

## **SUMMARY OF PRODUCT CHARACTERISTICS**

**1. NAME OF THE FINISHED PHARMACEUTICAL PRODUCT:**

**Name of product**

Enalapril Maleate tablets USP 10 mg

**Strength:**

10mg

**Pharmaceutical form:**

Uncoated tablets

**2. QUALITATIVE AND QUANTITATIVE COMPOSITION:**

Enalapril Maleate
Lactose
Colloidal Anhydrous silica
Maleic Acid
Zinc Stearate

**3. PHARMACEUTICAL FORM:**

White, circular, uncoated flat tablets with flat beveled edges having breakline on one side and plain on other side

#### **4. CLINICAL PARTICULARS:**

##### **i) Therapeutic indications:**

Treatment of Hypertension

Treatment of Symptomatic Heart Failure

Prevention of Symptomatic Heart Failure in patients with Asymptomatic Left Ventricular Dysfunction (ejection fraction  $\leq$  35%)

Enalapril can be used alone or in combination with other antihypertensive agents.

##### **ii) Posology and method of administration:**

###### **Posology**

The absorption of Enalapril Tablets is not affected by food.

The dose should be individualised according to patient profile and blood pressure response.

###### Hypertension

Enalapril can be used alone or in combination with other antihypertensive agents .

The initial dose is 5 to maximally 20 mg, depending on the degree of hypertension and the condition of the patient . Enalapril Tablets are given once daily. In mild hypertension, the recommended initial dose is 5 to 10 mg. Patients with a strongly activated renin-angiotensin-aldosterone system (e.g., renovascular hypertension, salt and/or volume depletion, cardiac decompensation, or severe hypertension) may experience an excessive blood pressure fall following the initial dose. A starting dose of 5 mg or lower is recommended in such patients and the initiation of treatment should take place under medical supervision.

Prior treatment with high dose diuretics may result in volume depletion and a risk of hypotension when initiating therapy with enalapril. A starting dose of 5 mg or lower is recommended in such patients. If possible, diuretic therapy should be discontinued for 2-3 days prior to initiation of therapy with enalapril. Renal function and serum potassium should be monitored.

The usual maintenance dose is 20 mg daily. The maximum maintenance dose is 40 mg daily.

###### Heart Failure/Asymptomatic Left Ventricular Dysfunction

In the management of symptomatic heart failure, Enalapril Tablets are used in addition to diuretics and, where appropriate, digitalis or beta-blockers. The initial dose of Enalapril Tablets in patients with symptomatic heart failure or asymptomatic left ventricular dysfunction is 2.5 mg, and it should be administered under close medical supervision to determine the initial effect on the blood pressure. In the absence of, or after effective management of, symptomatic hypotension following initiation of therapy with Enalapril Tablets in heart failure, the dose should be increased gradually to the usual maintenance dose of 20 mg, given in a single dose or two divided doses, as tolerated by the patient. This dose titration is recommended to be performed over a 2 to 4 week period. The maximum dose is 40 mg daily given in two divided doses.

**Suggested Dosage Titration of Enalapril Tablets in Patients with Heart Failure/Asymptomatic Left Ventricular Dysfunction**

Week	Dose mg/day
Week 1	Days 1 to 3: 2.5 mg/day* in a single dose Days 4 to 7: 5 mg/day in two divided doses
Week 2	10 mg/day in a single dose or in two divided doses
Weeks 3 and 4	20 mg/day in a single dose or in two divided doses

\*Special precautions should be followed in patients with impaired renal function or taking diuretics.

Blood pressure and renal function should be monitored closely both before and after starting treatment with Enalapril Tablets because hypotension and (more rarely) consequent renal failure have been reported. In patients treated with diuretics, the dose should be reduced if possible before beginning treatment with Enalapril Tablets. The appearance of hypotension after the initial dose of Enalapril Tablets does not imply that hypotension will recur during chronic therapy with Enalapril Tablets and does not preclude continued use of the drug. Serum potassium and renal function also should be monitored.

Dosage in Renal Insufficiency

Generally, the intervals between the administration of enalapril should be prolonged and/or the dosage reduced.

Creatinine Clearance (CrCL) mL/min	Initial Dose mg/day
30 < CrCL < 80 ml/min.	5 - 10 mg
10 < CrCL ≤ 30 ml/min.	2.5 mg
CrCL ≤ 10 ml/min.	2.5 mg on dialysis days*

Enalaprilat is dialysable. Dosage on nondialysis days should be adjusted depending on the blood pressure response.

#### Use in Elderly

The dose should be in line with the renal function of the elderly patient .

#### Use in paediatrics

There is limited clinical trial experience of the use of Enalapril Tablets in hypertensive paediatric patients .

