

**HIGHLIGHTS OF PRESCRIBING INFORMATION**

These highlights do not include all the information needed to use HORIZANT safely and effectively. See full prescribing information for HORIZANT.

**HORIZANT (gabapentin enacarbil) Extended-Release Tablets for oral use**

Initial U.S. Approval: 2011

-----**INDICATIONS AND USAGE**-----

HORIZANT is indicated for the treatment of moderate-to-severe primary Restless Legs Syndrome (RLS) in adults. (1)

-----**DOSAGE AND ADMINISTRATION**-----

- The recommended dose of HORIZANT is 600 mg once daily taken with food at about 5 PM. (2.1)
- A dose of 1,200 mg once daily provided no additional benefit compared with the 600-mg dose, but caused an increase in adverse reactions. (2.1)
- If the dose is not taken at the recommended time, the next dose should be taken the following day as prescribed. (2.1)
- Instruct patients to swallow tablets whole and not to cut, crush, or chew tablets. (2.1)

-----**DOSAGE FORMS AND STRENGTHS**-----

Extended-Release Tablets: 600 mg (3)

-----**CONTRAINDICATIONS**-----

None. (4)

-----**WARNINGS AND PRECAUTIONS**-----

- Driving impairment: Warn patients not to drive until they have gained sufficient experience with HORIZANT to assess whether it will impair their ability to drive. (5.1)
- Somnolence/sedation and dizziness: May impair the patient’s ability to operate complex machinery. (5.2)
- HORIZANT is not interchangeable with other gabapentin products. (5.3)
- Suicidal thoughts or behaviors: Monitor for suicidal thoughts or behaviors. (5.4)

-----**ADVERSE REACTIONS**-----

Most common adverse reactions (≥10% and at least 2 times the rate of placebo) were somnolence/sedation and dizziness. (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact GlaxoSmithKline at 1-888-825-5249 or FDA at 1-800-FDA-1088 or [www.fda.gov/medwatch](http://www.fda.gov/medwatch).

-----**USE IN SPECIFIC POPULATIONS**-----

- Pregnancy: based on animal data, may cause fetal harm. (8.1)
- Renal impairment: Dosage adjustments necessary. HORIZANT is not recommended for use in patients with creatinine clearance (CrCl) <30 mL/min or in patients on hemodialysis. (2.2)

See 17 for PATIENT COUNSELING INFORMATION and MEDICATION GUIDE.

Revised: 04/2011

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## FULL PRESCRIBING INFORMATION

### 1 INDICATIONS AND USAGE

HORIZANT™ (gabapentin enacarbil) Extended-Release Tablets are indicated for the treatment of moderate-to-severe primary Restless Legs Syndrome (RLS) in adults.

HORIZANT is not recommended for patients who are required to sleep during the daytime and remain awake at night.

### 2 DOSAGE AND ADMINISTRATION

#### 2.1 Restless Legs Syndrome

The recommended dosage for HORIZANT is 600 mg once daily taken with food at about 5 PM. A daily dose of 1,200 mg provided no additional benefit compared with the 600-mg dose, but caused an increase in adverse reactions [*see Adverse Reactions (6.1)*].

If the dose is not taken at the recommended time, the next dose should be taken the following day as prescribed.

Tablets should be swallowed whole and should not be cut, crushed, or chewed.

#### 2.2 Renal Impairment and Hemodialysis

In patients with compromised renal function (creatinine clearance [CrCl] 30 to 59 mL/min), 600 mg of HORIZANT should be administered on Day 1, Day 3, and every day thereafter.

In patients with stable renal function, CrCl can be estimated using the equation of Cockcroft and Gault:

$$\text{for males: CrCl} = (140 - \text{age})(\text{weight}) / [(72)(\text{SCr})]$$

$$\text{for females: CrCl} = (0.85)(140 - \text{age})(\text{weight}) / [(72)(\text{SCr})]$$

where age is in years, weight is in kilograms, and SCr is serum creatinine in mg/dL.

HORIZANT is not recommended for use in patients with a CrCl <30 mL/min or on hemodialysis because the dose cannot be reduced below 600 mg.

### 3 DOSAGE FORMS AND STRENGTHS

HORIZANT Extended-Release Tablets, 600 mg, are white to off-white, oval-shaped tablets debossed with “GS LFG”. HORIZANT Extended-Release Tablets may contain occasional black/grey spots.

### 4 CONTRAINDICATIONS

None.

### 5 WARNINGS AND PRECAUTIONS

#### 5.1 Effects on Driving

HORIZANT causes significant driving impairment. Patients being treated with HORIZANT should not drive until they have gained sufficient experience to assess whether HORIZANT impairs their ability to drive. However, prescribers and patients should be aware that patients' ability to assess their own driving competence, as well as their ability to assess the degree of somnolence caused by HORIZANT, can be imperfect.

In a 2-week simulated driving study in patients with RLS, a daily 1,200-mg dose of HORIZANT caused significant impairment within 2 hours and for up to 14 hours after dosing. The impairment was similar to that caused by the active control, a single oral dose of diphenhydramine 50 mg. The effect on driving at times other than 2 weeks is unknown. Whether the impairment is related to somnolence [*see Warnings and Precautions (5.2)*] or other effects of HORIZANT is unknown. The 600-mg dose was not studied. Because a 600-mg/day dose of HORIZANT can cause significant somnolence, similar to that of the 1,200-mg/day dose [*see Warnings and Precautions (5.2)*], the 600- and 1,200-mg/day doses may have similar effects on driving behavior.

## **5.2 Somnolence/Sedation and Dizziness**

HORIZANT causes somnolence/sedation and dizziness (see Table 2). Patients should be advised not to drive a car or operate other complex machinery until they have gained sufficient experience on HORIZANT to assess whether HORIZANT impairs their ability to perform these tasks.

