------------|-----------------------|--------------------------------------|
|                                                                   |                             |    | AUC                                      | Variability           |                                      |
| Ethanol<br>0.7 g/kg                                               | Abacavir<br>Single 600 mg   | 24 | ↑41%                                     | 90% CI:<br>35% to 48% | ↔ <sup>a</sup>                       |
| Nelfinavir<br>750 mg every 8 h x 7 to 10 days                     | Lamivudine<br>Single 150 mg | 11 | ↑10%                                     | 95% CI:<br>1% to 20%  | ↔                                    |
| Trimethoprim 160 mg/<br>Sulfamethoxazole<br>800 mg daily x 5 days | Lamivudine<br>Single 300 mg | 14 | ↑43%                                     | 90% CI:<br>32% to 55% | ↔                                    |

↑ = Increase; ↔ = No significant change.

<sup>a</sup> The drug-drug interaction was only evaluated in males.

## 12.4 Microbiology

### Mechanism of Action

**Dolutegravir:** Dolutegravir inhibits HIV integrase by binding to the integrase active site and blocking the strand transfer step of retroviral DNA integration which is essential for the HIV replication cycle. Strand transfer biochemical assays using purified recombinant HIV-1 integrase and pre-processed substrate DNA resulted in IC<sub>50</sub> values of 2.7 nM and 12.6 nM.

**Abacavir:** Abacavir is a carbocyclic synthetic nucleoside analogue. Abacavir is converted by cellular enzymes to the active metabolite, carbovir triphosphate (CBV-TP), an analogue of deoxyguanosine-5'-triphosphate (dGTP). CBV-TP inhibits the activity of HIV-1 reverse

transcriptase (RT) both by competing with the natural substrate dGTP and by its incorporation into viral DNA.

*Lamivudine:* Lamivudine is a synthetic nucleoside analogue. Intracellularly lamivudine is phosphorylated to its active 5'-triphosphate metabolite, lamivudine triphosphate (3TC-TP). The principal mode of action of 3TC-TP is inhibition of RT via DNA chain termination after incorporation of the nucleotide analogue.

#### Antiviral Activity in Cell Culture

*Dolutegravir:* Dolutegravir exhibited antiviral activity against laboratory strains of wild-type HIV-1 with mean concentration of drug necessary to affect viral replication by 50% (EC<sub>50</sub>) values of 0.5 nM (0.21 ng/mL) to 2.1 nM (0.85 ng/mL) in peripheral blood mononuclear cells (PBMCs) and MT-4 cells. Dolutegravir exhibited antiviral activity against 13 clinically diverse clade B isolates with a median EC<sub>50</sub> value of 0.54 nM (range: 0.41 to 0.60 nM) in a viral susceptibility assay using the integrase coding region from clinical isolates. Dolutegravir demonstrated antiviral activity in cell culture against a panel of HIV-1 clinical isolates with median EC<sub>50</sub> values of 0.18 nM (n = 3, range: 0.09 to 0.5 nM), 0.08 nM (n = 5, range: 0.05 to 2.14 nM), 0.12 nM (n = 4, range: 0.05 to 0.51 nM), 0.17 nM (n = 3, range: 0.16 to 0.35 nM), 0.24 nM (n = 3, range: 0.09 to 0.32 nM), 0.17 nM (n = 4, range: 0.07 to 0.44 nM), 0.2 nM (n = 3, range: 0.02 to 0.87 nM), and 0.42 nM (n = 3, range: 0.41 to 1.79 nM) for clades A, B, C, D, E, F, and G, and group O viruses, respectively. Dolutegravir EC<sub>50</sub> values against three HIV-2 clinical isolates in PBMC assays ranged from 0.09 nM to 0.61 nM.

*Abacavir:* The antiviral activity of abacavir against HIV-1 was assessed in a number of cell lines including in primary monocytes/macrophages and PBMCs. EC<sub>50</sub> values ranged from 3,700 to 5,800 nM (1 nM = 0.28 ng/mL) and 70 to 1,000 nM against HIV-1<sub>IIIB</sub> and HIV-1<sub>BaL</sub>, respectively, and the mean EC<sub>50</sub> value was 260 ± 180 nM against 8 clinical isolates. The median EC<sub>50</sub> values of abacavir were 344 nM (range: 14.8 to 676 nM), 16.9 nM (range: 5.9 to 27.9 nM), 8.1 nM (range: 1.5 to 16.7 nM), 356 nM (range: 35.7 to 396 nM), 105 nM (range: 28.1 to 168 nM), 47.6 nM (range: 5.2 to 200 nM), 51.4 nM (range: 7.1 to 177 nM), and 282 nM (range: 22.4 to 598 nM) against HIV-1 clades A-G and group O viruses (n = 3 except n = 2 for clade B), respectively. The EC<sub>50</sub> values against HIV-2 isolates (n = 4), ranged from 24 to 490 nM.

*Lamivudine:* The antiviral activity of lamivudine against HIV-1 was assessed in a number of cell lines including monocytes and PBMCs using standard susceptibility assays. EC<sub>50</sub> values were in the range of 3 to 15,000 nM (1 nM = 0.23 ng/mL). The median EC<sub>50</sub> values of lamivudine were 60 nM (range: 20 to 70 nM), 35 nM (range: 30 to 40 nM), 30 nM (range: 20 to 90 nM), 20 nM (range: 3 to 40 nM), 30 nM (range: 1 to 60 nM), 30 nM (range: 20 to 70 nM), 30 nM (range: 3 to 70 nM), and 30 nM (range: 20 to 90 nM) against HIV-1 clades A-G and group O viruses (n = 3 except n = 2 for clade B) respectively. The EC<sub>50</sub> values against HIV-2 isolates (n = 4) from 3 to 120 nM in PBMCs. Ribavirin (50,000 nM) used in the treatment of chronic HCV infection decreased the anti-HIV-1 activity of lamivudine by 3.5-fold in MT-4 cells.

