

WHO-PQ RECOMMENDED SUMMARY OF PRODUCT CHARACTERISTICS

*This summary of product characteristics focuses on uses of the medicine covered by WHO's Prequalification Team - Medicines. The recommendations for use are based on WHO guidelines and on information from stringent regulatory authorities.**

The medicine may be authorised for additional or different uses by national medicines regulatory authorities.

*https://extranet.who.int/prequal/sites/default/files/document_files/75%20SRA%20clarification_Feb2017_newtempl.pdf

1. NAME OF THE MEDICINAL PRODUCT

[HA662 trade name][†]

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each uncoated dispersible tablet contains 120 mg abacavir (as sulfate) and 60 mg lamivudine.

Excipient with known effect

Each dispersible tablet contains 12 mg aspartame.

For the full list of excipients, see section 6.1.

3. PHARMACEUTICAL FORM

Dispersible tablet.

White to off white capsule shaped, biconvex, uncoated tablet debossed with “CJ” on one side and deep scoreline on other side.

The tablet can be divided into equal doses.

4. CLINICAL PARTICULARS

4.1 Therapeutic indications

[HA662 trade name] is indicated as part of antiretroviral combination therapy for the treatment of HIV infection in infants and children aged from 4 weeks and weighing from 3 kg to 25 kg.

Because [HA662 trade name] contains abacavir, patients must be screened for HLA-B*5701 (a variant form of a gene) and [HA662 trade name] must not be used in patients who carry it (see section 4.4).

Treatment regimens should follow most recent WHO treatment guidelines, supplemented by other authoritative guidelines.

[HA662 trade name] may be used as part of a regimen for post-exposure prophylaxis to HIV. For use of antiretroviral agents for post-exposure prophylaxis the most recent official guidelines, e.g. those of the WHO should be consulted.

This medicine is for use in children. However, information from its use in adults is also included to give a fuller picture of the medicine's effects.

4.2 Posology and method of administration

Antiretroviral therapy should be prescribed by a health care provider experienced in the management of HIV infection.

Posology

[HA662 trade name] can be given as a single dose or, if once-daily dosing is not possible, in two divided doses (morning and evening).

[†] Trade names are not prequalified by WHO. This is the national medicines regulatory agency's responsibility.

*Infants and children aged over 4 weeks—**once daily** dosing*

Child's weight	Dose
3 to less than 6 kg	½ tablet once daily (abacavir 60 mg + lamivudine 30 mg)
6 to less than 10 kg	1½ tablets once daily (abacavir 180 mg + lamivudine 90 mg)
10 to less than 15 kg	2 tablets once daily (abacavir 240 mg + lamivudine 120 mg)
15 to less than 20 kg	2½ tablets once daily (abacavir 300 mg + lamivudine 150 mg)
20 to less than 25 kg	3 tablets once daily (abacavir 360 mg + lamivudine 180 mg)

*Infants and children aged over 4 weeks—**twice daily** dosing*

Child's weight	Morning dose	Evening dose
3 to less than 6 kg	[HA662 trade name] is not suitable for twice-daily dosing for this weight band	
6 to less than 10 kg	½ tablet (abacavir 60 mg + lamivudine 30 mg)	1 tablet (abacavir 120 mg + lamivudine 60 mg)
10 to less than 15 kg	1 tablet (abacavir 120 mg + lamivudine 60 mg)	1 tablet (abacavir 120 mg + lamivudine 60 mg)
15 to less than 20 kg	1 tablet (abacavir 120 mg + lamivudine 60 mg)	1½ tablets (abacavir 180 mg + lamivudine 90 mg)
20 to less than 25 kg	1½ tablets (abacavir 180 mg + lamivudine 90 mg)	1½ tablets (abacavir 180 mg + lamivudine 90 mg)

Patients weighing above 25 kg

[HA662 trade name] is not intended for patients weighing more than 25 kg. Formulations containing higher amounts of abacavir and lamivudine are more suitable

Switching between twice-daily and once-daily regimens

Patients switching from twice-daily dosing to once-daily dosing should take the first once-daily dose about 12 hours after the last twice-daily dose and then continue the recommended once-daily dose every 24 hours.

Patients switching from once-daily dosing to twice-daily dosing should take the first twice-daily dose about 24 hours after the last once-daily dose and then continue the recommended twice-daily dose every 12 hours.

Dose adjustment

[HA662 trade name] should not be prescribed for patients requiring dosage adjustments. Separate formulations of abacavir or lamivudine should be used if it is necessary to discontinue or adjust the dose of one of the active substances.

Elderly

No pharmacokinetic data are currently available in patients over 65 years of age. Special care is advised in the elderly due to age-associated changes such as impaired renal function and alteration of haematological parameters.

Renal impairment

[HA662 trade name] is not recommended for patients whose creatinine clearance is less than 30 mL/minute (see section 5.2), as appropriate dose adjustments cannot be made.

Hepatic impairment

Abacavir is primarily metabolised by the liver. No data are available in patients with moderate or severe hepatic impairment; therefore, [HA662 trade name] is not recommended unless the benefits are considered to

outweigh the risks. In patients with mild hepatic impairment close monitoring is required (see sections 4.4 and 5.2).

Missed dose

If the patient misses a dose, the patient should take the missed dose as soon as possible unless the next dose is due within 4 hours. The patient should then take the next regular dose at the usual time.

