

**RANITIDINE HYDROCHLORIDE- ranitidine hydrochloride solution**  
**Precision Dose Inc.**

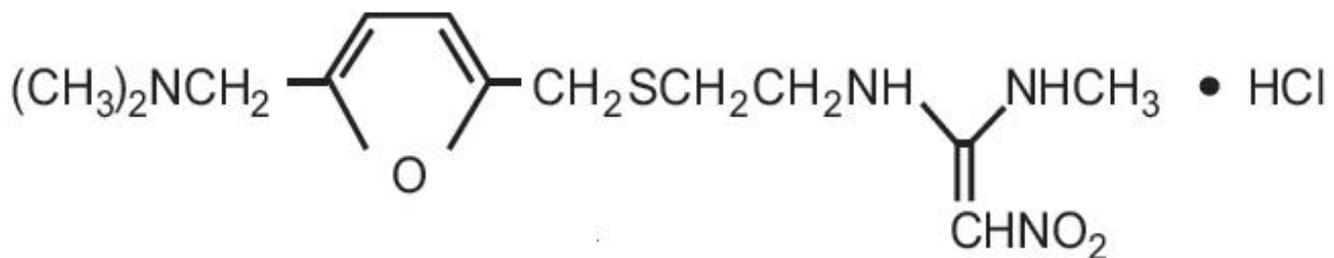
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**Ranitidine Syrup**  
**(Ranitidine Oral Solution, USP)**

**150 mg/10 mL**

**Rx Only**

**DESCRIPTION**

The active ingredient in Ranitidine Oral Solution, USP is ranitidine hydrochloride (HCl), USP, a histamine H<sub>2</sub>-receptor antagonist. Chemically it is N[2-[[[5-[(dimethylamino)methyl]-2-furanyl]methyl]thio]ethyl]-N'-methyl-2-nitro-1,1-ethenediamine, HCl. It has the following structure:



The empirical formula is  $\text{C}_{13}\text{H}_{22}\text{N}_4\text{O}_3\text{S}\cdot\text{HCl}$ , representing a molecular weight of 350.87. Ranitidine HCl, USP is a white to pale yellow, granular substance that is soluble in water. It has a slightly bitter taste and sulfurlike odor.

Each 1 mL of Ranitidine Oral Solution, USP contains 16.8 mg of ranitidine HCl, USP equivalent to 15 mg of ranitidine. Ranitidine Oral Solution, USP also contains the inactive ingredients butylparaben, dibasic sodium phosphate, hypromellose, monobasic sodium phosphate, natural peppermint extract, propylene glycol, propylparaben, purified water, saccharin sodium, sodium chloride, and sorbitol solution.

**CLINICAL PHARMACOLOGY**

Ranitidine hydrochloride is a competitive, reversible inhibitor of the action of histamine at the histamine H<sub>2</sub>-receptors, including receptors on the gastric cells. Ranitidine hydrochloride does not lower serum  $\text{Ca}^{++}$  in hypercalcemic states. Ranitidine hydrochloride is not an anticholinergic agent.

**Pharmacokinetics**

**Absorption**

Ranitidine hydrochloride is 50% absorbed after oral administration, compared to an intravenous (IV) injection with mean peak levels of 440 to 545 ng/mL occurring 2 to 3 hours after a 150-mg dose. The oral solution formulation is bioequivalent to the tablets. Absorption is not significantly impaired by the administration of food or antacids. Propantheline slightly delays and increases peak blood levels of ranitidine, probably by delaying gastric emptying and transit time. In one study, simultaneous administration of high-potency antacid (150 mmol) in fasting subjects has been reported to decrease the absorption of ranitidine hydrochloride.

## Distribution

The volume of distribution is about 1.4 L/kg. Serum protein binding averages 15%.

## Metabolism

In humans, the N-oxide is the principal metabolite in the urine; however, this amounts to <4% of the dose. Other metabolites are the S-oxide (1%) and the desmethyl ranitidine (1%). The remainder of the administered dose is found in the stool. Studies in patients with hepatic dysfunction (compensated cirrhosis) indicate that there are minor, but clinically insignificant, alterations in ranitidine half-life, distribution, clearance, and bioavailability.