For patients who can swallow tablets, the dose should be individualised according to patient profile and blood pressure response. The recommended initial dose is 2.5 mg in patients 20 to <50 kg and 5 mg in patients ≥50 kg. Enalapril Tablets are given once daily. The dosage should be adjusted according to the needs of the patient to a maximum of 20 mg daily in patients 20 to <50 kg and 40 mg in patients ≥50 kg.

Enalapril Tablets are not recommended in neonates and in paediatric patients with glomerular filtration rate <30 ml/min/1.73 m<sup>2</sup>, as no data are available.

#### **iii) Contraindications:**

- Hypersensitivity to enalapril, to any of the excipients or any other ACE inhibitor
- History of angioedema associated with previous ACE-inhibitor therapy
- Hereditary or idiopathic angioedema
- Second and third trimesters of pregnancy .
- The concomitant use of Enalapril Tablets with aliskiren-containing products is contraindicated in patients with diabetes mellitus or renal impairment (GFR < 60 ml/min/1.73 m<sup>2</sup>) .

**iv) Special warnings and precautions for use:**

Pretreatment assessment of renal function:

Evaluation of the patient should include assessment of renal function prior to initiation of therapy, and during treatment where appropriate.

Symptomatic hypotension:

Symptomatic hypotension is seen rarely in uncomplicated hypertensive patients. In hypertensive patients receiving Enalapril tablets, hypotension is more likely to occur if the patient has been volume-depleted, e.g. by diuretic therapy, dietary salt restriction, dialysis, diarrhoea or vomiting . In patients with heart failure, with or without associated renal insufficiency, symptomatic hypotension has been observed. This is most likely to occur in those patients with more severe degrees of heart failure, as reflected by the use of high doses of loop diuretics, hyponatraemia or functional renal impairment (see “Posology and method of administration” for management of these patients). In these patients, therapy should be started under medical supervision and the patients should be followed closely whenever the dose of 'Enalapril' and/or diuretic is adjusted.

Similar considerations may apply to patients with ischaemic heart or cerebrovascular disease in whom an excessive fall in blood pressure could result in a myocardial infarction or cerebrovascular accident.

If hypotension occurs, the patient should be placed in a supine position. Volume repletion with oral fluids or intravenous normal saline may be required. Intravenous atropine may be necessary if there is associated bradycardia. A transient hypotensive response is not a contra-indication to further doses, which can usually be given without difficulty once the blood pressure has increased after volume expansion.

In some patients with heart failure who have normal or low blood pressure, additional lowering of systemic blood pressure may occur with Enalapril tablets. This effect is anticipated, and usually is not a reason to discontinue treatment. If such hypotension

becomes symptomatic, a reduction of dose and/or discontinuation of the diuretic and/or Enalapril tablets may become necessary.

#### Aortic or mitral valve stenosis/hypertrophic cardiomyopathy

As with all vasodilators, ACE inhibitors should be given with caution in patients with left ventricular valvular and outflow tract obstruction and avoided in cases of cardiogenic shock and haemodynamically significant obstruction.

#### Renal function impairment

In cases of renal impairment (creatinine clearance <80 ml/min) the initial enalapril dosage should be adjusted according to the patient's creatinine clearance and then as a function of the patient's response to treatment. Routine monitoring of potassium and creatinine are part of normal medical practice for these patients.

Renal failure has been reported in association with enalapril tablets and has been occurring mainly in patients with severe heart failure or underlying renal disease, including renal artery stenosis. If recognised promptly and treated appropriately, renal failure when associated with therapy with enalapril tablets is usually reversible.

Some hypertensive patients, with no apparent pre-existing renal disease, have developed increases in blood urea and creatinine when enalapril tablets have been given concurrently with a diuretic. Dosage reduction of enalapril tablets and/or discontinuation of the diuretic may be required. This situation should raise the possibility of an underlying renal artery stenosis .

#### Renovascular hypertension:

There is an increased risk of hypotension and renal insufficiency when patients with bilateral renal artery stenosis or stenosis of the artery to a single functioning kidney are treated with ACE inhibitors. Loss of renal function may occur with only mild changes in serum creatinine. In these patients, therapy should be initiated under close medical supervision with low doses, careful titration, and monitoring of renal function.

#### Kidney transplantation

There is no experience regarding the administration of 'Enalapril' in patients with a recent kidney transplantation. Treatment with 'Enalapril' is therefore not recommended.

#### Hepatic failure

Rarely, ACE inhibitors have been associated with a syndrome that starts with cholestatic jaundice or hepatitis and progresses to fulminant hepatic necrosis and (sometimes) death. The mechanism of this syndrome is not understood. Patients receiving ACE inhibitors who develop jaundice or marked elevations of hepatic enzymes should discontinue the ACE inhibitor and receive appropriate medical follow-up.

