

SUMMARY OF PRODUCT CHARACTERISTICS

1 NAME OF THE MEDICINAL PRODUCT

Enalapril Maleate 10mg Tablets

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Enalapril Maleate 10mg

For excipients, see 6.1

3 PHARMACEUTICAL FORM

Tablets

Circular peach tablets with a score on one side and marked 'E10' on the reverse. Diameter = 7mm.

4 CLINICAL PARTICULARS

4.1 Therapeutic indications

Hypertension: Treatment of all grades of essential hypertension, also renovascular hypertension.

Congestive heart failure: Enalapril tablets should be used as an adjunctive therapy with digitalis and/ or non potassium-sparing diuretics as appropriate. Enalapril has been shown to improve symptoms, retard the progression of the disease, and reduce mortality and hospitalisation.

Prevention of symptomatic heart failure: When used in asymptomatic patients with left ventricular dysfunction, enalapril retards the development of symptomatic heart failure, and reduces hospitalisation for heart failure.

Prevention of coronary ischaemic events in patients with left ventricular dysfunction: Enalapril reduces the incidence of myocardial infarction and reduces hospitalisation for unstable angina pectoris.

4.2 Posology and method of administration

The Absorption of Enalapril maleate tablets is not affected by food.

The dose should be individualised according to patient profile (see 4.4 'Special warnings and precautions for use') and blood pressure response.

Hypertension:

The initial dose is 5 to maximally 20mg, depending on the degree of hypertension and the condition of the patient (see below). Enalapril maleate tablets are given once daily. In mild hypertension, the recommended initial dose is 5 to 10mg. 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 5mg 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 maleate tablets. A starting dose of 5mg 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 maleate tablets. Renal function and serum potassium should be monitored.

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

Heart Failure/Asymptomatic left ventricular dysfunction:

In the management of symptomatic heart failure, Enalapril maleate tablets are used in addition to diuretics and, where appropriate, digitalis or beta-blockers. The initial dose of Enalapril maleate tablets in patients with symptomatic heart failure or asymptomatic left ventricular dysfunction is 2.5mg, 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 maleate tablets in heart failure, the dose should be increased gradually to the usual maintenance dose of 20mg, 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 40mg daily given in two divided doses.

Suggested Dosage Titration of Enalapril maleate tablets in Patients with Heart Failure/Asymptomatic Left Ventricular Dysfunction

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

*Special precautions should be followed in patients with impaired renal function or taking diuretics (See 4.4 'Special warnings and precautions for use').

Blood pressure and renal function should be monitored closely both before and after starting treatment with Enalapril maleate tablets (see 4.4 'Special warnings and precautions for use') 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 maleate tablets. The appearance of hypotension after the initial dose of Enalapril maleate tablets does not imply that hypotension will recur during chronic therapy with Enalapril maleate 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 maleate tablets should be prolonged and/or the dosage reduced.

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

* See 4.4 'Special warnings and precautions for use' - Haemodialysis Patients. 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 (see 4.4 'Special warnings and precautions for use', Renal Function Impairment).

Use in paediatric patients:

There is limited clinical trial experience of the use of Enalapril maleate tablets in hypertensive paediatric patients (see 4.4 'Special warnings and precautions for use', 5.1 'Pharmacodynamic properties' and 5.2 'Pharmacokinetic properties'). For patients who can swallow tablets, the dose should be individualised according to patient profile and blood pressure response. The recommended initial dose is 2.5mg in patients 20 to <50kg and 5mg in patients ≥ 50kg. Enalapril maleate tablets are given once daily. The dosage should be adjusted according to the needs of the patient to a maximum of 20mg daily in patients 20 to <50kg and 40mg in patients ≥ 50kg. (See 4.4 'Special warnings and precautions for use'.)

Enalapril maleate tablets is not recommended in neonates and in paediatric patients with glomerular filtration rate <30ml/min/1.73m², as no data are available.

4.3 Contraindications

Second and third trimesters of pregnancy (see sections 4.4 and 4.6).

Hypersensitivity to the product or any of its components, and in patients with a history of angionerotic oedema relating to previous treatment with an ACE inhibitor.

Hereditary or idiopathic angioedema.

4.4. Special warning and precautions for use

Symptomatic hypotension: Symptomatic hypotension has been seen only rarely in uncomplicated hypertensive patients. In hypertensive patients receiving enalapril, 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. 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. (See Dosage and administration for management of these patients.). Similar considerations may apply to patients with ischemic heart or cerebrovascular disease in whom an excessive fall in blood pressure could result in a myocardial infarction or cerebrovascular accident.

If hypotension develops, the patients should be placed in 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 systematic blood pressure may occur with enalapril. 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 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.

