AMILORIDE HYDROCHLORIDE TABLETS, USP

DESCRIPTION
Amiloride HCl, an antikaliuretic-diuretic agent, is a pyrazine-carbonyl-guanidine that is unrelated chemically to other known antikaliuretic or diuretic agents. It is the salt of a moderately strong base (pKa 8.7). It is designated chemically as 3,5-diamino-6-chloro-N-(diaminomethylene)pyrazinecarboxamide monohydrochloride, dihydrate and has a molecular weight of 302.12. Its empirical formula is $\text{C}_9\text{H}_8\text{Cl}\text{N}_2\text{O}_5\cdot\text{HCl}\cdot2\text{H}_2\text{O}$ and its structural formula is:

Each tablet for oral administration contains 5 mg of Amiloride HCl, calculated on the anhydrous basis. Each tablet contains the following inactive ingredients: corn starch, crospovidone, lactose, magnesium stearate, microcrystalline cellulose and povidone.

CLINICAL PHARMACOLOGY
Amiloride HCl is a potassium-conserving (antikaliuretic) drug that possesses weak (compared with thiazide diuretics) natriuretic, diuretic, and antihypertensive activity. These effects have been partially additive to the effects of thiazide diuretics in some clinical studies. When administered with a thiazide or loop diuretic, amiloride has been shown to decrease the enhanced urinary excretion of magnesium which occurs when a thiazide or loop diuretic is used alone. Amiloride has potassium-conserving activity in patients receiving kaliuretic-diuretic agents.

Amiloride HCl is not an aldosterone antagonist and its effects are seen even in the absence of aldosterone.

Amiloride exerts its potassium sparing effect through the inhibition of sodium reabsorption at the distal convoluted tubule, cortical collecting tubule and collecting duct; this decreases the net negative potential of the tubular lumen and reduces both potassium and hydrogen secretion and their subsequent excretion. This mechanism accounts in large part for the potassium sparing action of amiloride.

Amiloride usually begins to act within 2 hours after an oral dose. Its effect on electrolyte excretion reaches a peak between 6 and 10 hours and lasts about 24 hours. Peak plasma levels are obtained in 3 to 4 hours and the plasma half-life varies from 6 to 9 hours. Effects on electrolytes increase with single doses of amiloride HCl up to approximately 15 mg.

Amiloride HCl is not metabolized by the liver but is excreted unchanged by the kidneys. About 50 percent of a 20 mg dose of amiloride HCl is excreted in the urine and 40 percent in the stool within 72 hours. Amiloride has little effect on glomerular filtration rate or renal blood flow. Because amiloride HCl is not metabolized by the liver, drug accumulation is not anticipated in patients with hepatic dysfunction, but accumulation can occur if the hepatorenal syndrome develops.

INDICATIONS AND USAGE
Amiloride HCl tablets are indicated as adjunctive treatment with thiazide diuretics or other kaliuretic-diuretic agents in congestive heart failure or hypertension to:

a. help restore normal serum potassium levels in patients who develop hypokalemia on the kaliuretic diuretic.

b. prevent development of hypokalemia in patients who would be exposed to particular risk if hypokalemia were to develop, e.g., digitalized patients or patients with significant cardiac arrhythmias.

The use of potassium-conserving agents is often unnecessary in patients receiving diuretics for uncomplicated essential hypertension when such patients have a normal diet. Amiloride HCl tablets have little additive diuretic or antihypertensive effect when added to a thiazide diuretic.

Amiloride HCl tablets should rarely be used alone. It has weak (compared with thiazides) diuretic and antihypertensive effects. Used as single agents, potassium sparing diuretics, including amiloride HCl tablets, result in an increased risk of hyperkalemia (approximately 10% with amiloride). Amiloride HCl tablets should be used alone only when persistent hypokalemia has been documented and only with careful titration of the dose and close monitoring of serum electrolytes.

CONTRAINDICATIONS
Amiloride HCl tablets should not be used in the presence of elevated serum potassium levels (greater than 5.5 mEq per liter).

Antikaliuretic Therapy or Potassium Supplementation
Amiloride HCl tablets should not be given to patients receiving other potassium-conserving agents, such as spironolactone or triamterene. Amiloride HCl tablets should not be used alone only when persistent hypokalemia has been documented and only with careful titration of the dose and close monitoring of serum electrolytes.

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PRECAUTIONS
General
Electrolyte Imbalance and BUN Increases
Hypokalemia and hypochloremia may occur when amiloride HCl is used with other diuretics and increases in BUN levels have been reported. These increases usually have accompanied vigorous fluid elimination, especially when diuretic therapy was used in seriously ill patients, such as those who had hepatic cirrhosis with ascites and metabolic alkalosis, or those with resistant edema. Therefore, when amiloride HCl is given with other diuretics to such patients, careful monitoring of serum electrolytes and BUN levels is important. In patients with pre-existing severe liver disease, hepatic encephalopathy, manifested by tremors, confusion, and coma, and increased jaundice, have been reported in association with diuretics, including amiloride HCl.