#### Neutropenia/Agranulocytosis

Neutropenia/agranulocytosis, thrombocytopenia and anaemia have been reported in patients receiving ACE inhibitors. In patients with normal renal function and no other complicating factors, neutropenia occurs rarely. Enalapril should be used with extreme caution in patients with collagen vascular disease, immunosuppressant therapy, treatment with allopurinol or procainamide, or a combination of these complicating factors, especially if there is pre-existing impaired renal function. Some of these patients developed serious infections which in a few instances did not respond to intensive antibiotic therapy. If enalapril is used in such patients, periodic monitoring of white blood cell counts is advised and patients should be instructed to report any sign of infection.

#### Hypersensitivity / Angioneurotic oedema:

Angioneurotic oedema of the face, extremities, lips, tongue, glottis and/or larynx has been reported with angiotensin-converting enzyme inhibitors, including Enalapril tablets. This may occur at any time during treatment. In such cases, Enalapril tablets should be discontinued immediately and appropriate monitoring should be instituted to ensure complete resolution of symptoms prior to dismissing the patient.



Even in those instances where swelling of only the tongue is involved, without respiratory distress, patients may require prolonged observation since treatment with antihistamines and corticosteroids may not be sufficient.

Very rarely, fatalities have been reported due to angioedema associated with laryngeal oedema or tongue oedema. Patients with involvement of the tongue, glottis or larynx are likely to experience airway obstruction especially those with a history of airway surgery. Where there is involvement of the tongue, glottis or larynx, likely to cause airway obstruction, appropriate therapy, which may include subcutaneous epinephrine solution 1:1000 (0.3 ml to 0.5 ml) and/or measures to ensure a patent airway, should be administered promptly.

Black patients receiving ACE inhibitors have been reported to have a higher incidence of angioedema compared to non-blacks.

Patients with a history of angioedema unrelated to ACE-inhibitor therapy may be at increased risk of angioedema while receiving an ACE inhibitor .

Patients receiving co-administration of ACE inhibitor and mTOR (mammalian target of rapamycin) inhibitor (e.g., temsirolimus, sirolimus, everolimus) therapy may be at increased risk for angioedema.

Anaphylactic reactions during hymenoptera desensitisation:

Rarely, patients receiving ACE inhibitors during desensitisation with hymenoptera venom (e.g. Bee or Wasp venom) have experienced life-threatening anaphylactoid reactions. These reactions were avoided by temporarily withholding ACE-inhibitor therapy prior to each desensitisation.

Anaphylactoid reactions during LDL apheresis:

Rarely, patients receiving ACE inhibitors during low-density lipoprotein (LDL) apheresis with dextran sulphate have experienced life-threatening anaphylactoid reactions. These reactions were avoided by temporarily withholding ACE-inhibitor therapy prior to each apheresis.

Haemodialysis patients:

Anaphylactoid reactions have been reported in patients dialysed with high-flux membranes (e.g. AN 69) and treated concomitantly with an ACE inhibitor. In these patients, consideration should be given to using a different type of dialysis membrane or a different class of antihypertensive agent.

Hypoglycaemia

Diabetic patients treated with oral antidiabetic agents or insulin starting an ACE inhibitor, should be told to closely monitor for hypoglycemia, especially during the first month of combined use.

Cough:

Cough has been reported with the use of ACE inhibitors. Characteristically, the cough is non-productive, persistent and resolves after discontinuation of therapy. ACE-inhibitor-induced cough should be considered as part of the differential diagnosis of cough.

Surgery / Anaesthesia:

In patients undergoing major surgery or during anaesthesia with agents that produce hypotension, Enalapril 5 mg, tablets block angiotensin-II formation secondary to compensatory renin release. If hypotension occurs and is considered to be due to this mechanism, it can be corrected by volume expansion.

Hyperkalaemia

Elevations in serum potassium have been observed in some patients treated with ACE inhibitors, including Enalapril. Risk factors for the development of hyperkalaemia include those with renal insufficiency, worsening of renal function, age (>70 years) diabetes mellitus, inter-current events in particular dehydration, acute decompensation, metabolic acidosis and concomitant use of potassium-sparing diuretics (e.g., spironolactone, eplerenone, triamterene, or amiloride), potassium supplements or potassium-containing salt substitutes; or those patients taking other drugs associated with increases in serum potassium (e.g. heparin). The use of potassium supplements,

potassium-sparing diuretics, or potassium-containing salt substitutes particularly in patients with impaired renal function may lead to a significant increase in serum potassium. Hyperkalaemia can cause serious, sometimes fatal arrhythmias. If concomitant use of Enalapril and any of the above-mentioned agents is deemed appropriate, they should be used with caution and with frequent monitoring of serum potassium.

