

Data

In lactating rats administered radiolabeled tolvaptan, lacteal radioactivity concentrations reached the highest level at 8 hours after administration and then decreased gradually with time with a half-life of 27.3 hours. The level of activity in milk ranged from 1.5- to 15.8-fold times in maternal blood over a period of 72 hours post-dose. Increased perinatal death and decreased body weight of the offspring were observed during the lactation period and after weaning at approximately 11 times the exposure in CHF patients at the MRHD of 60 mg.

8.4 Pediatric Use

Safety and effectiveness of tolvaptan in pediatric patients have not been established.

8.5 Geriatric Use

Of the total number of hyponatremic subjects treated with tolvaptan in clinical studies, 42% were 65 years old and over, while 19% were 75 years old and over. No overall differences in safety or effectiveness were observed between these subjects and younger subjects, and other reported clinical experience has not identified differences in responses between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out. Increasing age has no effect on tolvaptan plasma concentrations.

8.6 Use in Patients with Hepatic Impairment

Moderate and severe hepatic impairment do not affect exposure to tolvaptan to a clinically relevant extent. Avoid use of tolvaptan in patients with underlying liver disease.

8.7 Use in Patients with Renal Impairment

No dose adjustment is necessary based on renal function. There are no clinical trial data in patients with CrCl <10 mL/min, and, because drug effects on serum sodium levels are likely lost at very low levels of renal function, use in patients with a CrCl <10 mL/min is not recommended. No benefit can be expected in patients who are anuric [See *Contraindications* (4) and *Clinical Pharmacology* (12.3)].

10. OVERDOSAGE

Single oral doses up to 480 mg (8 times the maximum recommended daily dose) and multiple doses up to 300 mg once daily for 5 days have been well tolerated in studies in healthy subjects. There is no specific antidote for tolvaptan intoxication. The signs and symptoms of an acute overdose can be anticipated to be those of excessive pharmacologic effect: a rise in serum sodium concentration, polyuria, thirst, and dehydration/hypovolemia.

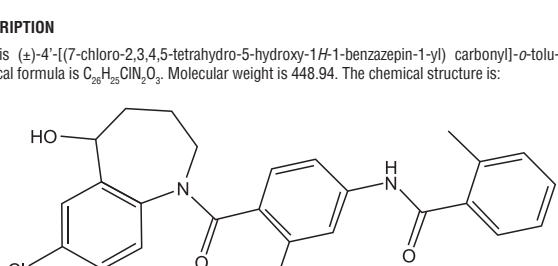
No mortality was observed in rats or dogs following single oral doses of 2000 mg/kg (maximum feasible dose). A single oral dose of 2000 mg/kg was lethal in mice, and symptoms of toxicity in affected mice included decreased locomotor activity, staggering gait, tremor and hypothermia.

In patients with suspected tolvaptan overdose, assessment of vital signs, electrolyte concentrations, ECG and fluid status are recommended. Continue replacement of water and electrolytes until aquaresis abates.

Dialysis may not be effective in removing tolvaptan because of its high binding affinity for human plasma protein (>98%).

11. DESCRIPTION

Tolvaptan is (±)-4-[(7-(chloro-2,3,4,5-tetrahydro-5-hydroxy-1*H*-1-benzazepin-1-yl) carbonyl)-*o*-tolu-*m*-toluidide. The empirical formula is C₂₄H₂₆ClN₂O₂. Molecular weight is 448.94. The chemical structure is:



Tolvaptan tablets for oral use contain 15 mg or 30 mg of tolvaptan. Inactive ingredients include corn starch, FD&C Blue #2/indigo carmine aluminum lake, hydroxypropyl cellulose, lactose monohydrate, low substituted hydroxypropyl cellulose, magnesium stearate and microcrystalline cellulose.

12. CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

Tolvaptan is a selective vasopressin V₂-receptor antagonist with an affinity for the V₂-receptor that is 1.8 times that of native arginine vasopressin (AVP). Tolvaptan affinity for the V₂-receptor is 29 times greater than for the V_{1A}-receptor. When taken orally, 15 to 60 mg doses of tolvaptan antagonize the effect of vasopressin and cause an increase in urine water excretion that results in an increase in free water clearance (aquaresis), a decrease in urine osmolality, and a resulting increase in serum sodium concentrations. Urinary excretion of sodium and potassium and plasma potassium concentrations are not significantly changed. Tolvaptan metabolites have no or weak antagonist activity for human V₂-receptors compared with tolvaptan.

12.2 Pharmacodynamics

In healthy subjects receiving a single dose of tolvaptan 60 mg, the onset of the aquaretic and sodium increasing effects occurs within 2 to 4 hours post-dose. A peak effect of about a 6 mEq increase in serum sodium and about 9 mL/min increase in urine excretion rate is observed between 4 and 8 hours post-dose; thus, the pharmacological activity lags behind the plasma concentrations of tolvaptan. About 60% of the peak effect on serum sodium is sustained at 24 hours post-dose, but the urinary excretion rate is no longer elevated by this time. Doses above 60 mg tolvaptan do not increase aquaresis or serum sodium further. The effects of tolvaptan in the recommended dose range of 15 to 60 mg once daily appear to be limited to aquaresis and the resulting increase in sodium concentration.

Plasma concentrations of native AVP may increase (avg. 2 to 9 pg/mL) with tolvaptan administration.

Cardiac Electrophysiology

No prolongation of the QT interval was observed with tolvaptan following multiple doses of 300 mg/day for 5 days.

12.3 Pharmacokinetics

In healthy subjects, the pharmacokinetics of tolvaptan after single doses of up to 480 mg and multiple doses up to 300 mg once daily have been examined. In hyponatremia subjects, single and multiple doses up to 60 mg have been studied.

Absorption

In healthy subjects, peak concentrations of tolvaptan are observed between 2 and 4 hours post-dose. Peak concentrations increase less than dose proportionally with doses greater than 240 mg.

The absolute bioavailability of tolvaptan decreases with increasing doses. The absolute bioavailability of tolvaptan following an oral dose of 30 mg is 56% (range 42 to 80%).

Co-administration of 90 mg tolvaptan with a high-fat meal (~1000 calories, of which 50% are from fat) doubles peak concentrations but has no effect on the AUC of tolvaptan; tolvaptan may be administered with or without food.

Distribution

Tolvaptan binds to both albumin and α1-acid glycoprotein and the overall protein binding is >98%; binding is not affected by disease state. The volume of distribution of tolvaptan is about 3 L/kg. The pharmacokinetic properties of tolvaptan are stereospecific, with a steady-state ratio of the S-(-) to the R-(+) enantiomer of about 3. When administered as multiple once-daily 300 mg doses to healthy subjects or to patients with congestive heart failure or ADPKD, tolvaptan's accumulation factor is <1.2. There is marked inter-subject variation in peak and average exposure to tolvaptan with a percent coefficient of variation ranging between 30 and 60%.

Metabolism and Elimination

Tolvaptan is metabolized almost exclusively by CYP3A. Fourteen metabolites have been identified in plasma, urine and feces; all but one were also metabolized by CYP3A and none are pharmacodynamically active. After oral administration of radiolabeled tolvaptan, tolvaptan was a minor component in plasma, representing 3% of total plasma radioactivity; the oxobutyric acid metabolite was present at 52.5% of total plasma radioactivity with all other metabolites present at lower concentrations than tolvaptan. The oxobutyric acid metabolite shows a plasma half-life of ~180 h. About 40% of radioactivity was recovered in urine (<1% as unchanged tolvaptan) and 59% in feces (19% as unchanged tolvaptan). Following intravenous infusion, tolvaptan half-life is approximately 3 hours. Following single oral doses to healthy subjects, the estimated half-life of tolvaptan increases from 3 hours for a 15 mg dose to approximately 12 hours for 120 mg and higher doses due to more prolonged absorption of tolvaptan at higher doses; apparent clearance is approximately 4 mL/min/kg and does not appear to change with increasing dose.