Drug Interactions
When amiloride HCl is administered concomitantly with an angiotensin-converting enzyme inhibitor, an angiotensin II receptor antagonist, cyclosporine or tacrolimus, the risk of hyperkalemia may be increased. Therefore, concomitant use of these agents is indicated because of demonstrated hypokalemia, they should be used with caution and with frequent monitoring of serum potassium.

(See WARNINGS).

Lithium generally should not be given with diuretics because they reduce its renal clearance and add a high risk of lithium toxicity. Read circulars for lithium preparations before use of such concomitant therapy.

In some patients, the administration of a non-steroidal anti-inflammatory agent can reduce the diuretic, natriuretic, and antihypertensive effects of loop, potassium-sparing and thiazide diuretics. Therefore, when amiloride HCl and non-steroidal anti-inflammatory agents are used concomitantly, the patient should be observed closely to determine if the desired effect of the diuretic is obtained. Since indomethacin and...
potassium-sparing diuretics, including amiloride HCl, may each be associated with increased serum potassium levels, the potential effects on potassium kinetics and renal function should be considered when these agents are administered concurrently.

Carcinogenicity, Mutagenicity and Impairment of Fertility

There was no evidence of a tumorigenic effect when amiloride HCl was administered for 92 weeks to mice at doses up to 10 mg/kg/day (25 times the maximum daily human dose). Amiloride HCl has also been administered for 104 weeks to male and female rats at doses up to 6 and 8 mg/kg/day (15 and 20 times the maximum daily dose for humans, respectively) and showed no evidence of carcinogenicity.

Amiloride HCl was devoid of mutagenic activity in various strains of Salmonella typhimurium with or without a mammalian liver microsomal activation system (Ames test).

Pregnancy

Pregnancy Category B. Teratogenicity studies with amiloride HCl in rabbits and mice given 20 and 25 times the maximum human dose, respectively, revealed no evidence of harm to the fetus, although studies showed that the drug crossed the placenta in modest amounts. Reproduction studies in rats at 20 times the expected maximum daily dose for humans showed no evidence of impaired fertility. At approximately 5 or more times the expected maximum daily dose for humans, some toxicity was seen in adult rats and rabbits and a decrease in rat pup growth and survival occurred.

There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, this drug should be used during pregnancy only if clearly needed.

Nursing Mothers

Studies in rats have shown that amiloride is excreted in milk in concentrations higher than those found in blood, but it is not known whether amiloride is excreted in human milk. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants from amiloride HCl, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.

Pediatric Use

Safety and effectiveness in pediatric patients have not been established.

Geriatric Use

Clinical studies of amiloride HCl did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. Other reported clinical experience has not identified differences in responses between the elderly and younger patients. In general, dose selection for an elderly patient should be cautious, usually starting at the low end of the dosing range, reflecting the greater frequency of decreased hepatic, renal or cardiac function, and of concomitant disease or other drug therapy.

This drug is known to be substantially excreted by the kidney, and the risk of toxic reactions to this drug may be greater in patients with impaired renal function. Because elderly patients are more likely to have decreased renal function, care should be taken in dose selection, and it may be useful to monitor renal function. (See CONTRAINDICATIONS, Impaired Renal Function.)

ADVERSE REACTIONS

Amloride HCl is usually well tolerated and, except for hyperkalemia (serum potassium levels greater than 5.5 mEq liter - see WARNINGS), significant adverse effects have been reported infrequently. Minor adverse reactions were reported relatively frequently (about 20%) but the relationship of many of the reports to amiloride HCl is uncertain and the overall frequency was similar in hydrochlorothiazide treated groups. Nausea/ anorexia, abdominal pain, flatulence, and mild skin rash have been reported and probably are related to amiloride. Other adverse experiences that have been reported with amiloride are generally those known to be associated with diuresis, or with the underlying disease being treated.

The adverse reactions for amiloride HCl listed in the following table have been arranged into two groups: (1) incidence greater than one percent; and (2) incidence one percent or less. The incidence for group (1) was determined from clinical studies conducted in the United States (837 patients treated with amiloride HCl). The adverse effects listed in group (2) include reports from the same clinical studies and voluntary reports since marketing. The probability of a causal relationship exists between amiloride HCl and these adverse reactions, some of which have been reported only rarely.