### Lithium

The combination of lithium and Enalapril is generally not recommended Dual blockade of the renin-angiotensin-aldosterone system (RAAS)

There is evidence that the concomitant use of ACE-inhibitors, angiotensin II receptor blockers or aliskiren increases the risk of hypotension, hyperkalaemia and decreased renal function (including acute renal failure). Dual blockade of RAAS through the combined use of ACE-inhibitors, angiotensin II receptor blockers or aliskiren is therefore not recommended .

If dual blockade therapy is considered absolutely necessary, this should only occur under specialist supervision and subject to frequent close monitoring of renal function, electrolytes and blood pressure.

ACE-inhibitors and angiotensin II receptor blockers should not be used concomitantly in patients with diabetic nephropathy.”

### Lactose

Enalapril tablets contains lactose and therefore should not be used by patients with rare hereditary problems of galactose intolerance, the Lapp lactase deficiency or glucose-galactose malabsorption. Enalapril Tablets contains less than 200 mg of lactose per tablet.

### Paediatric population

There is limited efficacy and safety experience in hypertensive children >6 years old, but no experience in other indications. Limited pharmacokinetic data are available in

children above 2 months of age. ( Enalapril tablets is not recommended in children in other indications than hypertension.

'Enalapril' is not recommended in neonates and in paediatric patients with glomerular filtration rate  $<30$  ml/min/1.73 m<sup>2</sup>, as no data are available.

#### Pregnancy

ACE inhibitors should not be initiated during pregnancy. Unless continued ACE inhibitor therapy is considered essential, patients planning pregnancy should be changed to alternative antihypertensive treatments which have an established safety profile for use in pregnancy. When pregnancy is diagnosed, treatment with ACE inhibitors should be stopped immediately, and, if appropriate, alternative therapy should be started .

#### Ethnic differences

As with other angiotensin-converting enzyme inhibitors, Enalapril is apparently less effective in lowering blood pressure in black people than in non-blacks, possibly because of a higher prevalence of low-renin states in the black hypertensive population.

#### **v) Interaction with other FPPs and other forms of interaction**

##### Dual blockade of the renin-angiotensin-aldosterone system (RAAS)

Clinical trial data have shown that dual blockade of the renin-angiotensin-aldosterone-system (RAAS) through the combined use of ACE inhibitors, angiotensin II receptor blockers or aliskiren is associated with a higher frequency of adverse events such as hypotension, hyperkalaemia and decreased renal function (including acute renal failure) compared to the use of a single RAAS-acting agent .

##### Potassium sparing diuretics or potassium supplements

ACE inhibitors attenuate diuretic induced potassium loss. Potassium sparing diuretics (e.g., spironolactone, eplerenone, triamterene or amiloride), potassium supplements, or potassium-containing salt substitutes may lead to significant increases in serum potassium. If concomitant use is indicated because of demonstrated hypokalaemia they should be used with caution and with frequent monitoring of serum potassium .

##### Diuretics (thiazide or loop diuretics)

Prior treatment with high dose diuretics may result in volume depletion and a risk of hypotension when initiating therapy with enalapril . The hypotensive effects can be reduced by discontinuation of the diuretic, by increasing volume or salt intake or by initiating therapy with a low dose of enalapril.

#### Other antihypertensive agents

Concomitant use of these agents may increase the hypotensive effects of enalapril. Concomitant use with nitroglycerine and other nitrates, or other vasodilators, may further reduce blood pressure.

#### Lithium

Reversible increases in serum lithium concentrations and toxicity have been reported during concomitant administration of lithium with ACE inhibitors. Concomitant use of thiazide diuretics may further increase lithium levels and enhance the risk of lithium toxicity with ACE inhibitors. Use of enalapril with lithium is not recommended, but if the combination proves necessary, careful monitoring of serum lithium levels should be performed.

#### Tricyclic antidepressants/Antipsychotics/Anaesthetics/Narcotics

Concomitant use of certain anaesthetic medicinal products, tricyclic antidepressants and antipsychotics with ACE inhibitors may result in further reduction of blood pressure .

#### Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) Including Selective Cyclooxygenase-2 (COX-2) Inhibitors

Non-steroidal anti-inflammatory drugs (NSAIDs) including selective cyclooxygenase-2 inhibitors (COX-2 inhibitors) may reduce the effect of diuretics and other antihypertensive drugs. Therefore, the antihypertensive effect of angiotensin II receptor antagonists or ACE inhibitors may be attenuated by NSAIDs including selective COX-2 inhibitors.