## Excretion

The principal route of excretion is the urine, with approximately 30% of the orally administered dose collected in the urine as unchanged drug in 24 hours. Renal clearance is about 410 mL/min, indicating active tubular excretion. The elimination half-life is 2.5 to 3 hours. Four patients with clinically significant renal function impairment (creatinine clearance 25 to 35 mL/min) administered 50 mg of ranitidine intravenously had an average plasma half-life of 4.8 hours, a ranitidine clearance of 29 mL/min, and a volume of distribution of 1.76 L/kg. In general, these parameters appear to be altered in proportion to creatinine clearance (see DOSAGE AND ADMINISTRATION).

## Geriatrics

The plasma half-life is prolonged and total clearance is reduced in the elderly population due to a decrease in renal function. The elimination half-life is 3 to 4 hours. Peak levels average 526 ng/mL following a 150-mg twice-daily dose and occur in about 3 hours (see PRECAUTIONS: Geriatric Use and DOSAGE AND ADMINISTRATION: Dosage Adjustment for Patients With Impaired Renal Function).

## Pediatrics

There are no significant differences in the pharmacokinetic parameter values for ranitidine in pediatric patients (from 1 month up to 16 years of age) and healthy adults when correction is made for body weight. The average bioavailability of ranitidine given orally to pediatric patients is 48% which is comparable to the bioavailability of ranitidine in the adult population. All other pharmacokinetic parameter values ( $t_{1/2}$ ,  $V_d$ , and  $CL$ ) are similar to those observed with intravenous ranitidine use in pediatric patients. Estimates of  $C_{max}$  and  $T_{max}$  are displayed in Table 1.

**Table 1. Ranitidine Pharmacokinetics in Pediatric Patients Following Oral Dosing**

<b>Population (age)</b>	<b>n</b>	<b>Dosage Form (dose)</b>	<b><math>C_{max}</math> (ng/mL)</b>	<b><math>T_{max}</math> (hours)</b>
Gastric or duodenal ulcer (3.5 to 16 years)	12	Tablets (1 to 2 mg/kg)	54 to 492	2
Otherwise healthy requiring Ranitidine Oral Solution (0.7 to 14 years, Single dose)	10	Oral Solution (2 mg/kg)	244	1.61
Otherwise healthy requiring Ranitidine Oral Solution (0.7 to 14 years, Multiple dose)	10	Oral Solution (2 mg/kg)	320	1.66

Plasma clearance measured in 2 neonatal patients (less than 1 month of age) was considerably lower (3 mL/min/kg) than children or adults and is likely due to reduced renal function observed in this population (see PRECAUTIONS: Pediatric Use and DOSAGE AND ADMINISTRATION: Pediatric Use).

## Pharmacodynamics

Serum concentrations necessary to inhibit 50% of stimulated gastric acid secretion are estimated to be 36 to 94 ng/mL. Following a single oral dose of 150 mg, serum concentrations of ranitidine are in this range up to 12 hours. However, blood levels bear no consistent relationship to dose or degree of acid inhibition.

### Antisecretory Activity

#### 1. Effects on Acid Secretion

Ranitidine Oral Solution inhibits both daytime and nocturnal basal gastric acid secretions as well as gastric acid secretion stimulated by food, betazole, and pentagastrin, as shown in Table 2.

**Table 2. Effect of Ranitidine Oral Solution on Gastric Acid Secretion**

	Time After Dose, hours	% Inhibition of Gastric Acid Output by Dose, mg			
		75 to 80	100	150	200
Basal	Up to 4		99	95	
Nocturnal	Up to 13	95	96	92	
Betazole	Up to 3		97	99	
Pentagastrin	Up to 5	58	72	72	80
Meal	Up to 3		73	79	95
Basal	Up to 4	75 to 80	100	150	200

It appears that basal-, nocturnal-, and betazole-stimulated secretions are most sensitive to inhibition by Ranitidine Oral Solution, responding almost completely to doses of 100 mg or less, while pentagastrin- and food-stimulated secretions are more difficult to suppress.