Impaired renal function:

In cases of renal impairment (creatinine clearance <80 ml/min) the initial enalapril dosage should be adjusted according to the patient's creatinine clearance (see section 4.2) 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 and has been mainly in patients with severe heart failure or underlying renal disease, including renal artery stenosis. If recognized promptly and treated appropriately, renal failure when associated with therapy with enalapril is usually reversible.

Some hypertensive patients, with no apparent pre-existing renal disease have developed increases in blood urea and creatinine when enalapril has been given concurrently with a diuretic. Dosage reduction of enalapril and/or discontinuation of diuretic may be required. This situation should raise the possibility of underlying renal artery stenosis (see section 4.4 'Renovascular hypertension').

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 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. This may occur at any time during treatment. In such cases, enalapril should be discontinued immediately and appropriate monitoring should be instituted to ensure complete resolution of symptoms prior to dismissing the patients.

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 (see also 'Contraindications').

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.

Haemodialysis patients: A high incidence of 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.

Anaphylactoid reaction 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.

Hypoglycaemia: Diabetic patients treated with oral antidiabetic agents or insulin starting an ACE inhibitor should be told to closely monitor for hypoglycaemia, especially during the first month of combined use. (See 4.5 'Interaction with other medicinal products and other forms of interaction', Antidiabetics.)

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 blocks angiotensin-II formation secondary to compensatory rennin release. This may lead to hypotension, which 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 cardiac 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. (See 4.5 'Interaction with other medicinal products and other forms of interaction'.)

Lithium: The combination of lithium and enalapril is generally not recommended (see 4.5 'Interaction with other medicinal products and other forms of interaction').

Lactose: Enalapril tablets contain lactose and therefore should not be used by patients with rare hereditary problems of galactose intolerance, the Lapp lactase deficiency or glucose-galactose malabsorption.

Paediatric use:

There is limited efficacy and safety experience in hypertensive children >6 years old, but no experience in other indications. Limited pharmacokinetic data is available in children above 2 months of age. (Also see section 4.2, 5.1 and 5.2). Enalapril is not recommended in other indications than hypertension.

Enalapril is not recommended in neonates and in paediatric patients with glomerular filtration rate <30ml/min/1.73m², as no data is available.(see section 4.2)

Pregnancy and Lactation:

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 (see sections 4.3 and 4.6).

Use of Enalapril is not recommended during breast feeding (see sections 4.6 and 5.2)

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.

4.5. Interaction with other medicinal products and other forms of interaction

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 (see section 4.4).

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 (see section 4.4). 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 hypertensive 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 (see section 4.4).

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 (see also section 4.4).

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

Chronic administration of NSAIDs may reduce the antihypertensive effect of an ACE inhibitor.

NSAIDs (including COX-2 inhibitors) and 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). 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.

Sympathomimetics: may reduce the antihypertensive effects of ACE Inhibitors

Antidiabetic drugs:

Epidemiological studies have suggested that concomitant administration of ACE inhibitors and antidiabetic medicine (insulin, oral hypoglycaemia 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 (See sections 4.4 and 4.8).

Allopurinol, Cytostatic or immunosuppressive agents, systemic corticosteroids and procainamide: concomitant administration with ACE inhibitors may lead to an increased risk for leucopenia.

Antacids: induce decreased bioavailability of ACE inhibitors.

Alcohol: enhances the hypotensive effect with ACE inhibitors.

Ciclosporin: increases the risk of hyperkalaemia with ACE inhibitors.

Concomitant use with levodopa, moxislyte, baclofen, tizanidine, nitrates or prostaglandins may enhance the hypotensive effect of enalapril.

Antagonism of hypotensive effect and increased risk of hyperkalaemia when given with Epoetin.

Drospirenone: Risk of hyperkalaemia when given with drospirenone.

Oestrogens: Hypotensive effect antagonised by oestrogens.

Acetyl salicylic acid, thrombolytics and β - blockers:

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

4.6 Pregnancy and lactation

Pregnancy:

The use of ACE inhibitors is not recommended during the first trimester of pregnancy (see section 4.4). The use of ACE inhibitors is contraindicated during the second and third trimesters of pregnancy (see sections 4.3 and 4.4).
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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) (See section 5.3.). 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 (see sections 4.3 and 4.4).

Lactation: Limited pharmacokinetic data demonstrate very low concentrations in breast milk (see section 5.2). Although these concentrations seem to be clinically irrelevant, the use of Enalapril Maleate Tablets 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 Maleate Tablets 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.

4.7 Effects on ability to drive and use machines

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

4.8 Undesirable effects

Undesirable effects reported for enalapril include:

[Very common ($\geq 1/10$); common ($\geq 1/100$, $< 1/10$); uncommon ($\geq 1/1,000$, $< 1/100$); rare ($\geq 1/10,000$, $< 1/1,000$); very rare ($< 1/10,000$), not known (cannot be estimated from the available data) including isolated reports.]