During the controlled trials in patients with RLS, somnolence/sedation was reported in 20% of patients treated with 600 mg of HORIZANT per day compared with 6% of patients receiving placebo. In those patients treated with HORIZANT who reported somnolence, the somnolence persisted during treatment in about 30%. In the remaining patients, symptoms resolved within 3 to 4 weeks. Dizziness was reported in 13% of patients receiving 600 mg of HORIZANT per day compared with 4% of patients receiving placebo. In those patients treated with HORIZANT who reported dizziness, symptoms persisted during treatment in about 20%. Somnolence/sedation led to withdrawal in 2% of patients receiving 600 mg of HORIZANT per day. Dizziness led to withdrawal in 1% of patients receiving 600 mg of HORIZANT per day. The incidence of these adverse reactions was greater in the patients receiving 1,200 mg per day.

## **5.3 Lack of Interchangeability With Gabapentin**

HORIZANT is not interchangeable with other gabapentin products because of differing pharmacokinetic profiles. The same dose of HORIZANT results in different plasma concentrations of gabapentin relative to other gabapentin products. [*See Clinical Pharmacology (12.3).*]

The safety and effectiveness of HORIZANT in patients with epilepsy have not been studied.

## **5.4 Suicidal Behavior and Ideation**

HORIZANT (gabapentin enacarbil) is a prodrug of gabapentin, an antiepileptic drug (AED). AEDs increase the risk of suicidal thoughts or behavior in patients taking these drugs for any indication. Because HORIZANT is a prodrug of gabapentin, HORIZANT also increases this

risk. Patients treated with any AED for any indication should be monitored for the emergence or worsening of depression, suicidal thoughts or behavior, and/or any unusual changes in mood or behavior.

Pooled analyses of 199 placebo-controlled clinical trials (monotherapy and adjunctive therapy) of 11 different AEDs showed that patients randomized to 1 of the AEDs had approximately twice the risk [adjusted relative risk 1.8, 95% confidence interval (CI): 1.2, 2.7] of suicidal thinking or behavior compared with patients randomized to placebo. In these trials, which had a median treatment duration of 12 weeks, the estimated incidence rate of suicidal behavior or ideation among 27,863 AED-treated patients was 0.43%, compared with 0.24% among 16,029 placebo-treated patients, representing an increase of approximately 1 case of suicidal thinking or behavior for every 530 patients treated. There were 4 suicides in drug-treated patients in the trials and none in placebo-treated patients, but the number is too small to allow any conclusion about drug effect on suicide.

The increased risk of suicidal thoughts or behavior with AEDs was observed as early as 1 week after starting drug treatment with AEDs and persisted for the duration of treatment assessed. Because most trials included in the analysis did not extend beyond 24 weeks, the risk of suicidal thoughts or behavior beyond 24 weeks could not be assessed.

The risk of suicidal thoughts or behavior was generally consistent among drugs in the data analyzed. The finding of increased risk with AEDs of varying mechanisms of action and across a range of indications suggests that the risk applies to all AEDs used for any indication. The risk did not vary substantially by age (5 to 100 years) in the clinical trials analyzed. Table 1 shows absolute and relative risk by indication for all evaluated AEDs.

**Table 1. Risk by Indication for Antiepileptic Drugs in the Pooled Analysis**

Indication	Placebo Patients With Events Per 1,000 Patients	Drug Patients With Events Per 1,000 Patients	Relative Risk: Incidence of Events in Drug Patients/Incidence in Placebo Patients	Risk Difference: Additional Drug Patients With Events Per 1,000 Patients
Epilepsy	1.0	3.4	3.5	2.4
Psychiatric	5.7	8.5	1.5	2.9
Other	1.0	1.8	1.9	0.9
Total	2.4	4.3	1.8	1.9

The relative risk for suicidal thoughts or behavior was higher in clinical trials for epilepsy than in clinical trials for psychiatric or other conditions, but the absolute risk differences were similar for the epilepsy and psychiatric indications.

Anyone considering prescribing HORIZANT must balance the risk of suicidal thoughts or behavior with the risk of untreated illness. Epilepsy and many other illnesses for which AEDs are prescribed are themselves associated with morbidity and mortality and an increased risk of

suicidal thoughts and behavior. Should suicidal thoughts and behavior emerge during treatment, the prescriber needs to consider whether the emergence of these symptoms in any given patient may be related to the illness being treated.

Patients, their caregivers, and families should be informed that HORIZANT increases the risk of suicidal thoughts and behavior and should be advised of the need to be alert for the emergence or worsening of the signs and symptoms of depression, any unusual changes in mood or behavior, or the emergence of suicidal thoughts, behavior, or thoughts about self-harm. Behaviors of concern should be reported immediately to healthcare providers.

### **5.5 Discontinuation of HORIZANT**

When discontinuing HORIZANT, patients receiving the recommended dose of 600 mg daily can discontinue the drug without tapering. If the recommended dose is exceeded, the dose should be reduced to 600 mg daily for 1 week prior to discontinuation to minimize the potential of withdrawal seizure.

### **5.6 Tumorigenic Potential**

In an oral carcinogenicity study, gabapentin enacarbil increased the incidence of pancreatic acinar cell adenoma and carcinoma in male and female rats [see *Nonclinical Toxicology (13.1)*]. The clinical significance of this finding is unknown.

In clinical studies of gabapentin as adjunctive therapy in epilepsy comprising 2,085 patient-years of exposure in patients >12 years of age, new tumors were reported in 10 patients (2 breast, 3 brain, 2 lung, 1 adrenal, 1 non-Hodgkin's lymphoma, 1 endometrial carcinoma *in situ*), and preexisting tumors worsened in 11 patients (9 brain, 1 breast, 1 prostate) during or up to 2 years following discontinuation of gabapentin. Without knowledge of the background incidence and recurrence in a similar population not treated with gabapentin, it is impossible to know whether the incidence reported in this cohort is or is not affected by treatment.