#### 2. Effects on Other Gastrointestinal Secretions

##### Pepsin

Ranitidine Oral Solution does not affect pepsin secretion. Total pepsin output is reduced in proportion to the decrease in volume of gastric juice.

##### Intrinsic Factor

Ranitidine Oral Solution has no significant effect on pentagastrin-stimulated intrinsic factor secretion.

##### Serum Gastrin

Ranitidine Oral Solution has little or no effect on fasting or postprandial serum gastrin.

##### Other Pharmacologic Actions

1. Gastric bacterial flora—increase in nitrate-reducing organisms, significance not known.
2. Prolactin levels—no effect in recommended oral or intravenous (IV) dosage, but small, transient, dose-related increases in serum prolactin have been reported after IV bolus injections of 100 mg or more.
3. Other pituitary hormones—no effect on serum gonadotropins, TSH, or GH. Possible impairment of vasopressin release.
4. No change in cortisol, aldosterone, androgen, or estrogen levels.
5. No antiandrogenic action.

6. No effect on count, motility, or morphology of sperm.

## Pediatrics

Oral doses of 6 to 10 mg/kg per day in 2 or 3 divided doses maintain gastric pH>4 throughout most of the dosing interval.

## Clinical Trials

### Active Duodenal Ulcer

In a multicenter, double-blind, controlled, US study of endoscopically diagnosed duodenal ulcers, earlier healing was seen in the patients treated with Ranitidine Oral Solution as shown in Table 3.

**Table 3. Duodenal Ulcer Patient Healing Rates**

	Ranitidine Oral Solution*		Placebo*	
	Number Entered	Healed/Evaluable	Number Entered	Healed/Evaluable
Outpatients	195	69/182	188	31/164
Week 2		(38%) <sup>†</sup>		(19%)
Week 4		137/187		76/168
		(73%) <sup>†</sup>		(45%)

\* All patients were permitted antacids as needed for relief of pain.

<sup>†</sup>  $P < 0.0001$ .

In these studies, patients treated with Ranitidine Oral Solution reported a reduction in both daytime and nocturnal pain, and they also consumed less antacid than the placebo-treated patients.

**Table 4. Mean Daily Doses of Antacid**

	Ulcer Healed	Ulcer Not Healed
Ranitidine Oral Solution	0.06	0.71
Placebo	0.71	1.43

Foreign studies have shown that patients heal equally well with 150 mg twice daily and 300 mg at bedtime (85% versus 84%, respectively) during a usual 4-week course of therapy. If patients require extended therapy of 8 weeks, the healing rate may be higher for 150 mg twice daily as compared to 300 mg at bedtime (92% versus 87%, respectively).

Studies have been limited to short-term treatment of acute duodenal ulcer. Patients whose ulcers healed during therapy had recurrences of ulcers at the usual rates.

### Maintenance Therapy in Duodenal Ulcer

Ranitidine has been found to be effective as maintenance therapy for patients following healing of acute duodenal ulcers. In 2 independent, double-blind, multicenter, controlled trials, the number of duodenal ulcers observed was significantly less in patients treated with Ranitidine Oral Solution (150 mg at bedtime) than in patients treated with placebo over a 12-month period.

**Table 5. Duodenal Ulcer Prevalence**

Double-Blind, Multicenter, Placebo-Controlled Trials					
Multicenter Trial	Drug	Duodenal Ulcer Prevalence			No. of Patients
		0 to 4	0 to 8	0 to 12	

		<b>Months</b>	<b>Months</b>	<b>Months</b>	
USA	RAN	20%*	24%*	35%*	138
	PLC	44%	54%	59%	139
Foreign	RAN	12%*	21%*	28%*	174
	PLC	56%	64%	68%	165

% = Life table estimate.