Specific Populations

Hyponatremia

In patients with hyponatremia of any origin the clearance of tolvaptan is reduced to about 2 mL/min/kg.

Hepatic Impairment

Moderate or severe hepatic impairment or congestive heart failure decrease the clearance and increase the volume of distribution of tolvaptan, but the respective changes are not clinically relevant. Exposure and response to tolvaptan in subjects with creatinine clearance ranging between 79 and 10 mL/min and patients with normal renal function are not different.

Renal Impairment

In a study in patients with creatinine clearances ranging from 10 to 124 mL/min administered a single dose of 60 mg tolvaptan, AUC and C_{max} of plasma tolvaptan were less than doubled in patients with severe renal impairment (creatinine clearance <30 mL/min) relative to the controls. The peak increase in serum sodium was 5 to 6 mEq/L, regardless of renal function, but the onset and offset of tolvaptan's effect on serum sodium were slower in patients with severe renal impairment [See *Use in Specific Populations* (8.7)].

Drug Interaction Studies

Impact of Other Drugs on Tolvaptan

Strong CYP3A Inhibitors

Ketoconazole: Tolvaptan's C_{max} and AUC were, respectively, 3.5 times and 5.4 times as high following ketoconazole 200 mg given one day prior to and concomitantly with 30 mg tolvaptan [See *Contraindications* (4), *Warnings and Precautions* (5.5) and *Drug Interactions* (7.1)].

Moderate CYP3A4 Inhibitors

Fluconazole: Fluconazole 400 mg given one day prior and 200 mg given concomitantly produced an 80% and 200% increase in tolvaptan C_{max} and AUC, respectively.

Grapefruit Juice: Co-administration of grapefruit juice and tolvaptan results in an increase in C_{max} and AUC of 90% and 60% for tolvaptan, respectively [See *Drug Interactions* (7.1)].

CYP3A4 Inducers

Rifampin: Rifampin 600 mg once daily for 7 days followed by a single 240 mg dose of tolvaptan decreased both tolvaptan C_{max} and AUC about 85%.

Other Drugs

Co-administration of lovastatin, digoxin, furosemide, and hydrochlorothiazide with tolvaptan has no clinically relevant impact on the exposure to tolvaptan.

Impact of Tolvaptan on Other Drugs

CYP3A Substrates

Tolvaptan is a weak inhibitor of CYP3A. Co-administration of lovastatin and tolvaptan increases the exposure to lovastatin and its active metabolite lovastatin-β hydroxyacid by factors of 1.4 and 1.3, respectively. This is not a clinically relevant change.

P-gp Substrates

Digoxin: Digoxin 0.25 mg was administered once daily for 12 days. Tolvaptan 60 mg, was co-administered once daily on Days 8 to 12. Digoxin C_{max} and AUC were increased 30% and 20%, respectively.

Transporter Substrates

Tolvaptan is a substrate of P-gp and an inhibitor of P-gp and BCRP. The oxobutyric acid metabolite of tolvaptan is an inhibitor of OATP1B1 and OAT3. Co-administration of tolvaptan with rosvastatin (BCRP substrate) did not have a clinically significant effect on rosvastatin exposure. Rosuvastatin C_{max} and AUC, increased 54% and 69%, respectively. Administration of rosvastatin (OATP1B1 substrate) or furosemide (OAT3 substrate) to healthy subjects with elevated oxobutyric acid metabolite plasma concentrations did not meaningfully alter the pharmacokinetics of rosvastatin or furosemide.

Other Drugs

Co-administration of tolvaptan does not appear to alter the pharmacokinetics of warfarin, furosemide, hydrochlorothiazide, or amiodarone (or its active metabolite, desethylamiodarone) to a clinically significant degree.