#### Antiviral Activity in Combination with Other Antiviral Agents

Neither dolutegravir, abacavir, nor lamivudine were antagonistic to all tested anti-HIV agents. See full prescribing information for ZIAGEN (abacavir), TIVICAY (dolutegravir), and EPIVIR (lamivudine).

### Resistance in Cell Culture

*Dolutegravir:* Dolutegravir-resistant viruses were selected in cell culture starting from different wild-type HIV-1 strains and clades. Amino acid substitutions E92Q, G118R, S153F or Y, G193E or R263K emerged in different passages and conferred decreased susceptibility to dolutegravir of up to 4-fold.

*Abacavir and Lamivudine:* HIV-1 isolates with reduced susceptibility to the combination of abacavir and lamivudine have been selected in cell culture with amino acid substitutions K65R, L74V, Y115F, and M184V/I in HIV-1 RT. M184V or I substitutions resulted in high-level resistance to lamivudine and approximately 2-fold decrease in susceptibility to abacavir. Substitutions K65R, L74V, or Y115F with M184V or I conferred a 7- to 8-fold reduction in abacavir susceptibility, and combinations of three substitutions were required to confer more than an 8-fold reduction in susceptibility.

### Resistance in Clinical Subjects

No subjects in the treatment arm receiving dolutegravir + EPZICOM in SINGLE (treatment-naïve trial) had a detectable decrease in susceptibility to dolutegravir or background NRTIs in the resistance analysis subset (n = 11 with HIV-1 RNA >400 copies/mL at failure or last visit and having resistance data). Two virologic failure subjects in SINGLE had treatment-emergent G/D/E193D and G193G/E integrase substitutions at Week 84 and Week 108, respectively, and 1 subject with 275 copies/mL HIV-1 RNA had a treatment-emergent Q157Q/P integrase substitution detected at Week 24. None of these subjects had a corresponding decrease in dolutegravir susceptibility. No treatment-emergent genotypic resistance to abacavir and lamivudine, components of abacavir, dolutegravir and lamivudine, was observed in the arm receiving dolutegravir + EPZICOM in the SINGLE trial through Week 144. One ART-naïve subject receiving TRIUMEQ PD in the pediatric IMPAACT 2019 trial experienced confirmed virologic failure at Week 24 but subsequently suppressed to 76 copies/mL by Week 48 while on continued study treatment. The subject's entry specimen (HIV-1 subtype AE) had the presence of baseline integrase substitution L74I polymorphism. Genotypic sequencing and phenotypic analyses failed at the confirmed virologic failure timepoint for this subject.

### Cross-Resistance

*Dolutegravir:* Cross-resistance has been observed among INSTIs. The single INSTI-resistance substitutions T66K, I151L, and S153Y conferred a >2-fold decrease in dolutegravir susceptibility (range: 2.3-fold to 3.6-fold from reference). Combinations of multiple substitutions T66K/L74M, E92Q/N155H, G140C/Q148R, G140S/Q148H, R or K, Q148R/N155H, T97A/G140S/Q148, and substitutions at E138/G140/Q148 showed a >2-fold decrease in dolutegravir susceptibility (range: 2.5-fold to 21-fold from reference). In HIV-2 mutants, combinations of substitutions A153G/N155H/S163G and E92Q/T97A/N155H/S163D conferred 4-fold decreases in dolutegravir susceptibility, and E92Q/N155H and G140S/Q148R showed 8.5-fold and 17-fold decreases in dolutegravir susceptibility, respectively.

*Abacavir and Lamivudine:* Cross-resistance has been observed among NRTIs. The combination of abacavir/lamivudine has demonstrated decreased susceptibility to viruses with a K65R substitution with or without an M184V/I substitution, viruses with L74V plus the M184V/I substitution, and viruses with thymidine analog mutation (TAM) substitutions (M41L, D67N,

K70R, L210W, T215Y/F, K219 E/R/H/Q/N) plus M184V. An increasing number of TAMs is associated with a progressive reduction in abacavir susceptibility.

## 13 NONCLINICAL TOXICOLOGY

### 13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

#### Carcinogenicity

*Dolutegravir*: Two-year carcinogenicity studies in mice and rats were conducted with dolutegravir. Mice were administered doses of up to 500 mg/kg, and rats were administered doses of up to 50 mg/kg. In mice, no significant increases in the incidence of drug-related neoplasms were observed at the highest doses tested, resulting in dolutegravir AUC exposures approximately 26-fold higher than those in humans at the recommended dose of 50 mg once daily. In rats, no increases in the incidence of drug-related neoplasms were observed at the highest dose tested, resulting in dolutegravir AUC exposures 17-fold and 30-fold higher in males and females, respectively, than those in humans at the recommended dose of 50 mg once daily.

*Abacavir*: Abacavir was administered orally at 3 dosage levels to separate groups of mice and rats in 2-year carcinogenicity studies. Results showed an increase in the incidence of malignant and non-malignant tumors. Malignant tumors occurred in the preputial gland of males and the clitoral gland of females of both species, and in the liver of female rats. In addition, non-malignant tumors also occurred in the liver and thyroid gland of female rats. These observations were made at systemic exposures in the range of 7 to 28 times the human exposure at the recommended dose of 600 mg.

