

EPLINICE-25

(Eplerenone Tablets 25 mg)

COMPOSITION

Each film coated tablet contains :

Eplerenone I.P. 25 mg
Excipients q.s.

Colours : Ferric Oxide USP-NF Red , Ferric Oxide USP-NF Yellow & Titanium Dioxide I.P.

DESCRIPTION

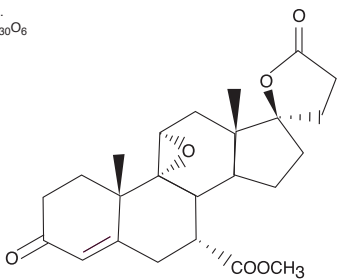
Eplerenone, a blocker of aldosterone binding at the mineralocorticoid receptor. Eplerenone is an odorless, white to off-white crystalline powder. It is very slightly soluble in water, with its solubility essentially pH independent. The octanol/water partition coefficient of eplerenone is approximately 7.1 at pH 7.0.

Chemical Name: Pregn-4-ene-7,21-dicarboxylic acid, 9,11-epoxy-17-hydroxy-3-oxo-, γ -lactone, methyl ester, (7 α ,11 α ,17 α)-

Molecular Weight: 414.50.

Molecular Formula: C₂₄H₃₀O₆

Structural formula



PHARMACODYNAMIC AND PHARMACOKINETIC PROPERTIES

Mechanism of Action

Eplerenone binds to the mineralocorticoid receptor and blocks the binding of aldosterone, a component of the renin-angiotensin-aldosterone-system (RAAS). Aldosterone synthesis, which occurs primarily in the adrenal gland, is modulated by multiple factors, including angiotensin II and non-RAAS mediators such as adrenocorticotropic hormone (ACTH) and potassium. Aldosterone binds to mineralocorticoid receptors in both epithelial (e.g., kidney) and non-epithelial (e.g., heart, blood vessels, and brain) tissues and increases blood pressure through induction of sodium reabsorption and possibly other mechanisms.

Eplerenone has been shown to produce sustained increases in plasma renin and serum aldosterone, consistent with inhibition of the negative regulatory feedback of aldosterone on renin secretion. The resulting increased plasma renin activity and aldosterone circulating levels do not overcome the effects of eplerenone.

Eplerenone selectively binds to recombinant human mineralocorticoid receptors relative to its binding to recombinant human glucocorticoid, progesterone and androgen receptors.

Pharmacokinetics

Peak plasma concentrations of eplerenone are reached about 1.5 hours after an oral dose; they are dose proportional for doses of 25 to 100 mg, and less than proportional above 100 mg. Protein binding, primarily to α 1-acid glycoprotein, is about 50%. Eplerenone metabolism is mainly mediated by the cytochrome P450 isoenzyme CYP3A4; less than 5% of a dose is excreted unchanged. About 32% of a dose is excreted in the faeces, and the remainder in the urine. The elimination half-life is about 4 to 6 hours. Eplerenone is not removed by dialysis.

Pharmacokinetics in special populations

Age, Gender, and Race: The pharmacokinetics of eplerenone at a dose of 100 mg once daily have been investigated in the elderly (≥ 65 years), in males and females, and in blacks. The pharmacokinetics of eplerenone did not differ significantly between males and females. At steady state, elderly subjects had increases in C_{max} (22%) and AUC (45%) compared with younger subjects (18 to 45 years). At steady state, C_{max} was 19% lower and AUC was 26% lower in blacks.

Renal Insufficiency: The pharmacokinetics of eplerenone was evaluated in patients with varying degrees of renal insufficiency and in patients undergoing hemodialysis. Compared with control subjects, steady-state AUC and C_{max} were increased by 38% and 24%, respectively, in patients with severe renal impairment and were decreased by 26% and 3%, respectively, in patients undergoing hemodialysis. No correlation was observed between plasma clearance of eplerenone and creatinine clearance. Eplerenone is not removed by hemodialysis.