13. NONCLINICAL TOXICOLOGY

13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

Carcinogenesis

The carcinogenic potential of tolvaptan was assessed in 2-year carcinogenicity studies in mice and rats. Tolvaptan did not increase tumors in male or female rats at doses up to 1000 mg/kg/day (1.24 to 3.26 times the exposure in CHF patients based on AUC at the MRHD of 60 mg), in male mice at doses up to 60 mg/kg/day (0.3 times the exposure in CHF patients at the MRHD) and to female mice at doses up to 100 mg/kg/day (0.4 times the exposure in CHF patients at the MRHD).

Mutagenesis

Tolvaptan was not clastogenic in the *in vitro* chromosomal aberration test in Chinese hamster lung fibroblast cells or the *in vivo* rat micronucleus assay and was not mutagenic in the *in vitro* bacterial reverse mutation assays.

Impairment of fertility

In a fertility study in which male and female rats were administered tolvaptan orally at 100, 300 or 1000 mg/kg/day, altered estrous cycles due to prolongation of diestrus were observed in dams given 300 and 1000 mg/kg/day (6.2 and 11 times the exposure in CHF patients at the 60 mg dose). Tolvaptan had no effect on copulation or fertility indices. There were also no effects on the incidences of early or late resorption, dead fetuses, pre- or post-implantation loss, external anomalies, or fetal body weights.

14. CLINICAL STUDIES

14.1 Hyponatremia

In two double-blind, placebo-controlled, multi-center studies (SALT-1 and SALT-2), a total of 424 patients with euvolemic or hypervolemic hyponatremia (serum sodium <135 mEq/L) resulting from a variety of underlying causes (heart failure, liver cirrhosis, syndrome of inappropriate antidiuretic hormone [SIADH] and others) were treated for 30 days with tolvaptan or placebo, then followed for an additional 7 days after withdrawal. Symptomatic patients likely to require saline therapy during the course of therapy, patients with acute and transient hyponatremia associated with head trauma or postoperative state and patients with hyponatremia due to primary polydipsia, uncontrolled adrenal insufficiency or uncontrolled hypothyroidism were excluded. Patients were randomized to receive either placebo (N = 220) or tolvaptan (N = 223) at an initial oral dose of 15 mg once daily. The mean serum sodium concentration at study entry was 129 mEq/L. Fluid restriction was to be avoided if possible during the first 24 hours of therapy to avoid overly rapid correction of serum sodium, and during the first 24 hours of therapy 87% of patients had no fluid restriction. Thereafter, patients could resume or initiate fluid restriction (defined as daily fluid intake of ≤1.0 liter/day) as clinically indicated.

The dose of tolvaptan could be increased at 24-hour intervals to 30 mg once daily, then to 60 mg once daily, until either the maximum dose of 60 mg or normonatremia (serum sodium >135 mEq/L) was reached. Serum sodium concentrations were determined at 8 hours after study drug initiation and daily up to 72 hours, within which time titration was typically completed. Treatment was maintained for 30 days with additional serum sodium assessments on Days 11, 18, 25 and 30. On the day of study discontinuation, all patients resumed previous therapies for hyponatremia and were reevaluated 7 days later. The primary endpoint for these studies was the average daily AUC for change in serum sodium from baseline to Day 4 and baseline to Day 30 in patients with

a serum sodium less than 135 mEq/L. Compared to placebo, tolvaptan caused a statistically greater increase in serum sodium (p<0.0001) during both periods in both studies (see Table 2). For patients with a serum sodium of <130 mEq/L or <125 mEq/L, the effects at Day 4 and Day 30 remained significant (see Table 2). This effect was also seen across all disease etiology subsets (e.g., CHF, cirrhosis, SIADH/other).