*Lamivudine*: Long-term carcinogenicity studies with lamivudine in mice and rats showed no evidence of carcinogenic potential at exposures up to 12 times (mice) and 57 times (rats) the human exposures at the recommended dose of 300 mg.

#### Mutagenicity

*Dolutegravir*: Dolutegravir was not genotoxic in the bacterial reverse mutation assay, mouse lymphoma assay, or in the *in vivo* rodent micronucleus assay.

*Abacavir*: Abacavir induced chromosomal aberrations both in the presence and absence of metabolic activation in an *in vitro* cytogenetic study in human lymphocytes. Abacavir was mutagenic in the absence of metabolic activation, although it was not mutagenic in the presence of metabolic activation in an L5178Y mouse lymphoma assay. Abacavir was clastogenic in males and not clastogenic in females in an *in vivo* mouse bone marrow micronucleus assay. Abacavir was not mutagenic in bacterial mutagenicity assays in the presence and absence of metabolic activation.

*Lamivudine*: Lamivudine was mutagenic in an L5178Y mouse lymphoma assay and clastogenic in a cytogenetic assay using cultured human lymphocytes. Lamivudine was not mutagenic in a microbial mutagenicity assay, in an *in vitro* cell transformation assay, in a rat micronucleus test, in a rat bone marrow cytogenetic assay, and in an assay for unscheduled DNA synthesis in rat liver.

### Impairment of Fertility

Dolutegravir, abacavir, or lamivudine did not affect male or female fertility in rats at doses associated with exposures approximately 44, 9, or 112 times (respectively) higher than the exposures in humans at the doses of 50 mg, 600 mg, and 300 mg (respectively).

## **13.2 Animal Toxicology and/or Pharmacology**

Myocardial degeneration was found in mice and rats following administration of abacavir for 2 years. The systemic exposures were equivalent to 7 to 21 times the expected systemic exposure in humans at a dose of 600 mg. The clinical relevance of this finding has not been determined.

## **14 CLINICAL STUDIES**

### **14.1 Adult Subjects**

The efficacy of abacavir, dolutegravir and lamivudine is supported by data from a randomized, controlled trial (double-blind through 96 weeks and open-label phase from 96 to 144 weeks) in antiretroviral treatment-naïve subjects, SINGLE (ING114467, NCT01263015) and other trials in treatment-naïve subjects. See full prescribing information for TIVICAY. The efficacy of dolutegravir, in combination with at least two active background regimens in treatment-experienced, INSTI- naïve subjects is supported by data from SAILING (ING111762, NCT01231516) (refer to the prescribing information for TIVICAY).

### Treatment-Naïve Subjects

In SINGLE, 833 subjects were randomized and received at least 1 dose of either TIVICAY 50 mg once daily with fixed-dose abacavir and lamivudine (EPZICOM) or fixed-dose efavirenz/emtricitabine/tenofovir disoproxil fumarate (ATRIPLA). At baseline, the median age of subjects was 35 years, 16% female, 32% non-white, 7% had hepatitis C co-infection (hepatitis B virus co-infection was excluded), 4% were CDC Class C (AIDS), 32% had HIV-1 RNA >100,000 copies/mL, and 53% had CD4+ cell count <350 cells/mm<sup>3</sup>; these characteristics were similar between treatment groups.

Week 144 (open-label-phase analysis which followed the Week 96 double-blind phase) outcomes for SINGLE are provided in Table 12.

**Table 12. Virologic Outcomes of Randomized Treatment in SINGLE at 144 Weeks (Snapshot Algorithm)**

|                                                     | <b>TIVICAY + EPZICOM Once Daily<br/>(n = 414)</b> | <b>ATRIPLA Once Daily<br/>(n = 419)</b> |
|-----------------------------------------------------|---------------------------------------------------|-----------------------------------------|
| <b>HIV-1 RNA &lt;50 copies/mL</b>                   | 71%                                               | 63%                                     |
| Treatment difference <sup>a</sup>                   | 8.3% (95% CI: 2.0%, 14.6%) <sup>d</sup>           |                                         |
| <b>Virologic nonresponse</b>                        | 10%                                               | 7%                                      |
| Data in window not <50 copies/mL                    | 4%                                                | <1%                                     |
| Discontinued for lack of efficacy                   | 3%                                                | 3%                                      |
| Discontinued for other reasons while not suppressed | 3%                                                | 4%                                      |
| <b>No virologic data</b>                            | 18%                                               | 30%                                     |
| Reasons                                             |                                                   |                                         |

|                                                                                        |     |     |
|----------------------------------------------------------------------------------------|-----|-----|
| Discontinued study/study drug due to adverse event or death <sup>b</sup>               | 4%  | 14% |
| Discontinued study/study drug for other reasons <sup>c</sup>                           | 12% | 13% |
| Missing data during window but on study                                                | 2%  | 3%  |
| <b>Proportion (%) of Subjects with HIV-1 RNA &lt;50 copies/mL by Baseline Category</b> |     |     |
| <b>Plasma viral load (copies/mL)</b>                                                   |     |     |
| ≤100,000                                                                               | 73% | 64% |
| ≥100,000                                                                               | 69% | 61% |
| <b>Gender</b>                                                                          |     |     |
| Male                                                                                   | 72% | 66% |
| Female                                                                                 | 69% | 48% |
| <b>Race</b>                                                                            |     |     |
| White                                                                                  | 72% | 71% |
| African American/African Heritage/Other                                                | 71% | 47% |

<sup>a</sup> Adjusted for pre-specified stratification factors.