RAN = ranitidine (Ranitidine Oral Solution).

PLC = placebo.

\* =  $P < 0.05$  (Ranitidine Oral Solution versus comparator).

As with other H<sub>2</sub>-antagonists, the factors responsible for the significant reduction in the prevalence of duodenal ulcers include prevention of recurrence of ulcers, more rapid healing of ulcers that may occur during maintenance therapy, or both.

### Gastric Ulcer

In a multicenter, double-blind, controlled, US study of endoscopically diagnosed gastric ulcers, earlier healing was seen in the patients treated with Ranitidine Oral Solution as shown in Table 6.

**Table 6. Gastric Ulcer Patient Healing Rates**

	<b>Ranitidine Oral Solution*</b>		<b>Placebo*</b>	
	<b>Number Entered</b>	<b>Healed/Evaluable</b>	<b>Number Entered</b>	<b>Healed/Evaluable</b>
Outpatients	92	16/83	94	10/83
Week 2		(19%)		(12%)
Week 6		50/73 (68%) <sup>†</sup>		35/69 (51%)

\* All patients were permitted antacids as needed for relief of pain.

†  $P = 0.009$ .

In this multicenter trial, significantly more patients treated with Ranitidine Oral Solution became pain free during therapy.

### Maintenance of Healing of Gastric Ulcers

In 2 multicenter, double-blind, randomized, placebo-controlled, 12-month trials conducted in patients whose gastric ulcers had been previously healed, Ranitidine Oral Solution 150 mg at bedtime was significantly more effective than placebo in maintaining healing of gastric ulcers.

### Pathological Hypersecretory Conditions (such as Zollinger-Ellison syndrome)

Ranitidine hydrochloride inhibits gastric acid secretion and reduces occurrence of diarrhea, anorexia, and pain in patients with pathological hypersecretion associated with Zollinger-Ellison syndrome, systemic mastocytosis, and other pathological hypersecretory conditions (e.g., postoperative, "short-gut" syndrome, idiopathic). Use of Ranitidine Oral Solution was followed by healing of ulcers in 8 of 19 (42%) patients who were intractable to previous therapy.

### Gastroesophageal Reflux Disease (GERD)

In 2 multicenter, double-blind, placebo-controlled, 6-week trials performed in the United States and Europe, Ranitidine Oral Solution 150 mg twice daily was more effective than placebo for the relief of heartburn and other symptoms associated with GERD. Ranitidine-treated patients consumed significantly less antacid than did placebo-treated patients.

The US trial indicated that Ranitidine Oral Solution 150 mg twice daily significantly reduced the

frequency of heartburn attacks and severity of heartburn pain within 1 to 2 weeks after starting therapy. The improvement was maintained throughout the 6-week trial period. Moreover, patient response rates demonstrated that the effect on heartburn extends through both the day and night time periods.

In 2 additional US multicenter, double-blind, placebo-controlled, 2-week trials, Ranitidine Oral Solution 150 mg twice daily was shown to provide relief of heartburn pain within 24 hours of initiating therapy and a reduction in the frequency of severity of heartburn.

### Erosive Esophagitis

In 2 multicenter, double-blind, randomized, placebo-controlled, 12-week trials performed in the United States, Ranitidine Oral Solution 150 mg 4 times daily was significantly more effective than placebo in healing endoscopically diagnosed erosive esophagitis and in relieving associated heartburn. The erosive esophagitis healing rates were as follows:

**Table 7. Erosive Esophagitis Patient Healing Rates**

	Healed/Evaluable	
	Placebo* n=229	Ranitidine Oral Solution 150 mg 4 times daily* n=215
Week 4	43/198 (22%)	96/206 (47%) <sup>†</sup>
Week 8	63/176 (36%)	142/200 (71%) <sup>†</sup>
Week 12	92/159 (58%)	162/192 (84%) <sup>†</sup>

\* All patients were permitted antacids as needed for relief of pain.

<sup>†</sup>  $P < 0.001$  versus placebo.