Hepatic Insufficiency: The pharmacokinetics of eplerenone 400 mg have been investigated in patients with moderate (Child-Pugh Class B) hepatic impairment and compared with normal subjects. Steady-state C_{max} and AUC of eplerenone were increased by 3.6% and 42%, respectively.

Heart Failure: The pharmacokinetics of eplerenone 50 mg were evaluated in 8 patients with heart failure (NYHA classification II-IV) and 8 matched (gender, age, weight) healthy controls. Compared with the controls, steady state AUC and C_{max} in patients with stable heart failure were 38% and 30% higher, respectively.

INDICATIONS

For the treatment of mild to moderate hypertension in adults.

Hypertension

The recommended starting dose of eplerenone is 50 mg administered once daily. The full therapeutic effect of eplerenone is apparent within 4 weeks. For patients with an inadequate blood pressure response to 50 mg once daily the dosage of eplerenone should be increased to 50 mg twice daily. Higher dosages of eplerenone are not recommended because they have no greater effect on blood pressure than 100 mg and are associated with an increased risk of hyperkalemia.

Recommended Monitoring

Serum potassium should be measured before initiating eplerenone therapy, within the first week and at one month after the start of treatment or dose adjustment. Serum potassium should be assessed periodically thereafter. Patient characteristics and serum potassium levels may indicate that additional monitoring is appropriate.

In all patients taking eplerenone who start taking a moderate CYP3A4 inhibitor, check serum potassium and serum creatinine in 3 to 7 days.

Dose Modifications for Specific Populations

For hypertensive patients receiving moderate CYP3A4 inhibitors (e.g., erythromycin, saquinavir, verapamil and fluconazole), the starting dose of eplerenone should be reduced to 25 mg once daily.

No adjustment of the starting dose is recommended for the elderly or for patients with mild-to-moderate hepatic impairment.

USE IN SPECIFIC POPULATIONS

Pregnancy

Pregnancy Category B

There are no adequate and well-controlled studies in pregnant women.

Eplerenone should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Teratogenic Effects

Embryo-fetal development studies were conducted with doses up to 1000 mg/kg/day in rats and 300 mg/kg/day in rabbits (exposures up to 32 and 31 times the human AUC for the 100 mg/day therapeutic dose, respectively). No teratogenic effects were seen in rats or rabbits, although decreased body weight in maternal rabbits and increased rabbit fetal resorptions and post-implantation loss were observed at the highest administered dosage. Because animal reproduction studies are not always predictive of human response, Eplerenone should be used during pregnancy only if clearly needed.

Nursing Mothers

The concentration of eplerenone in human breast milk after oral administration is unknown. However, preclinical data show that eplerenone and/or metabolites are present in rat breast milk (0.85:1 [milk:plasma] AUC ratio) obtained after a single oral dose. Peak concentrations in plasma and milk were obtained from 0.5 to 1 hour after dosing. Rat pups exposed by this route developed normally. Because many drugs are excreted in human milk and because of the unknown potential for adverse effects on the nursing infant, a decision should be made whether to discontinue nursing or discontinue the drug, taking into account the importance of the drug to the mother.

Pediatric Use

There are no data to recommend the use of eplerenone in the pediatric population, and therefore, use in this age group is not recommended.

Geriatric Use

Congestive Heart Failure Post-Myocardial Infarction

Patients greater than 75 years did not appear to benefit from the use of eplerenone. No differences in overall incidence of adverse events were observed between elderly and younger patients. However, due to age-related decreases in creatinine clearance, the incidence of laboratory-documented hyperkalemia was increased in patients 65 and older.

Hypertension

No overall differences in safety or effectiveness were observed between elderly subjects and younger subjects.

CONTRAINDICATIONS

For All Patients

Eplerenone is contraindicated in all patients with:

- serum potassium >5.5 mEq/L at initiation,
- creatinine clearance \leq 30 mL/min, or
- concomitant administration of strong CYP3A4 inhibitors (e.g., ketoconazole, itraconazole, nefazodone, troleanomycin, clarithromycin, ritonavir, and nelfinavir).