Table 2. Effects of Treatment with Tolvaptan 15 mg/day to 60 mg/day

	Tolvaptan 15 mg/day to 60 mg/day	Placebo	Estimated Effect (95% CI)
Subjects with Serum Sodium <135 mEq/L (ITT population)			
Change in average daily serum [Na ⁺] AUC baseline to Day 4 (mEq/L) Mean (SD) N	4.0 (2.8) 213	0.4 (2.4) 203	3.7 (3.3 to 4.2) p<0.0001
Change in average daily serum [Na ⁺] AUC baseline to Day 30 (mEq/L) Mean (SD) N	6.2 (4.0) 213	1.8 (3.7) 203	4.6 (3.9 to 5.2) p<0.0001
Percent of Patients Needing Fluid Restriction*	14% 30/215	25% 51/206	p=0.0017
Subgroup with Serum Sodium <130 mEq/L			
Change in average daily serum [Na ⁺] AUC baseline to Day 4 (mEq/L) Mean (SD) N	4.8 (3.0) 110	0.7 (2.5) 105	4.2 (3.5 to 5.0) p<0.0001
Change in average daily serum [Na ⁺] AUC baseline to Day 30 (mEq/L) Mean (SD) N	7.9 (4.1) 110	2.6 (4.2) 105	5.5 (4.4 to 6.5) p<0.0001
Percent of Patients Needing Fluid Restriction*	19% 21/110	36% 38/106	p<0.01
Subgroup with Serum Sodium <125 mEq/L			
Change in average daily serum [Na ⁺] AUC baseline to Day 4 (mEq/L) Mean (SD) N	5.7 (3.8) 27	1.0 (1.8) 30	5.3 (3.8 to 6.9) p<0.0001
Change in average daily serum [Na ⁺] AUC baseline to Day 30 (mEq/L) Mean (SD) N	10.0 (4.8) 26	4.1 (4.5) 30	5.7 (3.1 to 8.3) p<0.0001
Percent of Patients Needing Fluid Restriction*	35% 9/26	50% 15/30	p=0.14

* Fluid Restriction defined as <1L/day at any time during treatment period.

In patients with hyponatremia (defined as <135 mEq/L), serum sodium concentration increased to a significantly greater degree in tolvaptan-treated patients compared to placebo-treated patients as early as 8 hours after the first dose, and the change was maintained for 30 days. The percentage of patients requiring fluid restriction (defined as <1 L/day at any time during the treatment period) was also significantly less (p=0.0017) in the tolvaptan-treated group (30/215, 14%) as compared with the placebo-treated group (51/206, 25%).

Figure 1 shows the change from baseline in serum sodium by visit in patients with serum sodium <135 mEq/L. Within 7 days of tolvaptan discontinuation, serum sodium concentrations in tolvaptan-treated patients declined to levels similar to those of placebo-treated patients.

Figure 1: Pooled SALT Studies: Analysis of Mean Serum Sodium (± SD, mEq/L) by Visit - Patients with Baseline Serum Sodium <135 mEq/L