The co-administration of NSAIDs (including COX-2 inhibitors) and angiotensin II receptor antagonists or ACE inhibitors exert an additive effect on the increase in serum potassium and may result in a deterioration of renal function. These effects are usually reversible. Rarely, acute renal failure may occur, especially in patients with compromised renal function (such as the elderly or patients who are volume-depleted, including those on diuretic therapy). Therefore, the combination should be administered with caution in

patients with compromised renal function. Patients should be adequately hydrated and consideration should be given to monitoring renal function after initiation of concomitant therapy and periodically thereafter.

#### Gold

Nitritoid reactions (symptoms include facial flushing, nausea, vomiting and hypotension) have been reported rarely in patients on therapy with injectable gold (sodium aurothiomalate) and concomitant ACE inhibitor therapy including enalapril.

#### Mammalian Target of Rapamycin (mTOR) Inhibitors

Patients taking concomitant mTOR inhibitor (e.g., temsirolimus, sirolimus, everolimus) therapy may be at increased risk for angioedema .

#### Sympathomimetics

Sympathomimetics may reduce the antihypertensive effects of ACE inhibitors.

#### Antidiabetics

Epidemiological studies have suggested that concomitant administration of ACE inhibitors and antidiabetic medicines (insulins, oral hypoglycaemic agents) may cause an increased blood-glucose-lowering effect with risk of hypoglycaemia. This phenomenon appeared to be more likely to occur during the first weeks of combined treatment and in patients with renal impairment .

#### Alcohol

Alcohol enhances the hypotensive effect of ACE inhibitors.

#### Acetyl salicylic acid, thrombolytics and $\beta$ -blockers

Enalapril can be safely administered concomitantly with acetyl salicylic acid (at cardiologic doses), thrombolytics and  $\beta$ -blockers.

#### Paediatric population

Interaction studies have only been performed in adults.

### **vi) Fertility, pregnancy and lactation:**

#### Pregnancy

##### ACE inhibitors

The use of ACE inhibitors is not recommended during the first trimester of pregnancy . The use of ACE inhibitors is contraindicated during the second and third trimesters of pregnancy .

Epidemiological evidence regarding the risk of teratogenicity following exposure to ACE inhibitors during the first trimester of pregnancy has not been conclusive; however a small increase in risk cannot be excluded. Unless continued ACE inhibitor therapy is considered essential, patients planning pregnancy should be changed to alternative antihypertensive treatments which have an established safety profile for use in pregnancy. When pregnancy is diagnosed, treatment with ACE inhibitors should be stopped immediately, and, if appropriate, alternative therapy should be started.

Exposure to ACE inhibitor therapy during the second and third trimesters is known to induce human foetotoxicity (decreased renal function, oligohydramnios, skull ossification retardation) and neonatal toxicity (renal failure, hypotension, hyperkalaemia) . Maternal oligohydramnios, presumably representing decreased foetal renal function, has occurred and may result in limb contractures, craniofacial deformations and hypoplastic lung development.

Should exposure to ACE inhibitor have occurred from the second trimester of pregnancy, ultrasound check of renal function and skull is recommended.

Infants whose mothers have taken ACE inhibitors should be closely observed for hypotension .

**Breastfeeding:**

Limited pharmacokinetic data demonstrate very low concentrations in breast milk . Although these concentrations seem to be clinically irrelevant, the use of Enalapril in breastfeeding is not recommended for preterm infants and for the first few weeks after delivery, because of the hypothetical risk of cardiovascular and renal effects and because there is not enough clinical experience. In the case of an older infant, the use of Enalapril in a breast-feeding mother may be considered if this treatment is necessary for the mother and the child is observed for any adverse effect.

**vii) Effects on ability to drive and use machines:**

When driving vehicles or operating machines it should be taken in to account occasionally dizziness or weariness may occur .

**viii) Undesirable effects:**

**Undesirable effects reported for enalapril include:**

[Very common (>1/10); common (>1/100, <1/10); uncommon (>1/1,000, <1/100); rare (>1/10,000, <1/1,000); very rare (<1/10,000), Not Known (cannot be estimated from the available data)]

**Blood and the lymphatic system disorders:**

Uncommon: anaemia (including aplastic and haemolytic).

Rare: neutropenia, decreases in haemoglobin, decreases in haematocrit, thrombocytopenia, agranulocytosis, bone marrow depression, pancytopenia, lymphadenopathy, autoimmune diseases.

**Endocrine disorders:**

Not Known: Syndrome of inappropriate antidiuretic hormone secretion (SIADH)

**Metabolism and nutrition disorders:**

Uncommon: hypoglycaemia .

**Nervous system and psychiatric disorders**

Common: headache, depression, syncope, taste alteration

Uncommon: confusion, somnolence, insomnia, nervousness, paresthesia, vertigo

Rare: dream abnormality, sleep disorders

Very common: dizziness

**Eye disorders:**

Very common: blurred vision.