## **6 ADVERSE REACTIONS**

The following adverse reactions are described in more detail in the *Warnings and Precautions* section of the label:

- Somnolence/sedation and dizziness [see *Warnings and Precautions (5.2)*]

### **6.1 Clinical Trials Experience**

In all controlled and uncontrolled trials across various patient populations prior to approval of HORIZANT, more than 2,300 patients have received HORIZANT orally in daily doses ranging from 600 to 3,600 mg.

The exposure to HORIZANT in 1,201 patients with RLS included 613 exposed for at least 6 months and 371 exposed for at least 1 year. HORIZANT in the treatment of RLS was studied primarily in placebo-controlled trials (n = 642), and in long-term follow-up studies. The population with RLS ranged from 18 to 82 years of age, with 60% being female and 95% being Caucasian.

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared with rates in the clinical trials of another drug and may not reflect the rates observed in practice.

The safety of HORIZANT in doses ranging from 600 to 2,400 mg has been evaluated in 515 patients with RLS in 3 double-blind, placebo-controlled, 12-week clinical trials. The 600-mg dose was studied in 2 of the 3 studies. Eleven out of 163 (7%) patients treated with 600 mg of HORIZANT discontinued treatment due to adverse reactions compared with 10 of the 245 (4%) patients who received placebo.

The most commonly observed adverse reactions ( $\geq 5\%$  and at least 2 times the rate of placebo) in these trials for the 600-mg dose of HORIZANT were somnolence/sedation and dizziness (see Table 2). Table 2 lists treatment-emergent adverse reactions that occurred in  $\geq 2\%$  of patients with RLS treated with HORIZANT and numerically greater than placebo.

**Table 2. Incidence of Adverse Reactions in 12-Week RLS Studies Reported in  $\geq 2\%$  of Patients Treated With 600 or 1,200 mg of HORIZANT and Numerically Greater Than Placebo**

Body System/Adverse Reaction	Placebo <sup>a</sup> (N = 245) %	HORIZANT 600 mg/day <sup>b</sup> (N = 163) %	HORIZANT 1,200 mg/day <sup>c</sup> (N = 269) %
Nervous system disorders			
Somnolence/sedation	6	20	27
Dizziness	4	13	22
Headache	11	12	15
Gastrointestinal disorders			
Nausea	5	6	7
Dry mouth	2	3	4
Flatulence	<1	3	2
General disorders and administration site conditions			
Fatigue	4	6	7
Irritability	1	4	4
Feeling drunk	0	1	3
Feeling abnormal	<1	<1	3
Peripheral edema	1	<1	3
Metabolism and nutritional disorders			
Weight increased	2	2	3
Increased appetite	<1	2	2
Ear and labyrinth disorders			
Vertigo	0	1	3
Psychiatric disorders			
Depression	<1	<1	3
Libido decreased	<1	<1	2

<sup>a</sup> Placebo was a treatment arm in each of the 3 double-blind, placebo-controlled, 12-week clinical trials.

<sup>b</sup> The 600-mg dose of HORIZANT was a treatment arm in 2 of the 3 double-blind, placebo-controlled, 12-week clinical trials.

<sup>c</sup> The 1,200-mg dose of HORIZANT was a treatment arm in each of the 3 double-blind, placebo-controlled, 12-week clinical trials.

Adverse reactions reported in these three 12-week studies in <2% of patients treated with 600 mg of HORIZANT and numerically greater than placebo were balance disorder, blurred vision, disorientation, feeling drunk, lethargy, and vertigo.

The following adverse reactions were dose-related: somnolence/sedation, dizziness, feeling drunk, libido decreased, depression, headache, peripheral edema, and vertigo.

## 7 DRUG INTERACTIONS

Neither gabapentin enacarbil nor gabapentin are substrates, inhibitors, or inducers of the major cytochrome P450 enzymes. Gabapentin enacarbil is neither a substrate nor an inhibitor of P-glycoprotein *in vitro*.

Pharmacokinetic drug-drug interaction studies were conducted to examine the potential for an interaction of gabapentin enacarbil with cimetidine and naproxen. No significant pharmacokinetic interactions were observed. No clinically relevant pharmacokinetic interactions are expected between HORIZANT and other substrates of organic cation transporter type 2 (OCT2) and monocarboxylate transporter type 1 (MCT-1) [*see Clinical Pharmacology (12.3)*].

## 8 USE IN SPECIFIC POPULATIONS

### 8.1 Pregnancy

Pregnancy Category C. There are no adequate and well-controlled studies with HORIZANT in pregnant women. In nonclinical studies in rat and rabbits, administration of gabapentin enacarbil was developmentally toxic when administered to pregnant animals at doses and gabapentin exposures greater than those used clinically. HORIZANT should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

When pregnant rats were administered gabapentin enacarbil (oral doses of 200, 1,000, or 5,000 mg/kg/day) throughout the period of organogenesis, embryo-fetal mortality was increased at the 2 highest doses and fetal body weights were decreased at the high dose. The no-effect dose for embryo-fetal developmental toxicity in rats is approximately 3 times the recommended human dose (RHD) of 600 mg/day on a body surface area ( $\text{mg}/\text{m}^2$ ) basis.

When pregnant rabbits were administered gabapentin enacarbil (oral doses of 200, 500, or 2,500 mg/kg/day) throughout the period of organogenesis, embryo-fetal mortality was increased and fetal body weights were decreased at the high dose. The no-effect dose for embryo-fetal developmental toxicity in rabbits (500 mg/kg/day) is approximately 16 times the RHD on a  $\text{mg}/\text{m}^2$  basis.