For Patients Treated for Hypertension

Eplerenone tablets is contraindicated for the treatment of hypertension in patients with:

- type 2 diabetes with microalbuminuria,
- serum creatinine >2.0 mg/dL in males or >1.8 mg/dL in females,
- creatinine clearance <50 mL/min, or
- concomitant administration of potassium supplements or potassium sparing diuretics (e.g., amiloride, spironolactone, or triamterene).

WARNINGS AND PRECAUTIONS

Hyperkalemia

Minimize the risk of hyperkalemia with proper patient selection and monitoring, and avoidance of certain concomitant. Monitor patients for the development of hyperkalemia until the effect of Eplerenone is established. Patients who develop hyperkalemia (>5.5 mEq/L) may continue Eplerenone therapy with proper dose adjustment. Dose reduction decreases potassium levels.

The rates of hyperkalemia increase with declining renal function. Patients with hypertension who have serum creatinine levels >2.0 mg/dL (males) or >1.8 mg/dL (females) or creatinine clearance \leq 50 mL/min should not be treated with Eplerenone. Patients with CHF post-MI who have serum creatinine levels >2.0 mg/dL (males) or >1.8 mg/dL (females) or creatinine clearance \leq 50 mL/min should be treated with eplerenone with caution.

Diabetic patients with CHF post-MI should also be treated with caution, especially those with proteinuria. The subset of patients in the EPHEsus study with both diabetes and proteinuria on the baseline urinalysis had increased rates of hyperkalemia compared to patients with either diabetes or proteinuria.

Impaired Hepatic Function

Mild-to-moderate hepatic impairment did not increase the incidence of hyperkalemia. In 16 subjects with mild-to-moderate hepatic impairment who received 400 mg of eplerenone, no elevations of serum potassium above 5.5 mEq/L were observed. The mean increase in serum potassium was 0.12 mEq/L in patients with hepatic impairment and 0.13 mEq/L in normal controls. The use of Eplerenone in patients with severe hepatic impairment has not been evaluated.

Impaired Renal Function

Patients with decreased renal function are at increased risk of hyperkalemia.

DRUG INTERACTIONS

Pharmacodynamic interactions

Potassium-sparing diuretics and potassium supplements: Due to increased risk of hyperkalemia, eplerenone should not be administered to patients receiving potassium-sparing diuretics and potassium supplements. Potassium-sparing diuretics may potentiate the effect of anti-hypertensive agents and other diuretics.

Lithium: Drug interaction studies of eplerenone have not been conducted with lithium. However, lithium toxicity has been reported in patients receiving lithium concomitantly with diuretics and ACE inhibitors. Co-administration of eplerenone and lithium should be avoided. If this combination appears necessary, lithium plasma concentrations should be monitored.

Cyclosporin, tacrolimus: Cyclosporin and tacrolimus may lead to impaired renal function and increase the risk of hyperkalemia. The concomitant use of eplerenone and cyclosporin or tacrolimus should be avoided. If needed, close monitoring of serum potassium and renal function are recommended when cyclosporin and tacrolimus are to be administered during treatment with eplerenone.

Non-steroidal anti-inflammatory drugs (NSAIDs): Treatment with NSAIDs may lead to acute renal failure by acting directly on glomerular filtration, especially in at-risk patients (elderly and/or dehydrated patients). Patients receiving eplerenone and NSAIDs should be adequately hydrated and be monitored for renal function prior to initiating treatment.

Trimethoprim: The concomitant administration of trimethoprim with eplerenone increases the risk of hyperkalemia. Monitoring of serum potassium and renal function should be made, particularly in patients with renal impairment and in the elderly.

ACE inhibitors, angiotensin-II receptors antagonists (AIIA): Eplerenone and ACE inhibitors or angiotensin-II receptors antagonists should be co-administered with caution. Combining eplerenone with these drugs may increase risk of hyperkalemia in patients at risk for impaired renal function, e.g. the elderly. A close monitoring of serum potassium and renal function is recommended.