**Ear and Labyrinth disorders:**

Uncommon: Tinnitus

**Cardiac and vascular disorders:**

Common: hypotension (including orthostatic hypotension), syncope, chest pain, rhythm disturbances, angina pectoris, tachycardia

Uncommon: orthostatic hypotension, palpitations, myocardial infarction or cerebrovascular accident\*, possibly secondary to excessive hypotension in high risk patients

Rare: Raynaud's phenomenon

\* Incidence rates were comparable to those in the placebo and active control groups in the clinical trials



**Respiratory disorders:**

Very common: cough.

Common: dyspnoea.

Uncommon: rhinorrhoea, sore throat and hoarseness, bronchospasm/asthma.

Rare: pulmonary infiltrates, rhinitis, allergic alveolitis/eosinophilic pneumonia.

**Gastro-intestinal disorders:**

Very common: nausea.

Common: diarrhoea, abdominal pain

Uncommon: ileus, pancreatitis, vomiting, dyspepsia, constipation, anorexia, gastric irritations, dry mouth, peptic ulcer.

Rare: stomatitis/aphthous ulcerations, glossitis.

Very rare: intestinal angioedema.

**Hepatobiliary disorders:**

Rare: hepatic failure, hepatitis – either hepatocellular or cholestatic, hepatitis including necrosis, cholestasis (including jaundice).

**Skin and subcutaneous tissue disorders:**

Common: rash, hypersensitivity/angioneurotic oedema: angioneurotic oedema of the face, extremities, lips, tongue, glottis and/or larynx has been reported

Uncommon: diaphoresis, pruritus, urticaria, alopecia.

Rare: erythema multiforme, Stevens-Johnson syndrome, exfoliative dermatitis, toxic epidermal necrolysis, pemphigus, erythroderma

Not known: A symptom complex has been reported which may include some or all of the following: fever, serositis, vasculitis, myalgia/myositis, arthralgia/arthritis, a positive ANA, elevated ESR, eosinophilia, and leukocytosis. Rash, photosensitivity or other dermatologic manifestations may occur.

**Musculoskeletal, connective tissue, and bone disorders**

Uncommon: Muscle cramps.

**Renal and urinary disorders:**

Uncommon: renal dysfunction, renal failure, proteinuria.

Rare: oliguria.

**Reproductive system and breast disorders:**

Uncommon: impotence.

Rare: gynecomastia.

**General disorders and administration site conditions:**

Very common: asthenia.

Common: fatigue.

Uncommon: malaise, fever.

**Investigations:**

Common: hyperkalaemia, increases in serum creatinine.

Uncommon: increases in blood urea, hyponatraemia.

Rare: elevations of liver enzymes, elevations of serum bilirubin.

**Reporting of suspected adverse reactions**

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via: Yellow Card Scheme

Website: [www.mhra.gov.uk/yellowcard](http://www.mhra.gov.uk/yellowcard) or search for MHRA Yellow card in the Google play or Apple App store.

**ix) Overdose:**

Limited data are available for overdosage in humans. The most prominent features of overdosage reported to date are marked hypotension, beginning some six hours after ingestion of tablets, concomitant with blockade of the renin-angiotensin-aldosterone system, and stupor. Symptoms associated with overdosage of ACE inhibitors may include circulatory shock, electrolyte disturbances, renal failure, hyperventilation, tachycardia, palpitations, bradycardia, dizziness, anxiety and cough. Serum enalaprilat levels 100 times and 200 times higher than usually seen after therapeutic doses have been reported after ingestion of 300 mg and 440 mg of Enalapril, respectively.

The recommended treatment of overdosage is intravenous infusion of normal saline solution. If hypotension occurs, the patient should be placed in the shock position. If available, treatment with angiotensin II infusion and/or intravenous catecholamines may

also be considered. If ingestion is recent, take measures aimed at eliminating Enalapril maleate (e.g., emesis, gastric lavage, administration of absorbents, and sodium sulphate). Enalaprilat may be removed from the general circulation by haemodialysis. Pacemaker therapy is indicated for therapy-resistant bradycardia. Vital signs, serum electrolytes and creatinine concentrations should be monitored continuously.

#### **D. Pharmacological Properties:**

##### **i) Pharmacodynamic properties:**

**Pharmacotherapeutic group:** Angiotensin converting enzyme inhibitors

**ACT Code :** C09A A02

Enalapril tablets contain the maleate salt of enalapril, a derivative of two amino acids; L-alanine and L-proline. Angiotensin-converting enzyme (ACE) is a peptidyl dipeptidase which catalyses the conversion of angiotensin I into the pressor substance angiotensin II. After absorption, Enalapril tablets are hydrolysed to Enalaprilat which inhibits ACE. Inhibition of ACE results in decreased plasma renin activity (due to removal of negative feedback of renin release) and decreased aldosterone secretion.