When female rats were administered gabapentin enacarbil (oral doses of 200, 1,000, or 5,000 mg/kg/day throughout the pregnancy and lactation periods, offspring growth and survival were decreased at the two highest doses. The no-effect dose for pre- and post-natal developmental toxicity in rats is approximately 3 times the RHD on a  $\text{mg}/\text{m}^2$  basis.

In reproductive and developmental studies of gabapentin, developmental toxicity was observed at all doses tested. Increased incidences of hydronephrosis and/or hydroureter were observed in rat offspring following treatment of pregnant animals in studies of fertility and general reproductive performance, embryo-fetal development, and peri- and post-natal development. Overall, a no-effect dose was not established. In mice, treatment of pregnant animals with gabapentin during the period of organogenesis resulted in delayed fetal skeletal ossification at all but the lowest dose tested. When pregnant rabbits were treated with gabapentin during the period of organogenesis, an increase in embryo-fetal mortality was observed at all doses of gabapentin tested.



In a published study, gabapentin (400 mg/kg/day) was administered by intraperitoneal injection to neonatal mice during the first postnatal week, a period of synaptogenesis in rodents (corresponding to the last trimester of pregnancy in humans). Gabapentin caused a marked decrease in neuronal synapse formation in brains of intact mice and abnormal neuronal synapse formation in a mouse model of synaptic repair. Gabapentin has been shown *in vitro* to interfere with activity of the  $\alpha 2\delta$  subunit of voltage-activated calcium channels, a receptor involved in neuronal synaptogenesis. The clinical significance of these findings is unknown.

## **8.2 Labor and Delivery**

The effect of HORIZANT on labor and delivery is unknown.

## **8.3 Nursing Mothers**

It is not known whether gabapentin derived from HORIZANT is secreted in human milk; however, gabapentin is secreted into human milk following oral administration of gabapentin products. Because of the potential for adverse reactions in nursing infants from HORIZANT, 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.

## **8.4 Pediatric Use**

Safety and effectiveness of HORIZANT in pediatric patients have not been studied.

## **8.5 Geriatric Use**

Of the 515 patients treated with HORIZANT in the 3 double-blind, placebo-controlled, 12-week clinical trials for RLS, 11% were 65 to 74 years of age and 1% were 75 years of age and older. Clinical trials of HORIZANT did not include a sufficient number of patients 65 years and older to determine whether they respond differently from younger individuals.

Gabapentin is known to be almost exclusively excreted by the kidney, and the risk of adverse reactions to this drug may be greater in patients with impaired renal function. Because elderly patients are more likely to have decreased renal function, the frequency of dosing may need to be adjusted based on calculated creatinine clearance in these patients [*see Dosage and Administration (2.2)*].

## **8.6 Renal Impairment**

The dose of HORIZANT should be adjusted in patients with renal impairment [*see Dosage and Administration (2.2), Clinical Pharmacology (12.3)*].

# **10 OVERDOSAGE**

## **10.1 Human Overdose Experience**

There have been no reports describing individuals who have taken an overdose of HORIZANT. The highest single dose of gabapentin enacarbil administered to date is 6,000 mg in healthy subjects. At this supratherapeutic dose there were no serious adverse events. The incidence of central nervous system adverse reactions, particularly dizziness and somnolence/sedation, is increased with doses greater than 600 mg daily.

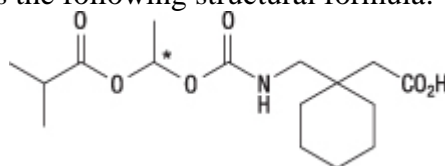
## **10.2 Overdosage Management**

In the event of an overdose, the patient should be treated supportively with appropriate monitoring as necessary. Gabapentin derived from gabapentin enacarbil can be removed by hemodialysis. Standard hemodialysis procedures result in significant clearance of gabapentin.

Further management should be as clinically indicated or as recommended by a poison control center.

## 11 DESCRIPTION

HORIZANT (gabapentin enacarbil) is a prodrug of gabapentin. Gabapentin enacarbil is described as (1-{{(1*RS*)-1-[(2-Methylpropanoyl)oxy]ethoxy}carbonyl}amino)methyl}cyclohexyl) acetic acid. It has a molecular formula of  $C_{16}H_{27}NO_6$  and a molecular weight of 329.39. It is a racemate and has the following structural formula:



Gabapentin enacarbil is a white to off-white crystalline solid with a melting onset of approximately 64°C and a solubility of 0.5 mg/mL in water and 10.2 mg/mL in phosphate buffer (pH 6.3).

HORIZANT is administered orally. Each HORIZANT Extended-Release Tablet contains 600 mg of gabapentin enacarbil and the following inactive ingredients: colloidal silicon dioxide, dibasic calcium phosphate dihydrate, glyceryl behenate, magnesium stearate, sodium lauryl sulfate, and talc.

## 12 CLINICAL PHARMACOLOGY

### 12.1 Mechanism of Action

Gabapentin enacarbil is a prodrug of gabapentin and, accordingly, its therapeutic effects in RLS are attributable to gabapentin.

The precise mechanism by which gabapentin is efficacious in RLS is unknown. Gabapentin is structurally related to the neurotransmitter gamma-aminobutyric acid (GABA) but has no effect on GABA binding, uptake, or degradation. Gabapentin enacarbil and gabapentin have been tested in radioligand binding assays, and neither exhibited affinity for a number of other common receptor, ion channel, or transporter proteins.

*In vitro* studies have shown that gabapentin binds with high affinity to the  $\alpha 2\delta$  subunit of voltage-activated calcium channels; however, the relationship of this binding to the therapeutic effects of gabapentin enacarbil in RLS is unknown.