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 (see 4.4 'Special warnings and special precautions for use,' Diabetic patients).

Nervous system and psychiatric disorders:

Common: headache, depression.

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

Rare: dream abnormality, sleep disorders.

Eye disorders:

Very common: blurred vision.

Cardiac and vascular disorders:

Very common: dizziness.

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 (see 4.4).

Rare: Raynaud's phenomenon.

Respiratory, thoracic and mediastinal 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, taste alteration.

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 (see 4.4 'Special warnings and special precautions for use').

Uncommon: diaphoresis, pruritus, urticaria, alopecia.

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

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.

Renal and urinary disorders:

Uncommon: renal dysfunction, renal failure, proteinuria.

Rare: oliguria.

Reproductive system and breast disorders:

Uncommon: impotence.

Rare: gynaecomastia.

General disorders and administration site conditions:

Very common: asthenia.

Common: fatigue.

Uncommon: muscle cramps, flushing, tinnitus, malaise, fever.

Investigations:

Common: hyperkalaemia, increases in serum creatinine.

Uncommon: increases in blood urea, hyponatraemia.

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

4.9 Overdose

Symptoms associated with overdosage of ACE inhibitors may include circulatory shock, electrolyte disturbances, renal failure, hyperventilation, tachycardia, palpitations, bradycardia, dizziness, anxiety and cough.

Limited data are available for over dosage in humans. The most prominent features of overdose reported to data are marked hypotension, beginning some six hours after ingestion of tablets, concomitant with blockade of the renin-angiotensin system, and stupor. Serum enalaprilat levels 100 times and 200 times higher than usually seen after therapeutic doses have been reported after ingestion of 300mg and 440mg of enalapril, respectively.

The recommended treatment of overdosage is intravenous infusion of normal saline solution. If ingestion is recent, induce emesis. Enalapril can be removed from the general circulation by haemodialysis.

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.

Pacemaker therapy is indicated for therapy-resistant bradycardia. Vital signs, serum electrolytes and creatinine concentrations should be monitored continuously.

5 PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic Group: Angiotensin converting enzyme inhibitors, ATC Code: CO9A A02

'Enalaprilat' (enalapril maleate) is 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 catalyzes the conversion of angiotensin I to the pressor substance angiotensin II. After absorption, enalapril is hydrolyzed to enalaprilat, which inhibits ACE. Inhibition of ACE results in decreased plasma angiotensin II, which leads to increased plasma renin activity (due to removal of negative feedback of renin release), and decreased aldosterone secretion.

ACE is identical to kininase II. Thus 'Enalapril' may also block the degradation of bradykinin, a potent vasodepressor peptide. However, the role that this plays in the therapeutic effects of 'Enalapril' remains to be elucidated.

While the mechanism through which 'Enalapril' lowers blood pressure is believed to be primarily suppression of the renin-angiotensin-aldosterone system, 'Enalapril' is antihypertensive even in patients with low-renin hypertension.

Administration of 'Enalapril' 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' 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' 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 pre-treatment 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 thiazide-type diuretics, the blood pressure-lowering effects of 'Enalapril' are at least additive. 'Enalapril' 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' 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.

A multicentre, randomised, double-blind, placebo-controlled trial (SOLVD Prevention trial) examined a population with asymptomatic left ventricular dysfunction (LVEF<35%). 4228 patients were randomised to receive either placebo (n=2117) or enalapril (n=2111). In the placebo group, 818 patients had heart failure or died (38.6%) as compared with 630 in the enalapril group

(29.8%) (risk reduction: 29%; 95% CI; 21 - 36%; p<0.001). 518 patients in the placebo group (24.5%) and 434 in the enalapril group (20.6%) died or were hospitalised for new or worsening heart failure (risk reduction 20%; 95% CI; 9 - 30%; p<0.001).

A multicentre, randomised, double-blind, placebo-controlled trial (SOLVD Treatment trial) examined a population with symptomatic congestive heart failure due to systolic dysfunction (ejection fraction <35%). 2569 patients receiving conventional treatment for heart failure were randomly assigned to receive either placebo (n=1284) or enalapril (n=1285). There were 510 deaths in the placebo group (39.7%) as compared with 452 in the enalapril group (35.2%) (reduction in risk, 16%; 95% CI, 5 - 26%; p=0.0036). There were 461 cardiovascular deaths in the placebo group as compared with 399 in the enalapril group (risk reduction 18%, 95% CI, 6 - 28%, p<0.002), mainly due to a decrease of deaths due to progressive heart failure (251 in the placebo group vs 209 in the enalapril group, risk reduction 22%, 95% CI, 6 - 35%). Fewer patients died or were hospitalised for worsening heart failure (736 in the placebo group and 613 in the enalapril group; risk reduction, 26%; 95% CI, 18 - 34%; p<0.0001). Overall in SOLVD study, in patients with left ventricular dysfunction, 'Enalapril' reduced the risk of myocardial infarction by 23% (95% CI, 11 - 34%; p<0.001) and reduced the risk of hospitalisation for unstable angina pectoris by 20% (95% CI, 9 - 29%; p<0.001).