Alpha 1 blockers (e.g. prazosin, alfuzosine): When alpha-1-blockers are combined with eplerenone, there is the potential for increased hypotensive effect and/or postural hypotension. Clinical monitoring for postural hypotension is recommended during alpha-1-blocker co-administration.

Tricyclic anti-depressants, neuroleptics, amifostine, baclofene : Co-administration of these drugs with eplerenone may potentially increase antihypertensive effects and risk of postural hypotension.

Glucocorticoides, tetracosactide: Co-administration of these drugs with eplerenone may potentially decrease antihypertensive effects (sodium and fluid retention).

Pharmacokinetic interactions

In vitro studies indicate that eplerenone is not an inhibitor of CYP1A2, CYP2C19, CYP2C9, CYP2D6 or CYP3A4 isozymes. Eplerenone is not a substrate or an inhibitor of P-Glycoprotein.

Digoxin: Systemic exposure (AUC) to digoxin increases by 16% (90% CI: 4% - 30%) when co-administered with eplerenone. Caution is warranted when digoxin is dosed near the upper limit of therapeutic range.

Warfarin: No clinically significant pharmacokinetic interactions have been observed with warfarin. Caution is warranted when warfarin is dosed near the upper limit of therapeutic range.

CYP3A4 substrates: Results of pharmacokinetic studies with CYP3A4 probe-substrates, i.e. midazolam and cisapride, showed no significant pharmacokinetic interactions when these drugs were co-administered with eplerenone.

- CYP3A4 inhibitors:

Strong CYP3A4 inhibitors: Significant pharmacokinetic interactions may occur when eplerenone is co-administered with drugs that inhibit the CYP3A4 enzyme. A strong inhibitor of CYP3A4 (ketoconazole 200 mg BID) led to a 441% increase in AUC of eplerenone. The concomitant use of eplerenone with strong CYP3A4 inhibitors such as ketoconazole, itraconazole, ritonavir, nelfinavir, clarithromycin, telithromycin and nefazodone, is contra-indicated.

Mild to moderate CYP3A4 inhibitors: Co-administration with erythromycin, saquinavir, amiodarone, diltiazem, verapamil, and fluconazole have led to significant pharmacokinetic interactions with rank order increases in AUC ranging from 98% to 187%. Eplerenone dosing should therefore not exceed 25 mg when mild to moderate inhibitors of CYP3A4 are co-administered with eplerenone.

CYP3A4 inducers: Co-administration of St John's Wort (a strong CYP3A4 inducer) with eplerenone caused a 30% decrease in eplerenone AUC. A more pronounced decrease in eplerenone AUC may occur with stronger CYP3A4 inducers such as rifampicin. Due to the risk of decreased eplerenone efficacy, the concomitant use of strong CYP3A4 inducers (rifampicin, carbamazepine, phenytoin, phenobarbital, St John's Wort) with eplerenone is not recommended.

Antacids: Based on the results of a pharmacokinetic clinical study, no significant interaction is expected when antacids are coadministered with eplerenone..

ADVERSE EFFECTS

Clinical Trials

Congestive Heart Failure Post-Myocardial Infarction

In EPHEsus, safety was evaluated in 3,307 patients treated with eplerenone and 3,301 placebo-treated patients. The overall incidence of adverse events reported with eplerenone (78.9%) was similar to placebo (79.5%). Adverse events occurred at a similar rate regardless of age, gender or race. Patients discontinued treatment due to an adverse event at similar rates in either treatment group (4.4% eplerenone vs. 4.3% placebo), with the most common reasons for discontinuation being hyperkalemia, myocardial infarction and abnormal renal function.

Adverse reactions that occurred more frequently in patients treated with eplerenone than placebo were hyperkalemia (3.4% vs. 2.0%) and increased creatinine (2.4% vs. 1.5%). Discontinuations due to hyperkalemia or abnormal renal function were less than 1.0% in both groups. Hypokalemia occurred less frequently in patients treated with eplerenone (0.6% vs. 1.6%).