### 12.3 Pharmacokinetics

HORIZANT is an extended-release formulation of gabapentin enacarbil, a prodrug of gabapentin. HORIZANT provides approximately dose-proportional and extended exposure to gabapentin over the range 300 to 6,000 mg. HORIZANT and gabapentin are not interchangeable because the same daily dose of each results in different plasma concentrations of gabapentin.

**Absorption:** The pathway for absorption of gabapentin enacarbil is believed to include active transport via a proton-linked monocarboxylate transporter, MCT-1. This transporter is expressed at high levels in the intestinal tract and is not saturated by administration of high doses of HORIZANT. Mean bioavailability of gabapentin (based on urinary recovery of gabapentin) for HORIZANT in the fed state is about 75%. Bioavailability under fasting conditions has been estimated by gabapentin urinary recovery to be 42% to 65%. In a food effect study, the exposure of gabapentin increased by 24%, 34%, and 44% with low, moderate, and high fat meals, respectively. The  $T_{max}$  of gabapentin after administration of 600 mg of HORIZANT was 5.0 hours in fasted subjects and 7.3 hours in fed subjects. Steady state is reached in 2 days with daily administration.

**Distribution:** Plasma protein binding of gabapentin has been reported to be <3%. The apparent volume of distribution of gabapentin in subjects receiving HORIZANT is 76 L.

**Metabolism:** After oral administration, gabapentin enacarbil undergoes extensive first-pass hydrolysis by non-specific carboxylesterases primarily in enterocytes and to a lesser extent in the liver, to form gabapentin, carbon dioxide, acetaldehyde, and isobutyric acid. Levels of gabapentin enacarbil in blood are low and transient ( $\leq 2\%$  of corresponding gabapentin plasma levels). Released gabapentin is not appreciably metabolized in humans. Neither gabapentin enacarbil nor gabapentin are substrates, inhibitors, or inducers of the major cytochrome P450 enzymes (CYP1A2, CYP2A6, CYP2C9, CYP2C19, CYP2D6, CYP2E1, and CYP3A4). It is not known if gabapentin enacarbil is an inhibitor of CYP2B6 and CYP2C8. Gabapentin enacarbil is neither a substrate nor an inhibitor of P-glycoprotein *in vitro*.

**Elimination:** Following hydrolysis of gabapentin enacarbil, the released gabapentin is excreted unchanged by the kidney. Gabapentin renal excretion is believed to involve a component of active secretion via an organic cation transporter (OCT2) present in the kidney. In a human pharmacokinetic study with immediate release  $^{14}\text{C}$  gabapentin enacarbil, mean recovery of total radioactivity in urine was 94%, with 5% of the radioactive dose recovered in feces.

Apparent oral clearance (CL/F) of gabapentin from plasma after dosing of HORIZANT with food ranged from 6.0 to 9.3 L/hr. Following oral dosing of HORIZANT, plasma clearance of gabapentin is approximately proportional to creatinine clearance. Renal clearance (CL<sub>r</sub>) of gabapentin ranged from 5 to 7 L/hr, regardless of food intake or food type. The elimination half-life ( $t_{1/2}$ ) of gabapentin ranges from 5.1 to 6.0 hours and is unaltered by dose or following multiple doses of HORIZANT.

**Special Populations: Race:** The majority (94%) of subjects in the clinical studies were Caucasian, and no single other race was greater than 4%; therefore, the effect of race could not be studied.

**Gender:** There are no clinically meaningful differences in pharmacokinetics of HORIZANT between male and female patients.

**Geriatric Patients:** There are no clinically significant differences in pharmacokinetics of HORIZANT between geriatric patients ( $\geq 65$  years of age) and younger patients (18 to

<65 years of age). However, the pharmacokinetics in geriatric patients may be affected by an age-related decline in renal function [see *Use in Specific Populations* (8.5)].

**Renal Impairment and Hemodialysis:** Gabapentin clearance after dosing with HORIZANT is approximately proportional to CrCl. Apparent oral clearance (CL/F) decreased in moderate (4.2 L/hr) and severe renal impairment patients (1.7 L/hr) compared with 6.0 to 9.3 L/hr in patients without renal impairment. Similarly, CL<sub>r</sub> was decreased to 3 and 1 L/hr in moderate and severe renal impairment patients, respectively, compared with 5 to 7 L/hr in non-renal impairment patients. Dosage reduction in patients with renal dysfunction is necessary. Gabapentin is effectively removed from plasma by hemodialysis. The mean percentage of gabapentin recovered following hemodialysis in patients with end-stage renal disease was 29% (expressed as a proportion of the gabapentin released from HORIZANT). For patients on hemodialysis, treatment with HORIZANT is not recommended [see *Dosage and Administration* (2.2)].

**Drug Interactions: Cimetidine:** Gabapentin released from HORIZANT is eliminated by renal clearance via OCT2. Cimetidine is a known substrate for this same elimination pathway. Coadministration of 1,200 mg of HORIZANT once daily with cimetidine 400 mg 4 times daily showed no effect on cimetidine exposure. There was an increase in AUC of gabapentin (24%) and a decrease in renal clearance of gabapentin (20%); these effects are not expected to be clinically relevant. No clinically relevant pharmacokinetic interactions are expected between HORIZANT and other substrates of OCT2.

**Naproxen:** The pathway for absorption of gabapentin enacarbil includes active transport via a proton-linked MCT-1. Coadministration of 1,200 mg of HORIZANT once daily with naproxen 500 mg twice daily, a known substrate of MCT-1, showed no effect on naproxen exposure or steady-state gabapentin C<sub>max</sub> and AUC. No clinically relevant pharmacokinetic interactions are expected between HORIZANT and other substrates of MCT-1.