There is limited experience of the use in hypertensive paediatric patients >6 years. In a clinical study involving 110 hypertensive paediatric patients 6 to 16 years of age with a body weight ≥ 20 kg and a glomerular filtration rate >30 ml/min/1.73m², patients who weighed <50kg received either 0.625, 2.5 or 20mg of enalapril daily and patients who weighed ≥ 50 kg received either 1.25, 5 or 40mg of enalapril daily. Enalapril administration once daily lowered trough blood pressure in a dose-dependent manner. The dose-dependent antihypertensive efficacy of enalapril was consistent across all subgroups (age, Tanner stage, gender, race). However, the lowest doses studied, 0.625mg and 1.25mg, corresponding to an average of 0.02mg/kg once daily, did not appear to offer consistent antihypertensive efficacy. The maximum dose studied was 0.58mg/kg (up to 40mg) once daily. The adverse experience profile for paediatric patients is not different from that seen in adult patients.

5.2 Pharmacokinetic properties

Absorption

Oral enalapril is rapidly absorbed, with peak serum concentrations of enalapril occurring within one hour. Based on urinary recovery, the extent of absorption of enalapril from oral enalapril tablet is approximately 60%. The absorption of oral 'Enalaprilat' is not influenced by the presence of food in the gastrointestinal tract.

Following absorption, oral enalapril is rapidly and extensively hydrolysed to enalaprilat, a potent angiotensin converting enzyme inhibitor. Peak serum concentrations of enalaprilat occur about 4 hours after an oral dose of enalapril tablet. The effective half-life for accumulation of enalaprilat following multiple doses of oral enalapril is 11 hours. In subjects with normal renal

function, steady-state serum concentrations of enalaprilat were reached after 4 days of treatment.

Distribution

Over the range of concentrations which are therapeutically relevant, enalaprilat binding to human plasma proteins does not exceed 60%.

Biotransformation

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

Elimination

Excretion of enalaprilat is primarily renal. The principal components in urine are enalaprilat, 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 enalaprilat was approximately two-fold higher than in patients with normal renal function after administration of 5mg once daily. In severe renal impairment (creatinine clearance \leq 30ml/min), AUC was increased approximately 8-fold. The effective half-life of enalaprilat following multiple doses of enalapril maleate is prolonged at this level of renal insufficiency and time to steady state is delayed. (See section 4.2.) Enalaprilat 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 0.14mg/kg enalapril maleate. There were no major differences in the pharmacokinetics of enalaprilat 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 enalaprilat was 14 hours.

Lactation: After a single 20mg oral dose in five postpartum women, the average peak enalapril milk level was 1.7 μ g/L (range 0.54 to 5.9 μ g/L) at 4 to 6 hours after the dose. The average peak enalaprilat level was 1.7 μ g/L (range 1.2 to 2.3 μ 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 10mg daily for 11 months had peak enalapril milk levels of 2 μ g/L 4 hours after a dose and peak enalaprilat levels of 0.75 μ 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 μ g/L and 0.63 μ g/L of milk respectively. Enalaprilat milk levels were undetectable (<0.2 μ g/L) 4 hours after a single dose of enalapril 5mg in one mother and 10mg in two mothers; enalapril levels were not determined.

5.3 Preclinical safety data

Preclinical data reveal no special hazard for humans based on conventional studies of safety pharmacology, repeated dose toxicity, genotoxicity and carcinogenic potential. Reproductive toxicity studies suggest that enalapril does not have serious adverse effects on fertility and reproductive performance in rats, and it is not teratogenic. It crosses the placenta and has been shown to be foetotoxic in rabbits during middle and late pregnancy.

6 PHARMACEUTICAL PARTICULARS

6.1 List of excipients

The tablets contain: croscarmellose sodium, lactose monohydrate, magnesium stearate, pregelatinised maize starch, sodium hydrogen carbonate and iron oxides (E172).

6.2 Incompatibilities

None known

6.3 Shelf life

24 months

6.4 Special precautions for storage

Do not store above 25°C

6.5 Nature and contents of container

PP container (Securitainer) with desiccant

Al/Al blisters in cardboard outer container

Pack sizes: 28 tablets (blister), 50 tablets (securitainer)

6.6 Special precautions for disposal

None

7 MARKETING AUTHORISATION HOLDER

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United Kingdom

8 MARKETING AUTHORISATION NUMBER(S)

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