<sup>b</sup> Includes subjects who discontinued due to an adverse event or death at any time point if this resulted in no virologic data on treatment during the analysis window.

<sup>c</sup> Other includes reasons such as withdrew consent, loss to follow-up, moved, and protocol deviation.

<sup>d</sup> The primary endpoint was assessed at Week 48 and the virologic success rate was 88% in the group receiving TIVICAY and 81% in the ATRIPLA group, with a treatment difference of 7.4% and 95% CI of (2.5%, 12.3%).

Treatment differences were maintained across baseline characteristics including baseline viral load, CD4+ cell count, age, gender, and race. The adjusted mean changes in CD4+ cell counts from baseline were 378 cells/mm<sup>3</sup> in the group receiving TIVICAY + EPZICOM and 332 cells/mm<sup>3</sup> for the ATRIPLA group at 144 weeks. The adjusted difference between treatment arms and 95% CI was 46.9 cells/mm<sup>3</sup> (15.6 cells/mm<sup>3</sup>, 78.2 cells/mm<sup>3</sup>) (adjusted for pre-specified stratification factors: baseline HIV-1 RNA, and baseline CD4+ cell count).

### Treatment-Experienced

In SAILING, there were 715 subjects included in the efficacy and safety analyses (see full prescribing information for TIVICAY). At Week 48, 71% of subjects randomized to TIVICAY plus background regimen versus 64% of subjects randomized to raltegravir plus background regimen had HIV-1 RNA <50 copies/mL (treatment difference and 95% CI: 7.4% [0.7%, 14.2%]).

## **14.2 Pediatric Subjects**

The efficacy of abacavir, dolutegravir and lamivudine and their individual components for the treatment of HIV-1 infection was evaluated in pediatric patients enrolled in the IMPAACT 2019 trial (NCT03760458), ARROW trial (NCT02028676) and IMPAACT P1093 trial (NCT01302847), as summarized below.

- Abacavir, dolutegravir and lamivudine were evaluated in treatment-naïve or treatment-experienced, HIV-1-infected subjects younger than 12 years in an open-label, multicenter clinical trial (IMPAACT 2019). Subjects were stratified by weight band and enrolled in one of five groups. Fifty-seven subjects, with a median age of 6.4 years (range: 1 to 11.3) and median weight of 17 kg (range: 8.2 to 39.3), received the recommended dose (determined by weight) and formulation, and contributed to the efficacy analysis at Week 48. At this timepoint, 79% of subjects achieved HIV-1 RNA less than 50 copies/mL and 95% achieved HIV-1 RNA less than 200 copies/mL (Snapshot algorithm).

- Abacavir and lamivudine once daily, in combination with a third antiretroviral drug, were evaluated in a randomized, multicenter trial (ARROW) in treatment-naïve pediatric subjects with HIV-1 infection. Subjects randomized to once-daily dosing (n = 336) and who weighed at least 25 kg received abacavir 600 mg and lamivudine 300 mg, as either the single entities or as EPZICOM. At Week 96, 67% of subjects receiving abacavir and lamivudine once-daily in combination with a third antiretroviral drug, had HIV-1 RNA <80 copies/mL.
- Dolutegravir (TIVICAY or TIVICAY PD), in combination with other antiretroviral drugs, was evaluated in treatment-naïve or treatment-experienced, INSTI-naïve, HIV-1-infected subjects aged at least 4 weeks to 18 years in an ongoing open-label, multicenter, dose-finding clinical trial, IMPAACT P1093. Subjects were stratified by age from 4 weeks to younger than 18 years and enrolled in one of five age cohorts. Thirty-six subjects weighing at least 6 kg who received the recommended dose (determined by weight and age) and formulation contributed to the efficacy analysis at Week 48. At this timepoint, 72% (26/36) of subjects weighing at least 6 kg achieved HIV-1 RNA <50 copies/mL (Snapshot algorithm).

## 16 HOW SUPPLIED/STORAGE AND HANDLING

### Abacavir, dolutegravir and lamivudine tablets

Abacavir, dolutegravir and lamivudine tablets are beige colored, oval shaped, biconvex, film coated tablets debossed with 'H' on one side and 'A60' on the other side and contain 600 mg of abacavir (as abacavir sulfate), 50 mg of dolutegravir (as dolutegravir sodium), and 300 mg lamivudine.

Bottles of 30 with child-resistant closure

NDC 68554-5295-0

Bottles of 90 with child-resistant closure

NDC 68554-5295-1

Store and dispense in the original package, protect from moisture, and keep the bottle tightly closed. Do not remove desiccant.

Store at 20°C to 25°C (68°F to 77°F); excursions permitted between 15°C and 30°C (59°F to 86°F). [See USP Controlled Room Temperature].

## 17 PATIENT COUNSELING INFORMATION

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

### Drug Interactions

Abacavir, dolutegravir and lamivudine tablets may interact with many drugs; therefore, advise patients to report to their healthcare provider the use of any other prescription or nonprescription medication or herbal products, including St. John's wort [see *Contraindications (4)*, *Warnings and Precautions (5.5)*, *Drug Interactions (7)*].

### Hypersensitivity Reaction

Inform patients:

- that a Medication Guide and Warning Card summarizing the symptoms of the abacavir hypersensitivity reaction and other product information will be dispensed by the pharmacist



with each new prescription and refill of abacavir, dolutegravir and lamivudine tablets, and instruct the patient to read the Medication Guide and Warning Card every time to obtain any new information that may be present about abacavir, dolutegravir and lamivudine tablets. The complete text of the Medication Guide is reprinted at the end of this document.