<table>
<thead>
<tr>
<th>Incidence &gt; 1%</th>
<th>Incidence ≤ 1%</th>
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<tbody>
<tr>
<td><strong>Skin</strong></td>
<td></td>
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<tr>
<td>None</td>
<td>Skin rash</td>
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<tr>
<td></td>
<td>Itching</td>
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<td></td>
<td>Dryness of mouth</td>
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<td></td>
<td>Pruritus</td>
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<tr>
<td></td>
<td>Alopecia</td>
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<tr>
<td><strong>Musculoskeletal</strong></td>
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<tr>
<td>Muscle cramps</td>
<td>Joint pain</td>
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<td></td>
<td>Leg ache</td>
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<tr>
<td><strong>Nervous</strong></td>
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<tr>
<td>Dizziness</td>
<td>Paresthesia</td>
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<tr>
<td>Encephalopathy</td>
<td>Tremors</td>
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<tr>
<td></td>
<td>Vertigo</td>
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<tr>
<td><strong>Psychiatric</strong></td>
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<tr>
<td>None</td>
<td>Nervousness</td>
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<tr>
<td></td>
<td>Mental confusion</td>
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<tr>
<td></td>
<td>Insomnia</td>
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<td>Decreased libido</td>
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<td></td>
<td>Depression</td>
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<td></td>
<td>Somnolence</td>
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<tr>
<td><strong>Respiratory</strong></td>
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<tr>
<td>Cough</td>
<td>Shortness of Breath</td>
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<tr>
<td>Dyspnea</td>
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<td></td>
<td></td>
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<tr>
<td><strong>Special Senses</strong></td>
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<tr>
<td>None</td>
<td>Visual disturbances</td>
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<tr>
<td></td>
<td>Nasal congestion</td>
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<tr>
<td></td>
<td>Tinnitus</td>
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<tr>
<td></td>
<td>Increased intraocular pressure</td>
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<tr>
<td><strong>Urogenital</strong></td>
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<tr>
<td>Impotence</td>
<td>Polyuria</td>
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<tr>
<td></td>
<td>Dysturia</td>
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<tr>
<td></td>
<td>Urinary frequency</td>
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<tr>
<td></td>
<td>Bladder spasms</td>
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<tr>
<td></td>
<td>Gynecomastia</td>
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</tbody>
</table>

* Reactions occurring in 3% to 8% of patients treated with amiloride HCl. (Those reactions occurring in less than 3% of the patients are unmarked.)
** See WARNINGS.

Causal Relationship Unknown

Other reactions have been reported but occurred under circumstances where a causal relationship could not be established. However, in these rarely reported events, that possibility cannot be excluded. Therefore, these observations are listed to serve as alerting information to physicians.

Activation of probable pre-existing peptic ulcer

Aplastic anemia

Neutropenia

Abnormal liver function

OVERDOSAGE

No data are available in regard to overdosage in humans.

The oral LD₅₀ of amiloride HCl (calculated as the base) is 56 mg/kg in mice and 36 to 85 mg/kg in rats, depending on the strain.

It is not known whether the drug is dialyzable.

The most likely signs and symptoms to be expected with overdosage are dehydration and electrolyte imbalance. These can be treated by established procedures. Therapy with amiloride HCl should be discontinued and the patient observed closely. There is no specific antidote. Emesis should be induced or gastric lavage performed. Treatment is symptomatic and supportive. If hyperkalemia occurs, active measures should be taken to reduce the serum potassium levels.

DOSEAGE AND ADMINISTRATION

Amloride HCl tablets should be administered with food.

Amloride HCl tablets, one 5 mg tablet daily, should be added to the usual antihypertensive or diuretic dosage of a kaliuretic diuretic. The dosage may be increased to 10 mg per day, if necessary. More than two 5 mg tablets of amiloride HCl daily usually are not needed, and there is little controlled experience with such doses. If persistent hypokalemia is documented with 10 mg, the dose can be increased to 15 mg, then 20 mg, with careful monitoring of electrolytes.

In treating patients with congestive heart failure after an initial diuresis has been achieved, potassium loss may also decrease and the need for amiloride HCl tablets should be re-evaluated. Dosage adjustment may be necessary. Maintenance therapy may be on an intermittent basis.

If it is necessary to use amiloride HCl tablets alone (see INDICATIONS), the starting dosage should be one 5 mg tablet daily. This dosage may be increased to 10 mg per day, if necessary. More than two 5 mg tablets usually are not needed, and there is little controlled experience with such doses. If persistent hypokalemia is documented with 10 mg, the dose can be increased to 15 mg, then 20 mg, with careful monitoring of electrolytes.

HOW SUPPLIED

Each yellow round compressed tablet contains 5 mg of anhydrous Amiloride HCl and is debossed “∑” on one side and “5” on the other. They are available in bottles of 100’s (NDC #64980-151-01).

Store at 20°-25°C (68°-77°F) [see USP Controlled Room Temperature].

Dispense in a tight, light-resistant container as defined in the USP.

Manufactured for:
Rising Pharmaceuticals, Inc.
Allendale, NJ 07401

Manufactured by:
SigmaPharm Laboratories, LLC
Bensalem, PA 19020

OS0105-02 REV. 0209
CUSTOMER: SIGMAPHARM LABORATORIES LLC
DATE: 3/4/09  ITEM#: OS005-02 REV.0209
PRODUCT: AMILORIDE HYDROCHLORIDE TABLETS
FLAT: 13.125"H x 11.1875"W  FOLD: 1.3125" x 1.3125"
PLATE #: 90274146  COLORS: Black
PROOF #: 3  MacOp Initls: MC/MS/DK
SUPPLIER: Cortegra  Telephone: 973-808-8000

APPROVAL

☐ APPROVED AS IS
☐ NOT APPROVED - REPROOF IS REQUIRED
☐ APPROVED WITH EDIT(S) - NO REPROOF REQUIRED

Signed  Date

Signed  Date

[Signature]

Cortegra