If the next dose is due within 4 hours, the patient should not take the missed dose and take the normal dose when it is next due. No double dose should be given to make up for a forgotten dose.

Method of administration

Oral use

[HA662 trade name] can be taken with food or between meals.

Please refer to section 6.6 for instructions on dispersing tablets.

4.3 Contraindications

Hypersensitivity to the active substances or to any of the excipients listed in section 6.1.

[HA662 trade name] must **not** be used in patients:

- carrying the variant gene allele HLA-B*5701
- who have already had or are suspected to have had abacavir-associated hypersensitivity reactions (see section 4.8)

4.4 Special warnings and precautions for use

Hypersensitivity reactions

Abacavir is associated with serious hypersensitivity reactions (see section 4.8) characterised by fever or rash or both with other symptoms indicating multi-organ involvement. Some hypersensitivity reactions with abacavir have been life-threatening, and in rare cases fatal, when not managed appropriately.

The risk for abacavir hypersensitivity reactions is high for patients that have the HLA-B*5701 allele (variant gene). However, abacavir hypersensitivity reactions have also been reported at a lower frequency in patients who do not carry this allele.

Therefore:

- HLA-B*5701 status must **always** be determined before starting [HA662 trade name].
- [HA662 trade name] must **never** be started in patients who are positive for HLA-B*5701, nor in patients negative for HLA-B*5701 but who had a suspected hypersensitivity reaction on a previous abacavir-containing regimen. [HA662 trade name] **must be stopped at once**, even in the absence of the HLA-B*5701 allele, if a hypersensitivity reaction is suspected. Delay in stopping [HA662 trade name] treatment after the onset of hypersensitivity may result in a life-threatening reaction.
- After stopping treatment with [HA662 trade name] for a suspected hypersensitivity reaction, the patient must **never** be given [HA662 trade name] or any other medicine containing abacavir.
- Restarting an abacavir-containing medicine after a hypersensitivity reaction to abacavir can cause swift return of symptoms within hours. This recurrence is usually more severe than the previous reaction and may include life-threatening hypotension and death.
- To prevent accidental use of abacavir, patients who had a suspected hypersensitivity reaction should be instructed to dispose of all remaining [HA662 trade name].

Rarely, patients who stopped abacavir for reasons other than symptoms of hypersensitivity reaction have also suffered life-threatening reactions within hours of restarting abacavir. In such patients, abacavir must be restarted in a setting where medical assistance is readily available.

Description of abacavir hypersensitivity reactions

Abacavir hypersensitivity reactions have been well characterised through clinical studies and post-marketing follow-up. Symptoms usually appeared within the first 6 weeks (median time to onset 11 days) of starting abacavir treatment, but they **may occur at any time during therapy**.

Almost all abacavir hypersensitivity reactions include fever or rash. Other signs and symptoms that occur as part of the hypersensitivity reactions are detailed in section 4.8 (under 'Abacavir hypersensitivity'); they include respiratory and gastrointestinal symptoms. Importantly, such symptoms **may be mistaken for respiratory disease** (pneumonia, bronchitis, pharyngitis) **or gastroenteritis**.

The symptoms of hypersensitivity reactions resolve on discontinuing abacavir but worsen with continued therapy.

Other warnings and precautions

Mitochondrial dysfunction following exposure in utero

Nucleoside analogues such as abacavir and lamivudine may cause a variable degree of mitochondrial damage. Mitochondrial dysfunction has been reported in HIV-negative infants exposed to nucleoside analogues either in utero or after birth; these have predominantly involved regimens containing zidovudine. The main adverse reactions reported are haematological disorders (anaemia, neutropenia) and metabolic disorders (hyperlactataemia, hyperlipasaemia). These events have often been transitory. Late-onset neurological disorders have been reported rarely (hypertonia, convulsion, abnormal behaviour). Whether such neurological disorders are transient or permanent is currently unknown.

Mitochondrial damage should be considered for any child who has been exposed in utero to nucleoside and nucleotide analogues and who presents with severe clinical findings of unknown aetiology, particularly neurological defects. These findings do not affect current guidelines on the use of antiretroviral therapy in pregnant women to prevent vertical transmission of HIV.

Weight and metabolic parameters

Weight and levels of blood lipids and glucose may increase during antiretroviral therapy. Such changes may in part be linked to disease control and lifestyle. For lipids, there is some evidence for a treatment effect, while there is no strong evidence relating weight gain to any particular treatment. Established HIV treatment guidelines should be consulted for advice on monitoring blood lipids and glucose. Lipid disorders should be managed as clinically appropriate.

Pancreatitis

Pancreatitis has been reported, but it is uncertain if abacavir or lamivudine treatment causes it.

If signs, symptoms or laboratory abnormalities for pancreatitis occur then management of pancreatitis would include the substitution with another therapeutic class.

Risk of virological failure

A high rate of virological failure, and of emergence of resistance have been reported at an early stage when abacavir and lamivudine were combined with tenofovir disoproxil (triple nucleoside therapy) as a once-daily regimen.

The risk of virological failure with [HA662 trade name] might be higher than with other therapeutic options (see section 5.1).

Liver disease

The safety and efficacy of [HA662 trade name] has not been established in patients with significant liver disorders. [HA662 trade name] is not recommended in patients with moderate or severe hepatic impairment (see section 5.2).