- to carry the Warning Card with them.
- how to identify a hypersensitivity reaction [*see Warnings and Precautions (5.1), Medication Guide*].
- that if they develop symptoms consistent with a hypersensitivity reaction they should call their healthcare provider right away to determine if they should stop taking abacavir, dolutegravir and lamivudine tablets.
- that a hypersensitivity reaction can worsen and lead to hospitalization or death if abacavir, dolutegravir and lamivudine tablets are not immediately discontinued.
- to not restart abacavir, dolutegravir and lamivudine tablets or any other abacavir-containing product following a hypersensitivity reaction because more severe symptoms can occur within hours and may include life-threatening hypotension and death.
- that if they have a hypersensitivity reaction, they should dispose of any unused abacavir, dolutegravir and lamivudine tablets to avoid restarting abacavir.
- that a hypersensitivity reaction is usually reversible if it is detected promptly and abacavir, dolutegravir and lamivudine tablets are stopped right away.
- that if they have interrupted abacavir, dolutegravir and lamivudine tablets for reasons other than symptoms of hypersensitivity (for example, those who have an interruption in drug supply), a serious or fatal hypersensitivity reaction may occur with reintroduction of abacavir.
- to not restart abacavir, dolutegravir and lamivudine tablets or any other abacavir-containing product without medical consultation and only if medical care can be readily accessed by the patient or others.
- to not restart abacavir, dolutegravir and lamivudine tablets or any other dolutegravir-containing product following a hypersensitivity reaction to abacavir, dolutegravir and lamivudine tablets.

### Hepatotoxicity

Inform patients that hepatotoxicity has been reported with dolutegravir, a component of abacavir, dolutegravir and lamivudine tablets [*see Warnings and Precautions (5.3), Adverse Reactions (6.1)*]. Inform patients that monitoring for hepatotoxicity during therapy with abacavir, dolutegravir and lamivudine tablets are recommended.

### Severe Acute Exacerbations of Hepatitis in Patients with HBV Co-infection

Advise all patients with HIV-1 to be tested for the presence of HBV prior to or when initiating abacavir, dolutegravir and lamivudine tablets. Advise patients co-infected with HIV-1 and HBV that worsening of liver disease has occurred in some cases when treatment with lamivudine was discontinued.

Advise patients to discuss any changes in regimen with their physician [*see Warnings and Precautions (5.2)*].

### Lactic Acidosis/Hepatomegaly

Inform patients that some HIV medicines, including abacavir, dolutegravir and lamivudine tablets, can cause a rare, but serious condition called lactic acidosis with liver enlargement (hepatomegaly) [see *Boxed Warning, Warnings and Precautions (5.4)*].

### Immune Reconstitution Syndrome

Advise patients to inform their healthcare provider immediately of any signs and symptoms of infection as inflammation from previous infection may occur soon after combination antiretroviral therapy, including when abacavir, dolutegravir and lamivudine tablets are started [see *Warnings and Precautions (5.6)*].

### Abacavir, Dolutegravir and Lamivudine Tablets and TRIUMEQ PD Tablets for Oral Suspension Are Not Bioequivalent

Advise patients that abacavir, dolutegravir and lamivudine tablets and TRIUMEQ PD are not bioequivalent and are not substitutable on a milligram-per-milligram basis. Advise patients or their care provider that patients switching from the tablets for oral suspension to the tablets must adjust the dose [see *Dosage and Administration (2.3) and Warnings and Precautions (5.7)*].

### Pregnancy Registry

Inform patients that there is an antiretroviral pregnancy registry to monitor fetal outcomes in those exposed to abacavir, dolutegravir and lamivudine tablets during pregnancy [see *Use in Specific Populations (8.1)*].

### Lactation

Inform individuals with HIV-1 infection that the potential risks of breastfeeding include: (1) HIV-1 transmission (in HIV-1–negative infants), (2) developing viral resistance (in HIV-1– positive infants), and (3) adverse reactions in a breastfed infant similar to those seen in adults [see *Use in Specific Populations (8.2)*].

### Administration Instructions

To avoid a dosing error from using the wrong formulation of abacavir, dolutegravir and lamivudine tablets, strongly advise patients and caregivers to visually inspect the tablets to verify the correct formulation each time the prescription is filled [see *Dosage and Administration (2), Warnings and Precautions (5.7), How Supplied/Storage and Handling (16)*].

Instruct patients and caregivers that if a dose of abacavir, dolutegravir and lamivudine tablets are missed, to take it as soon as they remember. Advise patients and caregivers not to double the next dose or take more than the prescribed dose [see *Dosage and Administration (2)*].

### Availability of Medication Guide

Instruct patients and caregivers to read the Medication Guide before starting abacavir, dolutegravir and lamivudine tablets and to re-read it each time the prescription is renewed. Instruct patients to inform their physician or pharmacist if they develop any unusual symptom, or if any known symptom persists or worsens.

## Storage

Instruct patients and caregivers to store abacavir, dolutegravir and lamivudine tablets in the original package, protect from moisture, and keep the bottle tightly closed. Do not remove desiccant.

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EPIVIR-HBV is a trademark owned by or licensed to the GSK group of companies.

The other brands listed are trademarks of their respective owners and are not trademarks of Hetero Labs Limited.