The rates of sex hormone-related adverse events are shown in Table 1.

	Rates in Males			Rates in Females
	Gynecomastia	Mastodynia	Either	Abnormal Vaginal Bleeding
Eplerenone	0.4 %	0.1%	0.5%	0.4%
Placebo	0.5 %	0.1%	0.6%	0.4%

Hypertension

Eplerenone has been evaluated for safety in 3,091 patients treated for hypertension. A total of 690 patients were treated for over 6 months and 106 patients were treated for over 1 year.

In placebo-controlled studies, the overall rates of adverse events were 47% with eplerenone and 45% with placebo. Adverse events occurred at a similar rate regardless of age, gender or race. Therapy was discontinued due to an adverse event in 3% of patients treated with eplerenone and 3% of patients given placebo. The most common reasons for discontinuation of eplerenone were headache, dizziness, angina pectoris/myocardial infarction and increased GGT. The adverse events that were reported at a rate of at least 1% of patients and at a higher rate in patients treated with eplerenone in daily doses of 25 mg to 400 mg versus placebo are shown in Table 2.

Table 2: Rates (%) of Adverse Events Occurring in Placebo-Controlled Hypertension Studies in \geq 1% of Patients Treated with Eplerenone (25 mg to 400 mg) and at a More Frequent Rate than in Placebo-Treated Patients

	Eplerenone (n=945)	Placebo (n=372)
Metabolic	1	0
Hypercholesterolemia	1	0
Hypertriglyceridemia		
Digestive	2	1
Diarrhea	1	0
Abdominal pain		
Urinary	1	0
Albuminuria		
Respiratory	2	1
Coughing		
Central/Peripheral Nervous System	3	2
Dizziness		
Body as a Whole		
Fatigue	2	1
Influenza-like symptoms	2	2

Note: Adverse events that are too general to be informative or are very common in the treated population are excluded.

Gynecomastia and abnormal vaginal bleeding were reported with eplerenone but not with placebo. The rates of these sex hormone-related adverse events are shown in Table 3. The rates increased slightly with increasing duration of therapy. In females, abnormal vaginal bleeding was also reported in 0.8% of patients on antihypertensive medications (other than spironolactone) in active control arms of the studies with eplerenone.

Table 3: Rates of Sex Hormone-Related Adverse Events with Eplerenone in Hypertension Clinical Studies

	Rates in Males			Rates in Females
	Gynecomastia	Mastodynia	Either	Abnormal Vaginal Bleeding
All controlled studies	0.5 %	0.8 %	1.0 %	0.6 %
Controlled studies lasting \geq 6 months	0.7 %	1.3 %	1.6 %	0.8 %
Open label, long-term study	1.0 %	0.3 %	1.0 %	2.1 %

Clinical Laboratory Test Findings

Congestive Heart Failure Post-Myocardial Infarction

Creatinine: Increases of more than 0.5 mg/dL were reported for 6.5% of patients administered eplerenone and for 4.9% of placebo-treated patients.

Potassium: In EPHEsus, the frequency of patients with changes in potassium (<3.5 mEq/L or >5.5 mEq/L or \geq 6.0 mEq/L) receiving eplerenone compared with placebo are displayed in Table 4.

Table 4: Hypokalemia (<3.5 mEq/L) or Hyperkalemia (>5.5 or \geq 6.0 mEq/L) in EPHEsus

Potassium (mEq/L)	Eplerenone (N=3,251) n (%)	Placebo (N=3,237) n (%)
<3.5	273 (8.4)	424 (13.1)
>5.5	508 (15.6)	363 (11.2)
\geq 6.0	180 (5.5)	126 (3.9)

Table 5 shows the rates of hyperkalemia in EPHEsus as assessed by baseline renal function (creatinine clearance).