Patients with liver dysfunction, including chronic active hepatitis, have a higher frequency of liver function abnormalities during combination antiretroviral therapy, and should be monitored. If liver disease worsens in such patients, interruption or discontinuation of treatment must be considered.

Patients co-infected with chronic hepatitis B or C virus

Patients with chronic hepatitis B or C and treated with combination antiretroviral therapy are at higher risk of severe and potentially fatal hepatic adverse events. Product information for antiviral medicines for treating hepatitis B or C may include further information.

If [HA662 trade name] is discontinued in patients co-infected with hepatitis B virus, periodic monitoring of both liver function tests and markers of hepatitis B virus replication is recommended, as withdrawal of lamivudine may result in an acute exacerbation of hepatitis.

Cardiovascular events

Observational studies suggest an increased risk of cardiovascular events such as myocardial infarction in patients treated with abacavir. When prescribing [HA662 trade name], action should be taken to minimise all modifiable risk factors (e.g. smoking, hypertension, and hyperlipidaemia).

Alternative treatment options to the abacavir containing regimen should be considered when treating patients with a high cardiovascular risk.

Immune reactivation syndrome

Immune reactivation syndrome has been reported in patients treated with combination antiretroviral therapy. During early stages of treatment, patients whose immune system responds to antiretroviral therapy may develop an inflammatory response to slow-developing or residual opportunistic infections (such as *Mycobacterium avium* infection, cytomegalovirus retinitis, *Pneumocystis jirovecii* pneumonia, or tuberculosis). These reactions may require further evaluation and treatment.

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

Osteonecrosis

Osteonecrosis has been reported, particularly in patients with advanced HIV disease or after long-term combination antiretroviral therapy. Its aetiology is considered to be multifactorial and includes corticosteroid use, alcohol consumption, severe immunosuppression, higher body mass index. Patients should be advised to speak with their health care provider about joint aches and pain, joint stiffness or movement difficulty.

Opportunistic infections

Health care providers should tell patients with impaired immunity that opportunistic infections and other complications of HIV infection may still develop while receiving antiretroviral medicines. This risk reduces as the immune system recovers.

Administration in subjects with moderate renal impairment

Adult patients with a creatinine clearance between 30 and 49 mL/min receiving [HA662 trade name] may experience a 1.6-to 3.3-fold higher lamivudine exposure (AUC) than patients with a creatinine clearance ≥ 50 mL/min. There are no safety data from randomised, controlled trials comparing [HA662 trade name] to the individual components in adults with a creatinine clearance between 30 and 49 mL/min who received dose-adjusted lamivudine. In the original lamivudine registrational trials in combination with zidovudine, higher lamivudine exposures were associated with higher rates of haematologic toxicities (neutropenia and anaemia), although discontinuations due to neutropenia or anaemia each occurred in <1% of subjects. Other lamivudine-related adverse events (such as gastro-intestinal and hepatic disorders) may occur.

Patients with a sustained creatinine clearance between 30 and 49 mL/min who receive [HA662 trade name] should be monitored for lamivudine-related adverse events, notably haematologic toxicities. If new or worsening neutropenia or anaemia develop, a dose adjustment of lamivudine, as per lamivudine prescribing information, is indicated, which cannot be achieved with [HA662 trade name]. [HA662 trade name] should be discontinued, and the individual components should be used to construct the treatment regimen.

Excipients

[HA662 trade name] contain aspartame which is a source of phenylalanine. This may be harmful for people with phenylketonuria.

It is important to consider the contribution of excipients from all the medicines that the patient is taking.

4.5 Interaction with other medicinal products and other forms of interaction

[HA662 trade name] contains abacavir and lamivudine, therefore any interactions identified for these individually may occur with [HA662 trade name]. Clinical studies have shown that there are no clinically significant interactions between abacavir and lamivudine.

Abacavir is metabolised by UDP-glucuronyltransferase (UGT) enzymes and alcohol dehydrogenase; co-administration of inducers or inhibitors of UGT enzymes or with compounds eliminated through alcohol dehydrogenase could alter abacavir exposure.

Lamivudine is cleared renally. Active renal secretion of lamivudine in the urine is mediated through organic cation transporters (OCTs); co-administration of lamivudine with OCT inhibitors may increase lamivudine exposure.

Abacavir and lamivudine are not significantly metabolised by cytochrome P450 enzymes (such as CYP3A4, CYP2C9 or CYP2D6) nor do they induce this enzyme system. Lamivudine does not inhibit cytochrome P450 enzymes. Abacavir shows limited potential to inhibit CYP3A4-mediated metabolism and has been shown in vitro not to inhibit CYP2C9 or CYP2D6 enzymes. In vitro studies have shown that abacavir has potential to inhibit cytochrome P450 1A1 (CYP1A1). Therefore, there is little potential for interactions with antiretroviral protease inhibitors, non-nucleosides and other medicines metabolised by major P450 enzymes.

[HA662 trade name] should not be taken with any other medicines that containing lamivudine.

The list below should not be considered exhaustive but is representative of the classes studied.