Manufactured by



**HETERO™**

**HETERO LABS LIMITED**

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| <b>MEDICATION GUIDE</b><br><b>Abacavir, Dolutegravir and Lamivudine Tablets</b><br><b>(a-BAK-a-vir, doe loo teg' ra vir, la miv' ue deen)</b>                                                                                                                                                                                                                                                                                                          |                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <b>What is the most important information I should know about abacavir, dolutegravir and lamivudine tablets?</b>                                                                                                                                                                                                                                                                                                                                       |                                                                  |
| <b>Abacavir, dolutegravir and lamivudine tablets can cause serious side effects, including:</b>                                                                                                                                                                                                                                                                                                                                                        |                                                                  |
| <ul style="list-style-type: none"><li>• <b>Serious allergic reactions (hypersensitivity reaction)</b> that can cause death have happened with abacavir, dolutegravir and lamivudine tablets and other abacavir-containing products. Your risk of this allergic reaction to abacavir is much higher if you have a gene variation called HLA-B*5701. Your healthcare provider can determine with a blood test if you have this gene variation.</li></ul> |                                                                  |
| <b>If you get a symptom from 2 or more of the following groups while taking abacavir, dolutegravir and lamivudine tablets, call your healthcare provider right away to find out if you should stop taking abacavir, dolutegravir and lamivudine tablets.</b>                                                                                                                                                                                           |                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Symptom(s)</b>                                                |
| <b>Group 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Fever</b>                                                     |
| <b>Group 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Rash</b>                                                      |
| <b>Group 3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Nausea, vomiting, diarrhea, abdominal (stomach area) pain</b> |
| <b>Group 4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Generally ill feeling, extreme tiredness, or achiness</b>     |

|                |                                                |
|----------------|------------------------------------------------|
| <b>Group 5</b> | <b>Shortness of breath, cough, sore throat</b> |
|----------------|------------------------------------------------|

A list of these symptoms is on the Warning Card your pharmacist gives you. **Carry this Warning Card with you at all times.**

**If you stop abacavir, dolutegravir and lamivudine tablets because of an allergic reaction, never take abacavir, dolutegravir and lamivudine tablets (abacavir, dolutegravir and lamivudine), or any other medicine that contains abacavir or dolutegravir (DOVATO, EPZICOM, JULUCA, TIVICAY, TIVICAY PD, TRIZIVIR, or ZIAGEN) again.**

- o If you have an allergic reaction, dispose of any unused abacavir, dolutegravir and lamivudine tablets. Ask your pharmacist how to properly dispose of medicines.
- o If you take abacavir, dolutegravir and lamivudine tablets or any other abacavir-containing medicine again after you have had an allergic reaction, within hours you may get life-threatening symptoms that may include very low blood pressure or death.
- o If you stop abacavir, dolutegravir and lamivudine tablets for any other reason, even for a few days, and you are not allergic to abacavir, dolutegravir and lamivudine tablets, talk with your healthcare provider before taking it again. Taking abacavir, dolutegravir and lamivudine tablets again can cause a serious allergic or life-threatening reaction, even if you never had an allergic reaction to it before.

**If your healthcare provider tells you that you can take abacavir, dolutegravir and lamivudine tablets again, start taking it when you are around medical help or people who can call a healthcare provider if you need one.**

- **Worsening of Hepatitis B virus (HBV) infection.** Your healthcare provider will test you for HBV infection before you start treatment with abacavir, dolutegravir and lamivudine tablets. If you have HBV infection and take abacavir, dolutegravir and lamivudine tablets, your HBV may get worse (flare-up) if you stop taking abacavir, dolutegravir and lamivudine tablets. A “flare-up” is when your HBV infection suddenly returns in a worse way than before.
  - o Do not run out of abacavir, dolutegravir and lamivudine tablets. Refill your prescription or talk to your healthcare provider before your abacavir, dolutegravir and lamivudine tablets are all gone.
  - o Do not stop abacavir, dolutegravir and lamivudine tablets without first talking to your healthcare provider.
  - o If you stop taking abacavir, dolutegravir and lamivudine tablets, your healthcare provider will need to check your health often and do blood tests regularly for several months to check your liver function and monitor your HBV infection. It may be necessary to give you a medicine to treat hepatitis B. Tell your healthcare provider about any new or unusual symptoms you may have after you stop taking abacavir, dolutegravir and lamivudine tablets.
- **Resistant HBV.** If you have human immunodeficiency virus-1 (HIV-1) and HBV, the HBV can change (mutate) during your treatment with abacavir, dolutegravir and lamivudine tablets and become harder to treat (resistant). Your healthcare provider may give you other medicines to treat HBV infection if you have HIV-1 and HBV infections and take abacavir, dolutegravir and lamivudine tablets.
- **For more information about side effects, see “What are the possible side effects of abacavir, dolutegravir and lamivudine tablets?”**

**What are abacavir, dolutegravir and lamivudine tablets?**

Abacavir, dolutegravir and lamivudine tablets are prescription medicines used to treat HIV-1 infection in adults and children who are at least 3 months of age and weigh at least 13.2 pounds (6 kg).

HIV-1 is the virus that causes Acquired Immune Deficiency Syndrome (AIDS).

Abacavir, dolutegravir and lamivudine tablets contain the prescription medicines abacavir, dolutegravir, and lamivudine.

- Abacavir, dolutegravir and lamivudine tablets should not be used by itself in people who have resistance to certain types of medicines.