## 13 NONCLINICAL TOXICOLOGY

### 13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

**Carcinogenesis:** Oral (gavage) carcinogenicity studies were conducted in mice and rats. In mice, gabapentin enacarbil was tested at doses of 500, 2,000, or 5,000 mg/kg/day for up to 104 weeks. There was no evidence of drug-related carcinogenicity. The highest dose tested is 40 times the RHD of 600 mg/day, on a body surface area (mg/m<sup>2</sup>) basis.

In rats, gabapentin enacarbil was tested at doses of 500, 2,000, or 5,000 mg/kg/day for up to 97 weeks in mid-dose males, 90 weeks in high-dose males, and 104 weeks in females. The plasma exposures (AUC) for gabapentin at these doses are approximately 10, 38, and 75 times, respectively, that in humans at the RHD. Increases in the incidence of pancreatic acinar adenoma and carcinoma were found in mid-dose males and high-dose males and females.

In 2-year dietary carcinogenicity studies of gabapentin, no evidence of drug-related carcinogenicity was observed in mice treated at doses up to 2,000 mg/kg/day. In rats, increases in the incidence of pancreatic acinar cell adenoma and carcinoma were found in male rats receiving

the highest dose (2,000 mg/kg), but not at doses of 250 or 1,000 mg/kg/day. At 1,000 mg/kg/day, the plasma AUC for gabapentin is estimated to be approximately 25 times that in humans at the RHD.

Studies designed to investigate the mechanism of gabapentin-induced pancreatic carcinogenesis in rats indicate that gabapentin stimulates DNA synthesis in rat pancreatic acinar cells *in vitro* and thus may be acting as a tumor promoter by enhancing mitogenic activity. It is not known whether gabapentin has the ability to increase cell proliferation in other cell types or in other species, including human.

**Mutagenesis:** Gabapentin enacarbil was negative in *in vitro* bacterial reverse mutation (Ames) and *in vivo* rat micronucleus assays. In an *in vitro* human lymphocyte assay, there was an increase in the number of chromosomal aberrations with gabapentin enacarbil. This *in vitro* response was attributed to acetaldehyde released by hydrolysis of gabapentin enacarbil during the incubation period. Acetaldehyde is known to cause chromosome aberrations *in vitro*, but is readily metabolized *in vivo*. The small quantity of acetaldehyde formed from gabapentin enacarbil *in vivo* is rapidly cleared by normal metabolic activity.

**Impairment of Fertility:** Oral administration of gabapentin enacarbil (doses of 0, 200, 1,000, or 5,000 mg/kg/day) to male and female rats prior to and throughout mating and continuing in females up to day 7 of gestation resulted in no adverse effects on fertility. The highest dose tested is approximately 80 times the RHD on a mg/m<sup>2</sup> basis.

## 14 CLINICAL STUDIES

### 14.1 12-Week Pivotal Studies

The effectiveness of HORIZANT in the treatment of moderate-to-severe primary RLS was demonstrated in two 12-week clinical studies in adults diagnosed with RLS using the International Restless Legs Syndrome Study Group diagnostic criteria. Key diagnostic criteria for RLS are: an urge to move the legs usually accompanied or caused by uncomfortable and unpleasant leg sensations, symptoms begin or worsen during periods of rest or inactivity such as lying or sitting, symptoms are partially or totally relieved by movement such as walking or stretching at least as long as the activity continues, and symptoms are worse or occur only in the evening or night. Patients were required to have a total score of  $\geq 15$  on the International Restless Legs Syndrome (IRLS) Rating Scale at baseline. Patients with RLS secondary to other conditions (e.g., pregnancy, renal failure, iron deficiency anemia) were excluded. In study 1, patients were randomized to receive 1,200 mg of HORIZANT (N = 112) or placebo (N = 108) taken once daily at about 5 PM with food. In study 2, patients were randomized to receive 600 mg of HORIZANT (N = 114), 1,200 mg of HORIZANT (N = 111), or placebo (N = 96) taken once daily at about 5 PM with food.

Efficacy was evaluated using the IRLS Rating Scale and Clinical Global Impression of Improvement (CGI-I) scores. The IRLS Rating Scale contains 10 items designed to assess the severity of sensory and motor symptoms, sleep disturbance, daytime somnolence/sedation, and impact on activities of daily living and mood associated with RLS. The range of scores is 0 to 40,

with 0 being absence of RLS symptoms and 40 the most severe symptoms. The CGI-I Scale allows the investigator to rate the patient's overall change in RLS symptoms since baseline, whether or not in the opinion of the investigator the change is related to study drug treatment. The change from baseline in the IRLS Rating Scale at Week 12 and the proportion of responders on the CGI-I Scale defined as a rating of "much improved" or "very much improved" at Week 12 were co-primary outcomes in these studies.

In these 2 studies, the mean age of patients studied was 50 years (range: 18 to 81 years); 59% of the patients were female. The racial distribution for these studies was as follows: Caucasian, 95%; black, 2%; and other, 3%.

Statistically significant differences ( $P < 0.05$ ) between the treatment groups receiving 600 and 1,200 mg of HORIZANT and the group receiving placebo were observed at Week 12 for both the mean change from baseline in the IRLS Scale total score and the proportion of responders ("much improved" or "very much improved") on the CGI-I Scale as described in Table 3.