Interacting drugs	Interaction Geometric mean change (%) (Possible mechanism)	Recommendation on co-administration
Antiretroviral medicines		
Didanosine with abacavir	Interaction not studied.	No dose adjustment necessary.
Didanosine with lamivudine	Interaction not studied.	
Zidovudine with abacavir	Interaction not studied	
Zidovudine with lamivudine Zidovudine 300 mg single dose Lamivudine 150 mg single dose	Lamivudine: AUC ↔ Zidovudine: AUC ↔	
Emtricitabine with lamivudine		Due to similarities, [HA662 trade name] should not be administered concomitantly with other cytidine analogues, such as emtricitabine.
Tipranavir/lamivudine with abacavir	Plasma concentration of abacavir significantly reduced	Co-administration of [HA662 trade name] with tipranavir/ritonavir is not recommended unless other nucleoside reverse transcriptase inhibitors cannot be used
Anti-infective medicines		
Trimethoprim/sulfamethoxazole with abacavir	Interaction not studied.	No [HA662 trade name] dose adjustment necessary.
Trimethoprim/sulfamethoxazole with lamivudine Trimethoprim/sulfamethoxazole 160 mg/800 mg once daily for 5 days Lamivudine 300 mg single dose	Lamivudine: AUC ↑ 40% Trimethoprim: AUC ↔ Sulfamethoxazole: AUC ↔ (organic cation transporter inhibition)	When co-administration with trimethoprim/sulfamethoxazole is necessary, patients should be monitored clinically. High doses of trimethoprim/sulfamethoxazole for treating <i>Pneumocystis jirovecii</i> pneumonia (PCP) and of toxoplasmosis have not been studied and should be avoided

Interacting drugs	Interaction Geometric mean change (%) (Possible mechanism)	Recommendation on co-administration
Flucytosine with lamivudine	Potential for haematological toxicity	Haematological parameters should be monitored, and dose reduction should be considered
Sulfadiazine with lamivudine	Sulfadiazine is associated with renal toxicity and in some cases renal failure. Potential for renal toxicity as lamivudine is mainly excreted by active renal transport.	Renal function should be monitored.
Antimycobacterials		
Rifampicin with abacavir	Interaction not studied. Potential to slightly decrease abacavir plasma concentrations through UGT induction.	Insufficient data to recommend dose adjustment.
Rifampicin with lamivudine	Interaction not studied.	
Anticonvulsants		
Phenobarbital with abacavir	Interaction not studied. Potential to slightly decrease abacavir plasma concentrations through UGT induction.	Insufficient data to recommend dose adjustment.
Phenobarbital with lamivudine	Interaction not studied.	
Phenytoin with abacavir	Interaction not studied. Potential to slightly decrease abacavir plasma concentrations through UGT induction.	Insufficient data to recommend dose adjustment. Monitor phenytoin concentrations.
Phenytoin with lamivudine	Interaction not studied.	
Antihistamines (histamine H2 receptor antagonists)		
Ranitidine with abacavir	Interaction not studied.	No dose adjustment necessary.
Ranitidine with lamivudine	Interaction not studied. Clinically significant interaction unlikely. Ranitidine eliminated only in part by renal organic cation transport system.	
Cimetidine with abacavir	Interaction not studied.	No dosage adjustment necessary.
Cimetidine with lamivudine	Interaction not studied. Clinically significant interaction unlikely. Cimetidine eliminated only in part by renal organic cation transport system.	
Cytotoxics		
Cladribine with lamivudine	Interaction not studied. In vitro, lamivudine inhibits intracellular phosphorylation of cladribine, leading to a potential risk of reduced cladribine efficacy. Some clinical findings also support a possible interaction between lamivudine and cladribine	Concomitant use of lamivudine with cladribine is not recommended.

Interacting drugs	Interaction Geometric mean change (%) (Possible mechanism)	Recommendation on co-administration
Cisplatin with lamivudine	Cisplatin and lamivudine could potentially compete for OCT2 which could slow their elimination. Also, cisplatin may impair renal function	Renal function should be monitored.
Opioids		
Methadone with abacavir Methadone 40–90 mg once daily for 14 days Abacavir 600 mg single dose, then 600mg twice daily for 14 days	Abacavir: AUC ↔ C _{max} ↓ 35% Methadone: CL/F ↑ 22%	No [HA662 trade name] dose adjustment necessary. Methadone dose adjustment unlikely to be needed in most patients; occasionally methadone re-titration may be required.
Methadone/Lamivudine	Interaction not studied.	
Retinoids		
Retinoid compounds (e.g. isotretinoin) with abacavir	Interaction not studied. Possible interaction given common pathway of elimination via alcohol dehydrogenase.	Insufficient data to recommend dose adjustment.
Retinoid compounds (e.g. isotretinoin) with lamivudine	Interaction not studied.	
Miscellaneous		
Ethanol with abacavir Ethanol 700 mg/kg single dose Abacavir 600 mg single dose	Abacavir: AUC ↑41% Ethanol: AUC ↔ (Inhibition of alcohol dehydrogenase)	No dose adjustment necessary.
Ethanol with lamivudine	Interaction not studied.	
Sorbitol with lamivudine Sorbitol solution (3.2 g, 10.2 g, 13.4 g) Lamivudine oral solution 300 mg single dose	Lamivudine: AUC ↓ 14%; 32%; 36% C _{max} ↓ 28%; 52%, 55%.	When possible, avoid chronic co-administration of [HA662 trade name] with medicines containing sorbitol or other osmotic-acting poly-alcohols or monosaccharide alcohols (e.g. lactitol, maltitol, mannitol and xylitol). Consider more frequent monitoring of HIV-1 viral load when chronic co-administration cannot be avoided.
Riociguat with abacavir	Riociguat ↑ In vitro, abacavir inhibits CYP1A1. Concomitant administration of a single dose of riociguat (0.5 mg) to HIV patients receiving abacavir/dolutegravir/lamivudine (600 mg/50 mg/300 mg once daily) led to about 3-fold higher riociguat AUC compared to historical riociguat AUC in healthy subjects.	Riociguat dose may need to be reduced. Consult the riociguat prescribing information for dosing recommendations.
Clopidogrel with abacavir	Pharmacodynamic effect of clopidogrel maybe reduced.	An alternative NRTI or antiplatelet agent should be considered.