**Do not take abacavir, dolutegravir and lamivudine tablets if you:**

- have a certain type of gene variation called the HLA-B\*5701 allele. Your healthcare provider will test you for this before prescribing treatment with abacavir, dolutegravir and lamivudine tablets.
- are allergic to abacavir, dolutegravir, lamivudine, or any of the ingredients in abacavir, dolutegravir and lamivudine tablets. See the end of this Medication Guide for a complete list of ingredients in abacavir, dolutegravir and lamivudine tablets.
- take dofetilide. Taking abacavir, dolutegravir and lamivudine tablets and dofetilide can cause side effects that may be serious or life-threatening.
- have certain liver problems.

**Before you take abacavir, dolutegravir and lamivudine tablets, tell your healthcare provider about all of your medical conditions, including if you:**

- have been tested and know whether or not you have a particular gene variation called HLA-B\*5701.
- have or have had liver problems, including hepatitis B or C virus infection.
- have kidney problems.
- have heart problems, smoke, or have diseases that increase your risk of heart disease such as high blood pressure, high cholesterol, or diabetes.
- drink alcohol or take medicines that contain alcohol.
- are pregnant or plan to become pregnant. Talk to your healthcare provider about the benefits and risks of treatment with abacavir, dolutegravir and lamivudine tablets during pregnancy.

**Pregnancy Registry.** There is a pregnancy registry for those who take abacavir, dolutegravir and lamivudine tablets during pregnancy. The purpose of this registry is to collect information about the health of you and your baby. Talk with your healthcare provider about how you can take part in this registry.

- are breastfeeding or plan to breastfeed. Abacavir, dolutegravir and lamivudine tablets passes to your baby in your breast milk. Talk with your healthcare provider about the following risks to your baby from breastfeeding during treatment with abacavir, dolutegravir and lamivudine tablets:
  - the HIV-1 virus may pass to your baby if your baby does not have HIV-1 infection.
  - the HIV-1 virus may become harder to treat if your baby has HIV-1 infection.
  - your baby may get side effects from abacavir, dolutegravir and lamivudine tablets.

**Tell your healthcare provider about all the medicines you take,** including prescription and over-the-counter medicines, vitamins, and herbal supplements.

Some medicines interact with abacavir, dolutegravir and lamivudine tablets. Keep a list of your medicines to show your healthcare provider and pharmacist when you get a new medicine.

- You can ask your healthcare provider or pharmacist for a list of medicines that interact with abacavir, dolutegravir and lamivudine tablets.
- **Do not start taking a new medicine without telling your healthcare provider.** Your healthcare provider can tell you if it is safe to take abacavir, dolutegravir and lamivudine tablets with other medicines.

#### **How should I take abacavir, dolutegravir and lamivudine tablets?**

- **Take abacavir, dolutegravir and lamivudine tablets exactly as your healthcare provider tells you to take it.**
- Do not change your dose, switch medicines or stop taking abacavir, dolutegravir and lamivudine tablets without talking with your healthcare provider first.
- **Abacavir, dolutegravir and lamivudine tablets are not the same as TRIUMEQ PD tablets for oral suspension and cannot be substituted for each other. Check to make sure you receive the correct dosage form each time you or your child's prescription is filled to avoid using the wrong medicine.**
- Your child's healthcare provider will prescribe abacavir, dolutegravir and lamivudine tablets based on your child's weight.
- Do **not** chew, cut, or crush abacavir, dolutegravir and lamivudine tablets.
- Abacavir, dolutegravir and lamivudine tablets may be taken with or without food.
- If you take antacids, laxatives, or other medicines that contain aluminum, magnesium, or buffered medicines, abacavir, dolutegravir and lamivudine tablets should be taken at least 2 hours before or 6 hours after you take these medicines.
- If you need to take iron or calcium supplements, or multivitamin supplements that contain iron or calcium, by mouth during treatment with abacavir, dolutegravir and lamivudine tablets:
  - If you take abacavir, dolutegravir and lamivudine tablets with food, you may take these supplements at the same time that you take abacavir, dolutegravir and lamivudine tablets.
  - If you do not take abacavir, dolutegravir and lamivudine tablets with food, take abacavir, dolutegravir and lamivudine tablets at least 2 hours before or 6 hours after you take these supplements.
- If you miss a dose of abacavir, dolutegravir and lamivudine tablets, take it as soon as you remember. Do not take 2 doses at the same time or take more than your healthcare provider tells you to take.
- Stay under the care of a healthcare provider during treatment with abacavir, dolutegravir and lamivudine tablets.
- Do not run out of abacavir, dolutegravir and lamivudine tablets. The virus in your blood may increase and the virus may become harder to treat. When your supply starts to run low, get more from your healthcare provider or pharmacy.
- If you take too much abacavir, dolutegravir and lamivudine, call your healthcare provider or go to the nearest hospital emergency room right away.