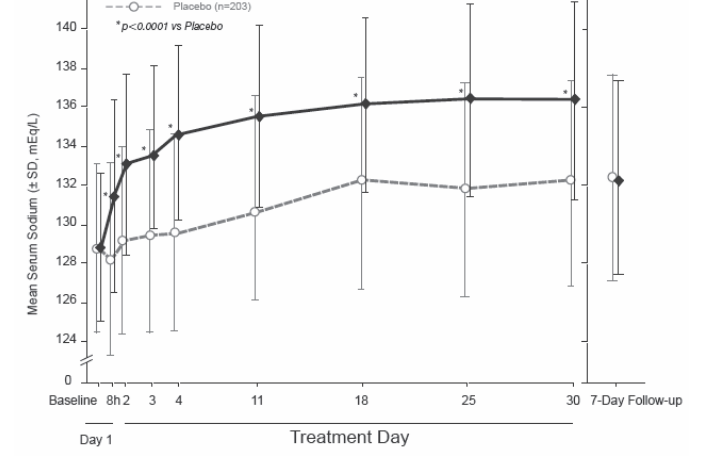
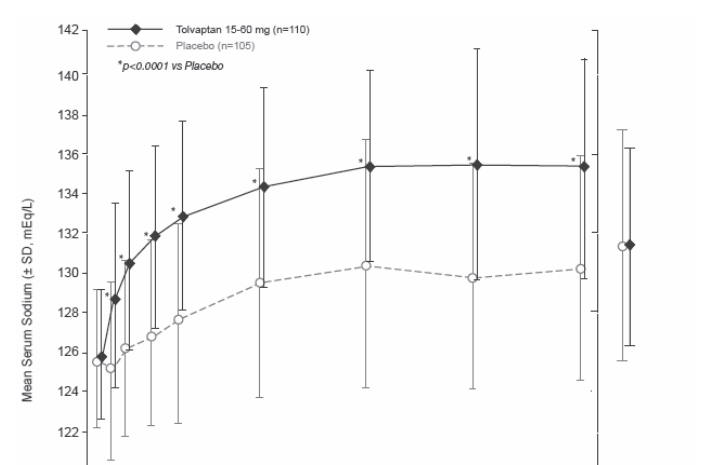
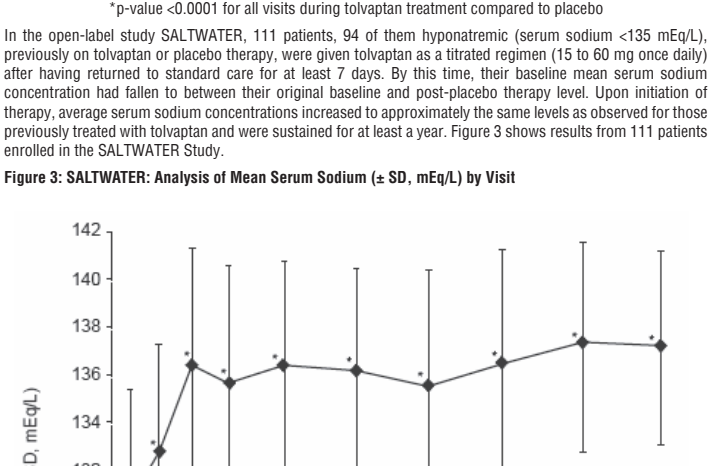


Figure 2: Pooled SALT Studies: Analysis of Mean Serum Sodium (± SD, mEq/L) by Visit - Patients with Baseline Serum Sodium <130 mEq/L



In the open-label study SALTWATER, 111 patients, 94 of them hyponatremic (serum sodium <135 mEq/L), previously on tolvaptan or placebo therapy, were given tolvaptan as a titrated regimen (15 to 60 mg once daily) after having returned to standard care for at least 7 days. By this time, their baseline mean serum sodium concentration had fallen to between their original baseline and post-placebo therapy level. Upon initiation of therapy, average serum sodium concentrations increased to approximately the same levels as observed for those previously treated with tolvaptan and were sustained for at least a year. Figure 3 shows results from 111 patients enrolled in the SALTWATER Study.

Figure 3: SALTWATER: Analysis of Mean Serum Sodium (± SD, mEq/L) by Visit



14.2 Heart Failure

In a phase 3 double-blind, placebo-controlled study (EVEREST), 4133 patients with worsening heart failure were randomized to tolvaptan or placebo as an adjunct to standard of care. Long-term tolvaptan treatment (mean duration of treatment of 0.75 years) had no demonstrated effect, either favorable or unfavorable, on all-cause mortality [HR (95% CI): 0.98 (0.9, 1.1)] or the combined endpoint of CV mortality or subsequent hospitalization for worsening HF [HR (95% CI): 1.0 (0.9, 1.1)].

16. HOW SUPPLIED/STORAGE AND HANDLING

How Supplied

Tolvaptan tablets are available in the following strengths and packages.