Interacting drugs		Interaction Geometric mean change (%) (Possible mechanism)		Recommendation on co-administration
↓	Decreased	AUC	area under the curve (bioavailability)	
↑	Increased	C _{max}	maximum (peak) concentration (in plasma or blood)	
↔	No change	C _{min}	minimum (trough) concentration (in plasma or blood)	

Paediatric population

Interaction studies have only been performed in adults.

4.6 Fertility, pregnancy and breastfeeding

Pregnancy

Studies of abacavir and lamivudine in animals have shown reproductive toxicity (see section 5.3).

No increased birth defects have been reported for abacavir or lamivudine in humans. However, placental transfer of abacavir and lamivudine can occur.

If a patient becomes pregnant during treatment, [HA662 trade name] may be continued if the benefit is considered to outweigh the risk. However, [HA662 trade name] should **not be started** during pregnancy, due to the risk of a hypersensitivity reaction to abacavir.

Patients co-infected with hepatitis and being treated with lamivudine containing medicinal products such as [HA662 trade name] and who becomes pregnant may be subject to recurrence of hepatitis on discontinuation of [HA662 trade name].

Mitochondrial dysfunction

In vitro and in vivo studies show that nucleoside and nucleotide analogues such as abacavir and lamivudine cause a variable degree of mitochondrial damage. Mitochondrial dysfunction has been reported in HIV-negative infants exposed to nucleoside analogues in utero or after birth (see section 4.4).

Breast-feeding

Abacavir and lamivudine are present in breast milk.

Current recommendations on HIV and breast-feeding (e.g. those from the WHO) should be followed to advise patients on breast-feeding. Preferred options may vary depending on the local circumstances.

Fertility

Studies in animals showed that neither abacavir nor lamivudine had any effect on fertility (see section 5.3).

4.7 Effects on ability to drive and use machines

No studies are available on the effects of [HA662 trade name] on the ability to drive and use machines. Nevertheless, the clinical status of the patient and the adverse reaction profile of [HA662 trade name] should be borne in mind when considering the patient's ability to drive or operate machinery.

4.8 Undesirable effects

Summary of the safety profile

The adverse reactions reported are consistent with those of abacavir and lamivudine given separately. It is unclear whether many of these adverse reactions are related to the active substance, the wide range of other medicines used to manage HIV infection, or whether they result from the underlying disease.

Many of the adverse reactions listed below occur commonly (nausea, vomiting, diarrhoea, fever, lethargy, rash) in patients with abacavir hypersensitivity— see 'Abacavir hypersensitivity', below. Therefore, patients with any of these symptoms should be carefully evaluated for hypersensitivity.

Very rarely cases of erythema multiforme, Stevens-Johnson syndrome or toxic epidermal necrolysis have been reported where abacavir hypersensitivity could not be ruled out. In such cases medicines containing abacavir should be permanently discontinued.

Tabulated list of adverse reactions

The adverse reactions considered at least possibly related to abacavir or lamivudine are listed below. Frequencies are defined as very common (more than 1 in 10), common (1 in 100 to 1 in 10), uncommon (1 in 1000 to 1 in 100), rare (1/10 000 to 1 in 1000), and very rare (less than 1 in 10 000).

Blood and lymphatic systems disorders		
Uncommon	neutropenia and anaemia (both occasionally severe), thrombocytopenia	
Very rare	pure red cell aplasia	
Immune system disorders		
Common	Hypersensitivity (see ‘Abacavir hypersensitivity’, below)	
Metabolism and nutrition disorders		
Common	anorexia	
Very rare	lactic acidosis	
Nervous system disorders		
Common	headache, insomnia	
Very rare	peripheral neuropathy (or paraesthesia)	
Respiratory, thoracic and mediastinal disorders		
Common	cough, nasal symptoms	
Gastrointestinal disorders		
Common	nausea, vomiting, abdominal pain or cramps, diarrhoea	
Rare	pancreatitis, but causal relationship to abacavir treatment uncertain rises in serum amylase	
Hepatobiliary disorders		
Uncommon	transient rises in liver enzymes (AST, ALT)	
Rare	hepatitis	
Skin and subcutaneous tissue disorders		
Common	rash (without systemic symptoms), alopecia	
Rare	angioedema	
Very rare	erythema multiforme, Stevens-Johnson syndrome, toxic epidermal necrolysis	
Musculoskeletal and connective tissue disorders		
Common	arthralgia, muscle disorders	
Rare	rhabdomyolysis	
General disorders and administration site conditions		
Common	fever, lethargy, malaise, fatigue	

Abacavir hypersensitivity

The signs and symptoms of abacavir hypersensitivity are listed below. They have been identified from clinical studies and post marketing surveillance. Those reported in at least 10% of patients with a hypersensitivity reaction are shown in **bold**.