**What are the possible side effects of abacavir, dolutegravir and lamivudine tablets?**

**Abacavir, dolutegravir and lamivudine tablets can cause serious side effects, including:**

- See “What is the most important information I should know about abacavir, dolutegravir and lamivudine tablets ?”
- **Liver problems.** People with a history of hepatitis B or C virus may have an increased risk of developing new or worsening changes in certain liver function tests during treatment with abacavir, dolutegravir and lamivudine tablets. Liver problems including liver failure have also happened with abacavir, dolutegravir and lamivudine tablets in people without a history of liver disease or other risk factors. Liver failure resulting in liver transplant has also been reported with abacavir, dolutegravir and lamivudine tablets. Your healthcare provider may do blood tests to check your liver. **Call your healthcare provider right away if you develop any of the signs or symptoms of liver problems listed below.**
  - your skin or the white part of your eyes turns yellow (jaundice)
  - dark or “tea-colored” urine
  - light colored stools (bowel movements)
  - loss of appetite
  - nausea or vomiting
  - pain, aching, or tenderness on the right side of your stomach area
- **Too much lactic acid in your blood (lactic acidosis).** Too much lactic acid is a serious medical emergency that can lead to death. **Call your healthcare provider right away if you get any of the following symptoms that could be signs of lactic acidosis:**
  - feel very weak or tired
  - unusual (not normal) muscle pain
  - trouble breathing
  - stomach pain with nausea and vomiting
  - feel cold, especially in your arms and legs
  - feel dizzy or lightheaded
  - have a fast or irregular heartbeat
- **Lactic acidosis can also lead to severe liver problems,** which can lead to death. Your liver may become large (hepatomegaly), and you may develop fat in your liver (steatosis). **Call your healthcare provider right away if you get any of the signs or symptoms of liver problems which are listed above under “Liver problems”.**
- **You may be more likely to get lactic acidosis or severe liver problems if you are female or very overweight (obese).**
- **Changes in your immune system (Immune Reconstitution Syndrome)** can happen when you start taking HIV-1 medicines. Your immune system may get stronger and begin to fight infections that have been hidden in your body for a long time. Tell your healthcare provider right away if you start having new symptoms after you start taking abacavir, dolutegravir and lamivudine tablets.
- **Heart attack.** Some HIV-1 medicines including abacavir, dolutegravir and lamivudine tablets may increase your risk of heart attack.
- **The most common side effects of abacavir, dolutegravir and lamivudine tablets include:**

o trouble  
sleeping

o headache

o tiredness

These are not all the possible side effects of abacavir, dolutegravir and lamivudine tablets. 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 abacavir, dolutegravir and lamivudine tablets?**

- Store abacavir, dolutegravir and lamivudine tablets at room temperature between 68°F to 77°F (20°C to 25°C) in the original bottle. Keep the bottle tightly closed and protect it from moisture.
- The bottle of abacavir, dolutegravir and lamivudine tablets contains a desiccant packet to help keep your medicine dry (protect it from moisture). Do not remove the desiccant packet from the bottle.
- Abacavir, dolutegravir and lamivudine tablets come in a child-resistant package.

**Keep abacavir, dolutegravir and lamivudine tablets, and all medicines out of the reach of children.**

**General information about the safe and effective use of abacavir, dolutegravir and lamivudine tablets.**

Medicines are sometimes prescribed for purposes other than those listed in a Medication Guide. Do not use abacavir, dolutegravir and lamivudine tablets for a condition for which it was not prescribed. Do not give abacavir, dolutegravir and lamivudine tablets to other people, even if they have the same symptoms that you have. It may harm them. You can ask your pharmacist or healthcare provider for information about abacavir, dolutegravir and lamivudine tablets that is written for health professionals.

**What are the ingredients in abacavir, dolutegravir and lamivudine tablets?**

**Active ingredients:** abacavir, dolutegravir, and lamivudine

**Inactive ingredients:**

Abacavir, dolutegravir and lamivudine tablets: magnesium stearate, mannitol, microcrystalline cellulose, povidone and sodium starch glycolate. Tablet film-coating contains: black iron oxide, iron oxide red, iron oxide yellow, polyethylene glycol, polyvinyl alcohol, talc and titanium dioxide.

Manufactured by



**HETERO™**

**HETERO LABS LIMITED**

Unit V, Polepally, Jadcherla,  
Mahabubnagar-509 301, India.

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For more information call Hetero Labs Limited at 1-866-495-1995.

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

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(Front of card)

**WARNING CARD**  
**Abacavir, Dolutegravir and Lamivudine Tablets**

**Patients taking abacavir, dolutegravir and lamivudine tablets may have a serious allergic reaction (hypersensitivity reaction) that can cause death. If you get a symptom from 2 or more of the following groups while taking abacavir, dolutegravir and lamivudine tablets, call your healthcare provider right away to find out if you should stop taking this medicine.**

|                | Symptom(s)                                                          |
|----------------|---------------------------------------------------------------------|
| <b>Group 1</b> | <b>Fever</b>                                                        |
| <b>Group 2</b> | <b>Rash</b>                                                         |
| <b>Group 3</b> | <b>Nausea, vomiting, diarrhea, or abdominal (stomach area) pain</b> |
| <b>Group 4</b> | <b>Generally ill feeling, extreme tiredness, or achiness</b>        |
| <b>Group 5</b> | <b>Shortness of breath, cough, or sore throat</b>                   |

Always carry this Warning Card with you to help recognize symptoms of this allergic reaction.

(Back of Card)

**WARNING CARD**  
**Abacavir, Dolutegravir and Lamivudine Tablets**

If you must stop treatment with abacavir, dolutegravir and lamivudine tablets because you have had an allergic reaction to abacavir, **NEVER** take abacavir, dolutegravir and lamivudine tablets or any other abacavir-containing medicine (ZIAGEN®, EPZICOM®, TRIUMEQ PD® or TRIZIVIR®) again. If you have an allergic reaction, dispose of any unused abacavir, dolutegravir and lamivudine tablets. Ask your pharmacist how to properly dispose of medicines. If you take abacavir, dolutegravir and lamivudine tablets or another abacavir-containing medicine again after you have had an allergic reaction, **WITHIN HOURS** you may get **life-threatening symptoms** that may include **very low blood pressure** or **death**.

Please read the Medication Guide for additional information on abacavir, dolutegravir and lamivudine tablets.

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