ACE is identical to kinase II, the use of ACE inhibitors may therefore block the degradation of bradykinin a potent vasodepressor peptide. The possible role of this mechanism in the therapeutic effects of enalapril has not yet been elucidated.

**Mechanism of action**

While the mechanism through which Enalapril 10 mg, tablets lower blood pressure is believed to be primarily suppression of the renin-angiotensin-aldosterone system, which plays a major role in the regulation of blood pressure, Enalapril 10 mg, tablets are antihypertensive even in patients with low-renin hypertension.

**Pharmacodynamic effects**

Administration of Enalapril 10 mg, tablets to patients with hypertension results in a reduction of both supine and standing blood pressure without a significant increase in heart rate.

Symptomatic postural hypotension is infrequent. In some patients the development of optimal blood pressure reduction may require several weeks of therapy. Abrupt

withdrawal of Enalapril 10 mg, tablets has not been associated with rapid increase in blood pressure.

Effective inhibition of ACE activity usually occurs 2 to 4 hours after oral administration of an individual dose of enalapril.

Onset of antihypertensive activity was usually seen at one hour, with peak reduction of blood pressure achieved by 4 to 6 hours after administration. The duration of effect is dose related.

However, at recommended doses, antihypertensive and haemodynamic effects have been shown to be maintained for at least 24 hours. In haemodynamic studies in patients with essential hypertension, blood pressure reduction was accompanied by a reduction in peripheral arterial resistance with an increase in cardiac output and little or no change in heart rate.

Following administration of Enalapril 10 mg, tablets there was an increase in renal blood flow; glomerular filtration rate was unchanged. There was no evidence of sodium or water retention. However, in patients with low pretreatment glomerular filtration rates, the rates were usually increased. In short term clinical studies in diabetic and nondiabetic patients with renal disease, decreases in albuminuria and urinary excretion of IgG and total urinary protein were seen after the administration of enalapril. When given together with thiazidetype diuretics, the blood pressure lowering effects of Enalapril 10 mg, tablets are at least additive.

Enalapril 10 mg, tablets may reduce or prevent the development of thiazide induced hypokalaemia.

In patients with heart failure on therapy with digitalis and diuretics, treatment with oral or injection Enalapril, 10mg tablets was associated with decreases in peripheral resistance and blood pressure. Cardiac output increased, while heart rate (usually elevated in patients with heart failure) decreased. Pulmonary capillary wedge pressure was also reduced.

Exercise tolerance and severity of heart failure, as measured by New York Heart Association criteria, improved. These actions continued during chronic therapy.

In patients with mild to moderate heart failure, enalapril retarded progressive cardiac dilatation/enlargement and failure, as evidenced by reduced left ventricular end diastolic and systolic volumes and improved ejection fraction.

#### Dual Blockade of the renin angiotensin aldosterone system (RAAS)

Two large randomised, controlled trials (ONTARGET (ONgoing Telmisartan Alone and in combination with Ramipril Global Endpoint Trial) and VA NEPHRON D (The Veterans Affairs Nephropathy in Diabetes)) have examined the use of the combination of an ACE inhibitor with an angiotensin II receptor blocker.

ONTARGET was a study conducted in patients with a history of cardiovascular or cerebrovascular disease, or type 2 diabetes mellitus accompanied by evidence of end organ damage. VA NEPHRON D was a study in patients with type 2 diabetes mellitus and diabetic nephropathy.

These studies have shown no significant beneficial effect on renal and/or cardiovascular outcomes and mortality, while an increased risk of hyperkalaemia, acute kidney injury and/or hypotension as compared to monotherapy was observed.

Given their similar pharmacodynamic properties, these results are also relevant for other ACE inhibitors and angiotensin II receptor blockers.

ACE inhibitors and angiotensin II receptor blockers should therefore not be used concomitantly in patients with diabetic nephropathy.

ALTITUDE (Aliskiren Trial in Type 2 Diabetes Using Cardiovascular and Renal Disease Endpoints) was a study designed to test the benefit of adding aliskiren to a standard therapy of an ACE inhibitor or an angiotensin II receptor blocker in patients with type 2 diabetes mellitus and chronic kidney disease, cardiovascular disease, or both. The study was terminated early because of an increased risk of adverse outcomes. Cardiovascular death and stroke were both numerically more frequent in the aliskiren group than in the placebo group and adverse events and serious adverse events of interest (hyperkalaemia, hypotension and renal dysfunction) were more frequently reported in the aliskiren group than in the placebo group.