Almost all patients developing hypersensitivity reactions had fever or rash (usually maculopapular or urticarial) as part of the syndrome; however, reactions have occurred without rash or fever. Other key symptoms include gastrointestinal, respiratory or constitutional symptoms such as lethargy and malaise.

<i>Skin</i>	Rash (usually maculopapular or urticarial)
<i>Gastrointestinal tract</i>	Nausea, vomiting, diarrhoea, abdominal pain , mouth ulceration
<i>Respiratory tract</i>	Dyspnoea, cough , sore throat, adult respiratory distress syndrome, respiratory failure
<i>Miscellaneous</i>	Fever, lethargy, malaise , oedema, lymphadenopathy, hypotension, conjunctivitis, anaphylaxis
<i>Neurological/Psychiatry</i>	Headache , paraesthesia
<i>Haematological</i>	Lymphopenia
<i>Liver</i>	Elevated liver function tests , hepatitis, hepatic failure
<i>Musculoskeletal</i>	Myalgia , rarely myolysis, arthralgia, elevated creatine phosphokinase
<i>Urology</i>	Elevated creatinine, renal failure

Symptoms related to abacavir hypersensitivity worsen with continued therapy and can be life- threatening and in rare instances, fatal.

Restarting abacavir after an abacavir hypersensitivity reaction may result in a return of symptoms within hours. This recurrence of the hypersensitivity reactions is usually more severe than on initial presentation and may include life-threatening hypotension and death. Similar reactions have also occurred infrequently after restarting abacavir in patients who had only one of the key symptoms of hypersensitivity (see above) before stopping abacavir; and on very rare occasions hypersensitivity reactions have occurred in patients who restarted therapy with no preceding symptoms of hypersensitivity reactions (i.e. patients previously considered to be abacavir tolerant).

See also section 4.4 for metabolic parameter, immune reactivation syndrome and osteonecrosis.

Children and adolescents

No additional safety issues have been identified in paediatric subjects receiving abacavir and lamivudine either once or twice daily. This is based on data from 669 HIV-infected patients aged from 1 up to 17 years receiving abacavir and lamivudine either once or twice daily.

Reporting of suspected adverse reactions

Health care providers are asked to report adverse reactions that may be linked to a medicine, to the marketing authorisation holder, or, if available, to the national reporting system. Reports of suspected adverse reactions to a medicine are important for the monitoring of the medicine's benefits and risks.

4.9 Overdose

No specific symptoms or signs have been identified following acute overdose with abacavir or lamivudine, apart from those listed as undesirable effects. An important feature of toxicity may be mitochondrial damage, which can result in disorders such as lactic acidosis.

If overdose occurs the patient should be monitored for toxicity (see section 4.8) and receive standard supportive treatment as necessary. Since lamivudine is dialysable, continuous haemodialysis may be used to treat an overdose, but this has not been studied. It is not known if abacavir can be removed by peritoneal dialysis or haemodialysis.

5. PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Antivirals for treatment of HIV infections, combinations,
ATC code: J05AR02

Mechanism of action

Abacavir and lamivudine are nucleoside analogue reverse transcriptase inhibitors (NRTIs). Both are metabolised sequentially by intracellular kinases to the respective 5'-triphosphate (TP) active forms. Carbovir-TP (the active triphosphate form of abacavir) and lamivudine-TP competitively inhibit the reverse transcriptase (RT) of HIV. Abacavir and lamivudine triphosphates have significantly less affinity for host cell DNA polymerases.

Clinical efficacy

Adults

Abacavir and lamivudine tablets was shown to be effective against HIV in three main studies involving a total of 1,230 patients. Abacavir was authorised at a dose of 300 mg twice a day. Studies were done where abacavir taken at a dose of 600 mg once a day and at a dose of 300 mg twice a day, in combination with lamivudine and one or two other antiviral medicines were compared. The main measure of effectiveness was the change in the level of HIV in the blood (viral load) after 24 or 48 weeks of treatment.

Two studies used the active substances, abacavir and lamivudine, taken as separate medicines. Both doses of abacavir, taken in combination with lamivudine and other antiviral medicines, were equally effective in reducing viral loads. In the first study, 66% (253 out of 384) of the patients taking abacavir once a day had undetectable viral loads (below 50 copies/mL) after 48 weeks of treatment, compared with 68% (261 out of 386) of the patients taking it twice a day.

The third study used a combination tablet for the once-daily dose. The combination tablet taken once a day was as effective as the medicines taken separately twice a day in reducing viral loads over 24 weeks of treatment.

Children

Among 45 antiretroviral therapy-naïve children aged 3 months to 16 years receiving abacavir/lamivudine in combination with nelfinavir (except 6 who received only abacavir/lamivudine) 56% had viral load less than 50 copies after 48 weeks of treatment.

In a study in 669 patients aged 1 to under 17 years, abacavir/lamivudine once daily had similar efficacy to giving it twice daily.

Resistance

Clinically significant reduction of susceptibility to abacavir has occurred in patients with uncontrolled viral replication, who were resistant to other nucleoside inhibitors. In clinical trials where abacavir was added to the antiretroviral regimen, patients had M184V/I (74%), T215Y/F (30%), M41L (27%), K70R (18%) and D67N (15%). Variants L74V and Y115F were uncommon (no more than 3%). It was considered that the presence of 3 or more NRTI resistance-associated mutations was associated with reduced response at week 4, or 4 or more mutations at week 24. In addition, the 69 insertion complex or the Q151M mutation, usually found in combination with A62V, V75I, F77L and F116Y, causes a high level of resistance to abacavir.