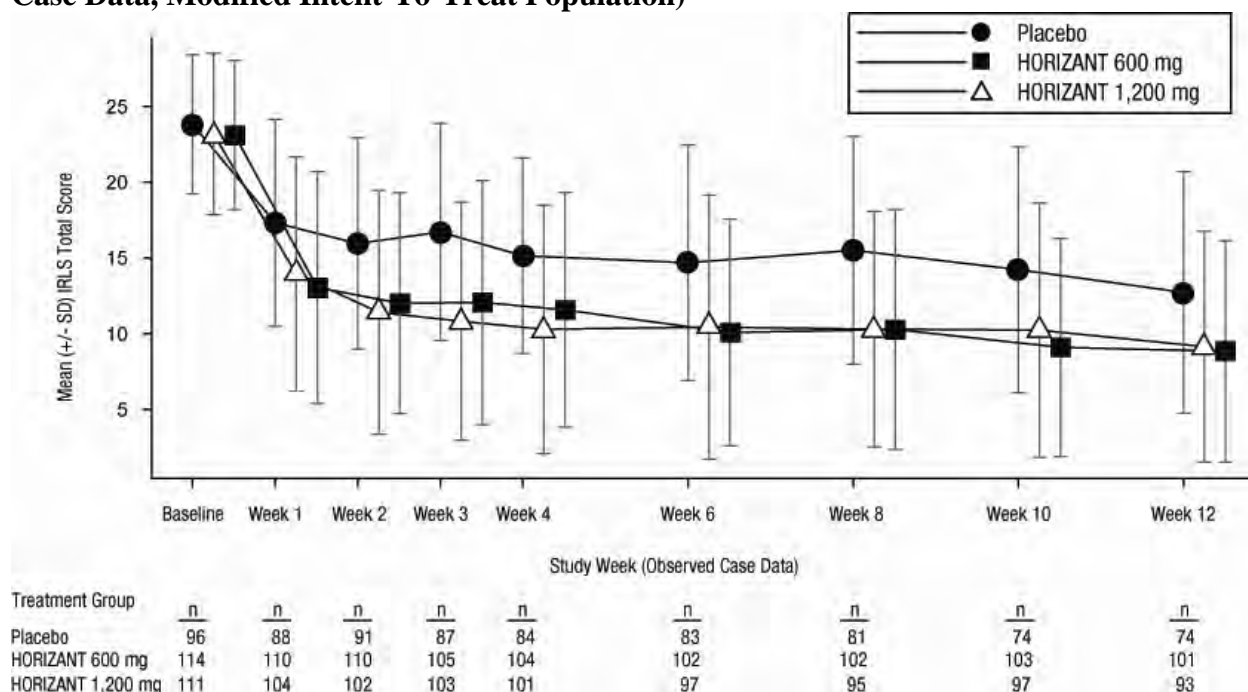
**Table 3. Mean Change in IRLS Scale Total Score and Proportion of Responders on CGI-I Scale at Week 12**

Week 12	Study 1		Study 2		
	HORIZANT 1,200 mg (N = 112)	Placebo (N = 108)	HORIZANT 600 mg (N = 114)	HORIZANT 1,200 mg (N = 111)	Placebo (N = 96)
Mean Change in IRLS Score	-13.2	-8.8	-13.8	-13.0	-9.8
Proportion of Responders <sup>a</sup> on CGI-I	76%	39%	73%	77%	45%

<sup>a</sup> CGI-I Responders = "much improved" and "very much improved."

Figure 1 presents the improvement in mean IRLS Rating Scale total score in patients treated with placebo or 600 or 1,200 mg of HORIZANT over the 12 weeks of treatment in study 2.

**Figure 1. Study 2, Mean ( $\pm$ SD) IRLS Rating Scale Total Score Over 12 Weeks (Observed Case Data, Modified Intent-To-Treat Population)**



## 16 HOW SUPPLIED/STORAGE AND HANDLING

HORIZANT Extended-Release Tablets containing 600 mg of gabapentin enacarbil are white to off-white, with occasional black/grey spots, oval-shaped tablets debossed with “GS LFG”. They are supplied as follows:

- NDC 0173-0806-01: Bottles of 30
- NDC 0173-0806-03: Bottles of 60
- NDC 0173-0806-06: Bottles of 180

Store at 25°C (77°F); excursions permitted 15° to 30°C (59° to 86°F) [see USP Controlled Room Temperature]. Protect from moisture. Do not remove desiccants. Dispense in original bottle.

## 17 PATIENT COUNSELING INFORMATION

*See Medication Guide.*

Physicians should instruct their patients to read the Medication Guide before starting therapy with HORIZANT and to reread it upon prescription renewal for new information regarding the use of HORIZANT.

### 17.1 Effects on Driving

Patients should be told that HORIZANT can cause significant driving impairment. Accordingly, they should be advised not to drive a car or until they have gained sufficient

experience on HORIZANT to assess whether HORIZANT impairs their ability to drive. Patients should be told that it is not known how long this effect lasts.

### **17.2 Somnolence/Sedation and Dizziness**

Patients should be told that HORIZANT can cause significant somnolence and dizziness. This typically resolves within several weeks of initiating treatment. Accordingly, they should be told not to operate dangerous machinery until they have gained sufficient experience on HORIZANT to assess whether HORIZANT impairs their ability to operate dangerous machinery safely.

### **17.3 Suicidal Behavior and Ideation**

Patients, their caregivers, and families should be counseled that HORIZANT may increase the risk of suicidal thoughts and behavior, and should be advised of the need to be alert for the emergence or worsening of symptoms of depression, any unusual changes in mood or behavior, or the emergence of suicidal thoughts, behavior, or thoughts about self-harm. Behaviors of concern should be reported immediately to healthcare providers.

### **17.4 Lack of Interchangeability With Gabapentin**

Patients should be advised that doses of HORIZANT and other gabapentin products are not interchangeable.

### **17.5 Dosing Instructions**

- Patients should be instructed to take HORIZANT only as prescribed.
- HORIZANT should be taken once daily with food at about 5 PM.
- If the dose is not taken at the recommended time, the patient should take the next dose at about 5 PM the following day.
- Tablets should be swallowed whole and should not be cut, crushed, or chewed.

HORIZANT is a trademark of GlaxoSmithKline.

Manufactured by:

Patheon Inc.