#### **ii) Pharmacokinetic properties:**

### Absorption

Enalapril tablets are rapidly absorbed, with peak serum concentrations of enalapril occurring within one hour. Based on urinary recovery, the extent of absorption of enalapril from Enalapril tablets is approximately 60%.

Following absorption, Enalapril tablets are rapidly and extensively hydrolysed to enalaprilat. Peak serum concentrations of enalaprilat occur 3 to 4 hours after an oral dose of Enalapril tablets. Excretion of Enalapril tablets is primarily renal. The principal components in urine are enalaprilat, accounting for about 40% of the dose and intact enalapril. In subjects with normal renal function, steady state serum concentrations of enalaprilat were achieved by the fourth day of administration. The effective half-life for accumulation of enalaprilat following multiple doses of Enalapril tablets is 11 hours. Accumulation may occur, however in patients with severely impaired renal function, and the dosage of enalapril should be adjusted accordingly. The absorption of Enalapril tablets is not influenced by the presence of food in the gastro-intestinal tract. The extent of absorption and hydrolysis of enalapril is similar for the various doses in the recommended therapeutic range.

### Distribution

Over the range of concentrations which are therapeutically relevant, enalapril binding to human plasma protein does not exceed 60%

### Biotransformation

Except for conversion to enalapril, there is no evidence for significant metabolism of enalapril.

### Elimination

Excretion of enalapril is primarily renal. The principal components in urine are enalapril, accounting for about 40% of the dose, and intact enalapril (about 20%).

### Renal impairment

The exposure of enalapril and enalaprilat is increased in patients with renal insufficiency. In patients with mild to moderate renal insufficiency (creatinine clearance 40-60ml/min) steady state AUC of enalapril was approximately two fold higher than in patients with normal renal function after administration of 5 mg once daily. In severe renal impairment (creatinine clearance  $\leq 30$  ml/min), AUC was increased approximately 8-fold. The effective half-life of enalapril following multiple doses of enalapril maleate is prolonged at this level of renal insufficiency and time to steady state is delayed. Enalapril may be removed from the general circulation by haemodialysis. The dialysis clearance is 62ml/min.

#### Children and adolescents

A multiple dose pharmacokinetic study was conducted in 40 hypertensive male and female paediatric patients aged 2 months to  $\leq 16$  years following daily oral administration of 0.07 to 0.14 mg/kg enalapril maleate. There were no major differences in the pharmacokinetics of enalapril in children compared with historic data in adults. The data indicate an increase in AUC (normalised to dose per body weight) with increased age; however, an increase in AUC is not observed when data are normalised by body surface area. At steady state, the mean effective half-life for accumulation of enalapril was 14 hours

#### Lactation:

After a single 20 mg oral dose in five postpartum women, the average peak enalapril milk level was 1.7  $\mu\text{g/L}$  (range 0.54 to 5.9  $\mu\text{g/L}$ ) at 4 to 6 hours after the dose. The average peak enalaprilat level was 1.7  $\mu\text{g/L}$  (range 1.2 to 2.3  $\mu\text{g/L}$ ); peaks occurred at various times over the 24-hour period. Using the peak milk level data, the estimated maximum intake of an exclusively breastfed infant would be about 0.16% of the maternal weight-adjusted dosage. A woman who had been taking oral enalapril 10 mg daily for 11 months had peak enalapril milk levels of 2  $\mu\text{g/L}$  4 hours after a dose and peak enalaprilat levels of 0.75  $\mu\text{g/L}$  about 9 hours after the dose. The total amount of enalapril and enalaprilat measured in milk during the 24 hour period was 1.44  $\mu\text{g/L}$  and 0.63  $\mu\text{g/L}$  of milk respectively. Enalaprilat milk levels were undetectable ( $<0.2$   $\mu\text{g/L}$ ) 4 hours after a single

dose of enalapril 5 mg in one mother and 10 mg in two mothers; enalapril levels were not determined.

## **6 PHARMACEUTICAL PARTICULARS:**

### **i) List of Excipients:**

Colloidal Anhydrous Silica

Lactose

Maleic acid

Zinc stearate

### **ii) Incompatibilities:**

Not applicable.

### **iii) Shelf life:**

24 Months

### **iv) Special precautions for storage:**

Store in dry place at a temperature below 25°C.

### **v) Nature and contents of container:**

Blister pack of 3 x 10 tablets.

### **vi) Special precautions for disposal:**

Not applicable.

## **7. MARKETING AUTHORIZATION HOLDER:**



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**8. Number(s) in the National register of finished pharmaceutical products:**

206181/06883/REN/2018

**9. Date of first authorization/renewal of the Authorization :**

23<sup>rd</sup> December 2004

Last renewal date : Jul 24, 2021

**10. Date of revision of the text :**

27/03/2018