No additional benefit in healing of esophagitis or in relief of heartburn was seen with a ranitidine dose of 300 mg 4 times daily.

### Maintenance of Healing of Erosive Esophagitis

In 2 multicenter, double-blind, randomized, placebo-controlled, 48-week trials conducted in patients whose erosive esophagitis had been previously healed, Ranitidine Oral Solution 150 mg twice daily was significantly more effective than placebo in maintaining healing of erosive esophagitis.

## INDICATIONS AND USAGE

Ranitidine Oral Solution, USP is indicated in:

1. Short-term treatment of active duodenal ulcer. Most patients heal within 4 weeks. Studies available to date have not assessed the safety of ranitidine in uncomplicated duodenal ulcer for periods of more than 8 weeks.
2. Maintenance therapy for duodenal ulcer patients at reduced dosage after healing of acute ulcers. No placebo-controlled comparative studies have been carried out for periods of longer than 1 year.
3. The treatment of pathological hypersecretory conditions (e.g., Zollinger-Ellison syndrome and systemic mastocytosis).
4. Short-term treatment of active, benign gastric ulcer. Most patients heal within 6 weeks and the usefulness of further treatment has not been demonstrated. Studies available to date have not assessed the safety of ranitidine in uncomplicated, benign gastric ulcer for periods of more than 6 weeks.
5. Maintenance therapy for gastric ulcer patients at reduced dosage after healing of acute ulcers. Placebo-controlled studies have been carried out for 1 year.
6. Treatment of GERD. Symptomatic relief commonly occurs within 24 hours after starting therapy with Ranitidine Oral Solution, USP 150 mg twice daily.

7. Treatment of endoscopically diagnosed erosive esophagitis. Symptomatic relief of heartburn commonly occurs within 24 hours of therapy initiation with Ranitidine Oral Solution, USP 150 mg 4 times daily.
8. Maintenance of healing of erosive esophagitis. Placebo-controlled trials have been carried out for 48 weeks.

Concomitant antacids should be given as needed for pain relief to patients with active duodenal ulcer; active, benign gastric ulcer; hypersecretory states; GERD; and erosive esophagitis.

## **CONTRAINDICATIONS**

Ranitidine Oral Solution, USP is contraindicated for patients known to have hypersensitivity to the drug or any of the ingredients (see PRECAUTIONS).

## **PRECAUTIONS**

### **General**

1. Symptomatic response to therapy with Ranitidine Oral Solution does not preclude the presence of gastric malignancy.
2. Since ranitidine hydrochloride is excreted primarily by the kidney, dosage should be adjusted in patients with impaired renal function (see DOSAGE AND ADMINISTRATION). Caution should be observed in patients with hepatic dysfunction since ranitidine hydrochloride is metabolized in the liver.
3. Rare reports suggest that ranitidine hydrochloride may precipitate acute porphyric attacks in patients with acute porphyria. Ranitidine hydrochloride should therefore be avoided in patients with a history of acute porphyria.

### **Laboratory Tests**

False-positive tests for urine protein with MULTISTIX<sup>®</sup> may occur during therapy with Ranitidine Oral Solution, and therefore testing with sulfosalicylic acid is recommended.

### **Drug Interactions**

Ranitidine has been reported to affect the bioavailability of other drugs through several different mechanisms such as competition for renal tubular secretion, alteration of gastric pH, and inhibition of cytochrome P450 enzymes.

#### **Procainamide**

Ranitidine, a substrate of the renal organic cation transport system, may affect the clearance of other drugs eliminated by this route. High doses of ranitidine (e.g., such as those used in the treatment of Zollinger-Ellison syndrome) have been shown to reduce the renal excretion of procainamide and N-acetylprocainamide resulting in increased plasma levels of these drugs. Although this interaction is unlikely to be clinically relevant at usual ranitidine doses, it may be prudent to monitor for procainamide toxicity when administered with oral ranitidine at a dose exceeding 300 mg per day.