Resistance to abacavir requires M184V with at least one other abacavir-selected mutation, or M184V with multiple thymidine analogue mutations. Cross-resistance to other NRTIs with M184V or M184I mutation alone is limited. Zidovudine, didanosine, stavudine and tenofovir remain active against such HIV-1 variants. M184V with K65R confers cross-resistance between abacavir, tenofovir, didanosine and lamivudine, and

M184V with L74V gives rise to cross-resistance between abacavir, didanosine and lamivudine. M184V with Y115F confers cross-resistance between abacavir and lamivudine.

Isolates resistant to abacavir may also show reduced sensitivity to lamivudine. The combination of abacavir/lamivudine has demonstrated decreased susceptibility to viruses with the substitutions K65R with or without the M184V/I substitution, and to viruses with L74V plus the M184V/I substitution. The M184V or M184I variants arise in patients treated with lamivudine-containing antiretroviral therapy and confer high-level resistance to lamivudine. Laboratory data suggest that continuing lamivudine despite the development of M184V might provide residual antiretroviral activity. However, the clinical relevance of these findings has not been established and the patient should preferably be switched to NRTIs that the HIV is susceptible to. Lamivudine may be continued only if no other active NRTI is available.

Appropriate use of abacavir and lamivudine can be guided by using recommended resistance algorithms. Cross-resistance between abacavir or lamivudine and antiretrovirals from other classes e.g. PIs or NNRTIs is unlikely.

5.2 Pharmacokinetic properties

The absorption characteristics of [HA662 trade name] have been determined in healthy volunteers for abacavir and lamivudine and summarised in the following tables;

Abacavir

Characteristic	Arithmetic mean $\pm$ Standard deviation (Geometric mean)
Maximum concentration (C_{max})	5838 $\pm$ 2023 (ng/mL) (5588)
Area under the curve ($AUC_{0-\infty}$), a measure of the extent of absorption	15374 $\pm$ 2460 (ng.h/mL) (15204)
Time to attain maximum concentration (T_{max})	0.80 $\pm$ 0.59 hours

Lamivudine

Characteristic	Arithmetic mean $\pm$ Standard deviation (Geometric mean)
Maximum concentration (C_{max})	2868 $\pm$ 689 (ng/mL) (2789)
Area under the curve ($AUC_{0-\infty}$), a measure of the extent of absorption	14779 $\pm$ 3357 (ng.h/mL) (14402)
Time to attain maximum concentration (T_{max})	1.86 $\pm$ 0.84 hours

Pharmacokinetics of abacavir and lamivudine

	Abacavir	Lamivudine
General	NA*	NA*
Absorption		
Absolute bioavailability	83%	NA*
Oral bioavailability	At least 83%	80–85%

Food effect	Concomitant food intake did not affect the extent of absorption but increased T_{max} and decreased C_{max}	Not clinically relevant
Distribution		
Volume of distribution (mean)	0.8 L/kg	1.3 L/kg
Plasma proteinbinding <i>in vitro</i>	About 49% (binding to human plasma proteins)	< 36%
Tissue distribution	CSF to plasma AUC ratio: 30 to 44%	
Metabolism		
	hepatic metabolism followed by glucuronidation to produce 5'-carboxylic acid and 5'-glucuronide	Only minor route (< 10%)
Active metabolite(s)	None	None
Elimination		
Elimination half life	1.5 hours after single dose 21 hours for intracellular carbovir triphosphate	18–19 hours 16–19 hours for intracellular lamivudine triphosphate
Mean systemic clearance (Cl/F)	NA*	0.32 L/hour/kg.
% of dose excreted in urine	Approximately 2% excreted unchanged; total 83%	> 70% (predominantly cleared unchanged)
% of dose excreted in faeces	16%	NA*
Pharmacokinetic linearity	Linear pharmacokinetics and dose proportional over the range of 300–1200 mg/day	Linear pharmacokinetics
Drug interactions (in vitro)		
Transporters	NA*	OCT (organic cationic transporters)
Metabolising Enzymes	Alcohol dehydrogenase, UDP-glucuronyltransferase	-

NA* = Information not available

Special populations

Hepatic impairment

Pharmacokinetic data has been obtained for abacavir and lamivudine alone.

Abacavir is metabolised primarily by the liver. In patients with mild hepatic impairment (Child-Pugh score 5–6) receiving a single 600-mg dose, there was a mean 1.89-fold increase in the abacavir AUC, and 1.58-fold increase in the elimination half-life. No recommendation on dose adjustments can be made for these patients due to the substantial variability of abacavir exposure.

Data from patients with moderate to severe hepatic impairment show that lamivudine pharmacokinetics are not significantly affected by hepatic dysfunction.

[HA662 trade name] is not recommended in patients with moderate or severe hepatic impairment.

Renal impairment

Pharmacokinetic data have been obtained for lamivudine and abacavir alone.

Abacavir is primarily metabolised by the liver, with about 2% of abacavir excreted unchanged in the urine. The pharmacokinetics of abacavir in patients with end-stage renal disease is similar to patients with normal renal function.

Lamivudine plasma concentrations are increased in patients with renal dysfunction due to decreased clearance.