Table 5: Rates of Hyperkalemia (>5.5 mEq/L) in EPHEsus by Baseline Creatinine Clearance*

Baseline Creatinine Clearance	* Estimated using the Cockcroft-Gault formula.	
	Eplerenone (N=508) n (%)	Placebo (N=363) n (%)
\leq 30 mL/min	160 (32)	82 (23)
31–50 mL/min	122 (24)	46 (13)
51–70 mL/min	86 (17)	48 (13)
>70 mL/min	56 (11)	32 (9)

Table 6 shows the rates of hyperkalemia in EPHEsus as assessed by two baseline characteristics: presence/absence of proteinuria from baseline urinalysis and presence/absence of diabetes.

Table 6: Rates of Hyperkalemia (>5.5 mEq/L) in EPHEsus by Proteinuria and History of Diabetes*

	Eplerenone (N=508) n (%)	Placebo (N=363) n (%)
Proteinuria, no Diabetes	81 (16)	40 (11)
Diabetes, no Proteinuria	91 (18)	47 (13)
Proteinuria and Diabetes	132 (26)	58 (16)

Hypertension

Potassium: In placebo-controlled fixed-dose studies, the mean increases in serum potassium were dose-related and are shown in Table 7 along with the frequencies of values >5.5 mEq/L.

Table 7: Increases in Serum Potassium in the Placebo-Controlled, Fixed-Dose Hypertension Studies of Eplerenone

Daily Dosage	n	Mean Increase mEq/L	%> 5.5 mEq/L
Placebo	194	0	1
25	97	0.08	0
50	245	0.14	0
100	193	0.09	1
200	139	0.19	1
400	104	0.36	8.7

Patients with both type 2 diabetes and microalbuminuria are at increased risk of developing persistent hyperkalemia. In a study of such patients taking eplerenone 200 mg, the frequencies of maximum serum potassium levels >5.5 mEq/L were 33% with eplerenone given alone and 38% when eplerenone was given with enalapril.

Rates of hyperkalemia increased with decreasing renal function. In all studies, serum potassium elevations >5.5 mEq/L were observed in 10.4% of patients treated with eplerenone with baseline calculated creatinine clearance <70 mL/min, 5.6% of patients with baseline creatinine clearance of 70 mL/min to 100 mL/min and 2.6% of patients with baseline creatinine clearance of >100 mL/min.

Sodium: Serum sodium decreased in a dose-related manner. Mean decreases ranged from 0.7 mEq/L at 50 mg daily to 1.7 mEq/L at 400 mg daily. Decreases in sodium (<135 mEq/L) were reported for 2.3% of patients administered eplerenone and 0.6% of placebo-treated patients.

Triglycerides: Serum triglycerides increased in a dose-related manner. Mean increases ranged from 7.1 mg/dL at 50 mg daily to 26.6 mg/dL at 400 mg daily. Increases in triglycerides (above 252 mg/dL) were reported for 15% of patients administered eplerenone and 12% of placebo-treated patients.

Cholesterol: Serum cholesterol increased in a dose-related manner. Mean changes ranged from a decrease of 0.4 mg/dL at 50 mg daily to an increase of 11.6 mg/dL at 400 mg daily. Increases in serum cholesterol values greater than 200 mg/dL were reported for 0.3% of patients administered eplerenone and 0% of placebo-treated patients.

Liver Function Tests: Serum alanine aminotransferase (ALT) and gamma glutamyl transpeptidase (GGT) increased in a dose-related manner. Mean increases ranged from 0.8 U/L at 50 mg daily to 4.8 U/L at 400 mg daily for ALT and 3.1 U/L at 50 mg daily to 11.3 U/L at 400 mg daily for GGT. Increases in ALT levels greater than 120 U/L (3 times upper limit of normal) were reported for 15/2,259 patients administered eplerenone and 1/351 placebo-treated patients. Increases in ALT levels greater than 200 U/L (5 times upper limit of normal) were reported for 5/2,259 of patients administered eplerenone and 1/351 placebo-treated patients. Increases of ALT greater than 120 U/L and bilirubin greater than