Tolvaptan 15 mg tablets are blue colored, triangular, shallow convex tablets debossed with "E" on one side and "500" on the other side.

Blister of 10 tablets NDC 49884-768-52
Carton of 1 blister NDC 49884-768-54

Tolvaptan 30 mg tablets are blue colored, circular, shallow convex tablets debossed with "E" on one side and "501" on the other side.

Blister of 10 tablets NDC 49884-770-52
Carton of 1 blister NDC 49884-770-54

Storage and Handling

Store at 20° to 25°C (68° to 77°F); excursions permitted to 15° to 30°C (59° to 86°F) [see USP Controlled Room Temperature].

Keep out of reach of children.

17. PATIENT COUNSELING INFORMATION

As a part of patient counseling, healthcare providers must review the tolvaptan tablets Medication Guide with every patient [See *FDA-Approved Medication Guide*].

Pregnancy

Advise pregnant women of the potential risk to a fetus. Advise females of reproductive potential to inform their prescriber of a known or suspected pregnancy [See *Use in Specific Populations* (8.1)].

Lactation

Advise patients not to breastfeed an infant if they are taking tolvaptan [See *Use in Specific Populations* (8.2)].

Dist. by:
Par Pharmaceutical
Chestnut Ridge, NY 10977 U.S.A.

Mfg. by:
Par Formulations Private Limited,
9/215, Pudupakkam, Kelambakkam-603 103.
Made in India

Mfg. Lic. No.: TN00002121
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your healthcare provider should decide if you will take tolvaptan tablets or breast-feed. You should not do both.

• **Call your doctor for medical advice about side effects.** You may report side effects to FDA at 1-800-FDA-1088.

How should I store tolvaptan tablets?

Store tolvaptan tablets between 59° to 86°F (15° to 30°C).

Keep tolvaptan tablets and all medicines out of the reach of children.

General information about tolvaptan tablets

Medicines are sometimes prescribed for purposes other than those listed in a Medication Guide. Do not use tolvaptan tablets for a condition for which it was not prescribed. Do not give tolvaptan tablets to other people, even if they have the same symptoms you have. They may harm them.

How should I take tolvaptan tablets?

• See **“What is the most important information I should know about tolvaptan tablets?”**

• Take tolvaptan tablets exactly as prescribed by your healthcare provider.

• Take tolvaptan tablets one time each day.

• You can take tolvaptan tablets with or without food.

• Do not drink grapefruit juice during treatment with tolvaptan tablets. This could cause you to have too much tolvaptan in your blood.

• Certain medicines or illnesses may keep you from drinking fluids or may cause you to lose too much body fluid, such as vomiting or diarrhea. If you have these problems, call your healthcare provider right away.

• Do not miss or skip doses of tolvaptan tablets. If you miss a dose, take it as soon as you remember. If it is near the time of the next dose, skip the missed dose. Just take the next dose at your regular time. Do not take 2 doses at the same time.

• **If you take too much tolvaptan, call your healthcare provider right away.** If you take an overdose of tolvaptan tablets, you may need to go to a hospital.

• If your healthcare provider tells you to stop taking tolvaptan tablets, follow their instructions about limiting the amount of fluid you should drink.

What are the possible side effects of tolvaptan tablets?

Tolvaptan tablets can cause serious side effects including:

• **See “What is the most important information I should know about tolvaptan tablets?”**

• **Loss of too much body fluid (dehydration).** Tell your healthcare provider if you:

◦ have vomiting or diarrhea and cannot drink normally.

◦ feel dizzy or faint. These may be symptoms that you have lost too much body fluid.

Call your healthcare provider right away if you have any of these symptoms.

The most common side effects of tolvaptan tablets are:

• thirst

• dry mouth

• weakness

• constipation

• making large amounts of urine and urinating often

• increased blood sugar levels

DETACH AND DISPENSE