[HA662 trade name] is not recommended in patients with a creatinine clearance less than 30 mL/minute because necessary dose adjustments cannot be made.

Children

Abacavir is rapidly and well absorbed from oral formulations when administered to children. Paediatric pharmacokinetic studies have demonstrated that once-daily dosing provides equivalent AUC₂₄ to twice-daily dosing of the same total daily dose for both oral solution and tablet formulations.

The absolute bioavailability of lamivudine (about 58 to 66%) was lower and more variable in children under 12 years of age. However, paediatric pharmacokinetic studies with tablet formulations have demonstrated that once-daily dosing provides equivalent AUC_{0-24h} to twice-daily dosing of the same total daily dose.

Elderly

No pharmacokinetic data are available in patients over 65 years of age.

5.3 Preclinical safety data

With the exception of a negative in vivo rat micronucleus test, there is no data available on the effects of the combination of abacavir and lamivudine in animals.

General toxicity

In toxicology studies abacavir increased liver weights in rats and monkeys. The clinical relevance of this is unknown. There is no evidence from clinical studies that abacavir is hepatotoxic. Additionally, autoinduction of abacavir metabolism, or induction of the metabolism of other medicines metabolised in the liver has not been seen in humans.

Mild myocardial degeneration occurred in mice and rats after administration of abacavir for 2 years. The systemic exposures were equivalent to 7 to 24 times the expected systemic exposure in humans. The clinical relevance of this finding has not been determined.

Administration of lamivudine in animal toxicity studies at high doses was not associated with any major organ toxicity. At the highest dosage levels, minor effects on indicators of liver and kidney function were seen together with occasional reductions in liver weight. Clinically relevant effects were a reduction in red blood cell count and neutropenia.

Mutagenicity and carcinogenicity

Abacavir and lamivudine were not mutagenic in bacterial tests but, like many nucleoside analogues, they inhibit cellular DNA replication in in vitro mammalian tests such as the mouse lymphoma assay. Based on available data, lamivudine should not pose a genotoxic hazard to patients. Abacavir has a weak potential to cause chromosomal damage both in vitro and in vivo at high tested concentrations.

The carcinogenic potential of a combination of abacavir and lamivudine has not been tested.

The results of long-term carcinogenicity studies in rats and mice did not show any carcinogenic potential. Carcinogenicity studies with oral abacavir in mice and rats showed an increase in the incidence of malignant and non-malignant tumours. Malignant tumours occurred in the preputial gland of males and the clitoral gland of females of both species, and in rats in the thyroid gland of males and in the liver, urinary bladder, lymph nodes and the subcutis of females.

Most of these tumours occurred at the highest abacavir dose of 330 mg/kg/day in mice and 600 mg/kg/day in rats. The exception was the preputial gland tumour which occurred at a dose of 110 mg/kg in mice. The systemic exposure at the no-effect level in mice and rats was equivalent to 3 and 7 times the human systemic

exposure during therapy. While the clinical relevance of these findings is unknown, these data suggest that a carcinogenic risk to humans is outweighed by the potential clinical benefit.

Reproductive toxicology

Abacavir and lamivudine crossed the placenta in animal studies.

Oral administration of lamivudine to pregnant rabbits during organogenesis resulted in embryo lethality at systemic exposure similar to the recommended clinical dose. A similar effect was not seen in rats even at very high systemic exposure.

Abacavir was toxic to the developing embryo and fetus in rats, but not in rabbits. These findings included decreased fetal body weight, fetal oedema, increased skeletal variations or malformations, early intra-uterine deaths and stillbirths. No conclusion can be drawn about the teratogenic potential of abacavir because of this embryo-fetal toxicity.

A fertility study in rats has shown that abacavir and lamivudine had no effect on male or female fertility.

6. PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Microcrystalline cellulose,
Sodium starch glycolate,
Hypromellose,
Corn starch,
Strawberry cream flavor,
Aspartame,
Colloidal silicon dioxide,
Magnesium stearate.

This medicine is essentially 'sodium-free'. It contains less than 1 mmol sodium (23 mg) per tablet.

6.2 Incompatibilities

Not applicable

6.3 Shelf life

36 months

6.4 Special precautions for storage

Do not store above 30°C.

6.5 Nature and contents of container

Tablets are packed in 85cc HDPE container with 38 mm CRC polypropylene cap, having a silica gel bag of 1g and rayon sanicoil. Pack size: 60 tablets

Tablets are packed in 50cc HDPE container with 38 mm CRC polypropylene cap, having a silica gel bag of 1g and rayon sanicoil. Pack size: 30 tablets

6.6 Special precautions for disposal and other handling

Preparation and administration - extemporaneous formulation for children

Instructions for dispersing tablets

The tablets should be dispersed in drinking water. Each tablet should be dispersed in at least 10 mL water; the maximum volume of water recommended for dispersion of a dose is 50 mL. When a half tablet is to be administered, it should be dispersed in 5 mL of water.

1. The required amount of drinking water should be poured into a small, clean cup and the required number of tablets should be added.
2. The cup should be gently swirled until tablets disperse, and the patient should take the entire mixture immediately.
3. The cup should be rinsed with an additional 10 mL of water, which the patient should drink to ensure the entire dose is taken.

7. SUPPLIER

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8. WHO REFERENCE NUMBER (WHO Prequalification Programme)

HA662

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10. DATE OF REVISION OF THE TEXT

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