Research Triangle Park, NC 27709

for:



GlaxoSmithKline

Research Triangle Park, NC 27709

Licensed from:



XenoPort, Inc.

Santa Clara, CA 95051

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**PHARMACIST—DETACH HERE AND GIVE TO PATIENT**

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**MEDICATION GUIDE**  
**HORIZANT™** [*ho-ri' zant*]  
**(gabapentin enacarbil)**  
**Extended-Release Tablets**

Read this Medication Guide before you start taking HORIZANT and each time you get a refill. There may be new information. This information does not take the place of talking to your healthcare provider about your medical condition or treatment.

**What is the most important information I should know about HORIZANT?**

**HORIZANT can cause serious side effects:**

- 1. Do not drive after taking your dose of HORIZANT until you know how HORIZANT affects you, including the morning after you take your dose.**

**Do not** operate heavy machinery or do other dangerous activities until you know how HORIZANT affects you. HORIZANT can cause sleepiness, dizziness, slow thinking, and can affect your coordination. Ask your healthcare provider when it would be okay to do these activities.

- 2. HORIZANT may cause suicidal thoughts or actions in a very small number of people, about 1 in 500.**

**Call a healthcare provider right away if you have any of these symptoms, especially if they are new, worse, or worry you:**

- thoughts about suicide or dying
- attempt to commit suicide
- new or worse depression
- new or worse anxiety
- feeling agitated
- new or worse restlessness
- panic attacks
- new or worse trouble sleeping (insomnia)
- new or worse irritability
- acting aggressive, being angry, or violent
- acting on dangerous impulses
- an extreme increase in activity and talking (mania)
- other unusual changes in behavior or mood

**How can I watch for early symptoms of suicidal thoughts and actions?**

- Pay attention to any changes, especially sudden changes, in mood, behaviors, thoughts, or feelings.
- Keep all follow-up visits with your healthcare provider as scheduled.
- Call your healthcare provider between visits as needed, especially if you are worried about symptoms.

**Do not stop HORIZANT without first talking to a healthcare provider.**

Suicidal thoughts or actions can be caused by things other than medicines. If you have suicidal thoughts or actions, your healthcare provider may check for other causes.

**What is HORIZANT?**

HORIZANT is a prescription medicine used to treat adults with moderate-to-severe primary Restless Legs Syndrome (RLS).

HORIZANT is not for people who need to sleep during the daytime and need to stay awake at night.

HORIZANT is not the same medicine as gabapentin (for example, NEURONTIN<sup>®</sup> or GRALISE<sup>®</sup>) and should not be used in its place.

It is not known if HORIZANT is safe and effective in children.

**What should I tell my healthcare provider before taking HORIZANT?**

Before taking HORIZANT, tell your healthcare provider if you:

- have or have had kidney problems or are on hemodialysis.
- have or have had depression, mood problems, or suicidal thoughts or behavior.
- if you are pregnant or plan to become pregnant. It is not known if HORIZANT will harm your unborn baby. Talk to your healthcare provider if you are pregnant or plan to become pregnant while taking HORIZANT. You and your healthcare provider will decide if you should take HORIZANT while you are pregnant.
- are breastfeeding or plan to breastfeed. Your body turns HORIZANT into another drug (gabapentin) that passes into your milk. It is not known if this can harm your baby. You and your healthcare provider should decide if you will take HORIZANT or breastfeed.

**Tell your healthcare provider about all the medicines you take**, including prescription and non-prescription medicines, vitamins, and herbal supplements.

Know the medicines you take. Keep a list of them and show it to your healthcare provider and pharmacist when you get a new medicine.

### **How should I take HORIZANT?**

- Take HORIZANT exactly as your healthcare provider tells you to take it.
- Take HORIZANT 1 time each day with food around 5 PM. If you miss your dose, wait and take your usual dose the next day around 5 PM.
- Take HORIZANT tablets whole. **Do not** cut, crush, or chew your tablet.
- If you take too much HORIZANT, call your healthcare provider or go to the nearest hospital emergency room right away.

### **What should I avoid while taking HORIZANT?**

- Do not take other medicines that make you sleepy or dizzy while taking HORIZANT without first talking with your healthcare provider. Taking HORIZANT with medicines that cause sleepiness or dizziness may make your sleepiness or dizziness worse.
- Do not take other gabapentin drugs (for example, NEURONTIN or GRALISE) while you take HORIZANT.

### **What are the possible side effects of HORIZANT?**

- See **“What is the most important information I should know about HORIZANT?”**

The most common side effects of HORIZANT include:

- sleepiness
- dizziness

Tell your healthcare provider if you have any side effect that bothers you or that does not go away.

These are not all the possible side effects of HORIZANT. For more information, ask your healthcare provider or pharmacist.

**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 HORIZANT?**

- Store HORIZANT between 59° and 86°F (15° and 30°C).
- Keep HORIZANT dry and away from moisture.
- Keep HORIZANT tightly closed in the bottle provided to you. Do not remove any moisture control packs that may come in the bottle.

**Keep HORIZANT and all medicines out of the reach of children.**

## General Information about the safe and effective use of HORIZANT

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

This Medication Guide summarizes the most important information about HORIZANT. If you would like more information, talk with your healthcare provider. You can ask your healthcare provider or pharmacist for information about HORIZANT that was written for healthcare professionals.

For more information about HORIZANT, go to [www.gsk.com](http://www.gsk.com) or call 1-888-825-5249.

## What are the ingredients in HORIZANT?

**Active ingredients:** gabapentin enacarbil

**Inactive ingredients:** colloidal silicon dioxide, dibasic calcium phosphate dihydrate, glyceryl behenate, magnesium stearate, sodium lauryl sulfate, and talc.

## This Medication Guide has been approved by the U.S. Food and Drug Administration.

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Research Triangle Park, NC 27709

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