#### **Warfarin**

There have been reports of altered prothrombin time among patients on concomitant warfarin and ranitidine therapy. Due to the narrow therapeutic index, close monitoring of increased or decreased prothrombin time is recommended during concurrent treatment with ranitidine.

Ranitidine may alter the absorption of drugs in which gastric pH is an important determinant of bioavailability. This can result in either an increase in absorption (e.g., triazolam, midazolam, glipizide) or a decrease in absorption (e.g., ketoconazole, atazanavir, delavirdine, gefitinib). Appropriate clinical

monitoring is recommended.

#### Atazanavir

Atazanavir absorption may be impaired based on known interactions with other agents that increase gastric pH. Use with caution. See atazanavir label for specific recommendations.

#### Delavirdine

Delavirdine absorption may be impaired based on known interactions with other agents that increase gastric pH. Chronic use of H<sub>2</sub>-receptor antagonists with delavirdine is not recommended.

#### Gefitinib

Gefitinib exposure was reduced by 44% with the co-administration of ranitidine and sodium bicarbonate (dosed to maintain gastric pH above 5.0). Use with caution.

#### Glipizide

In diabetic patients, glipizide exposure was increased by 34% following a single 150-mg dose of oral ranitidine. Use appropriate clinical monitoring when initiating or discontinuing ranitidine.

#### Ketoconazole

Oral ketoconazole exposure was reduced by up to 95% when oral ranitidine was co-administered in a regimen to maintain a gastric pH of 6 or above. The degree of interaction with usual dose of ranitidine (150 mg twice daily) is unknown.

#### Midazolam

Oral midazolam exposure in 5 healthy volunteers was increased by up to 65% when administered with oral ranitidine at a dose of 150 mg twice daily. However, in another interaction study in 8 volunteers receiving IV midazolam, a 300 mg oral dose of ranitidine increased midazolam exposure by about 9%. Monitor patients for excessive or prolonged sedation when ranitidine is co-administered with oral midazolam.

#### Triazolam

Triazolam exposure in healthy volunteers was increased by approximately 30% when administered with oral ranitidine at a dose of 150 mg twice daily. Monitor patients for excessive or prolonged sedation.

### **Carcinogenesis, Mutagenesis, Impairment of Fertility**

There was no indication of tumorigenic or carcinogenic effects in life-span studies in mice and rats at dosages up to 2,000 mg/kg/day.

Ranitidine was not mutagenic in standard bacterial tests (*Salmonella*, *Escherichia coli*) for mutagenicity at concentrations up to the maximum recommended for these assays.

In a dominant lethal assay, a single oral dose of 1,000 mg/kg to male rats was without effect on the outcome of 2 matings per week for the next 9 weeks.

### **Pregnancy**

#### Teratogenic Effects

#### *Pregnancy Category B*

Reproduction studies have been performed in rats and rabbits at doses up to 160 times the human dose and have revealed no evidence of impaired fertility or harm to the fetus due to Ranitidine Oral Solution. 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**

Ranitidine hydrochloride is secreted in human milk. Caution should be exercised when Ranitidine Oral Solution is administered to a nursing mother.

### **Pediatric Use**

The safety and effectiveness of Ranitidine Oral Solution have been established in the age-group of 1 month to 16 years for the treatment of duodenal and gastric ulcers, gastroesophageal reflux disease and erosive esophagitis, and the maintenance of healed duodenal and gastric ulcer. Use of Ranitidine Oral Solution in this age-group is supported by adequate and well-controlled studies in adults, as well as additional pharmacokinetic data in pediatric patients and an analysis of the published literature (see CLINICAL PHARMACOLOGY: Pediatrics and DOSAGE AND ADMINISTRATION: Pediatric Use).

Safety and effectiveness in pediatric patients for the treatment of pathological hypersecretory conditions or the maintenance of healing of erosive esophagitis have not been established.

Safety and effectiveness in neonates (less than 1 month of age) have not been established (see CLINICAL PHARMACOLOGY: Pediatrics).

### **Geriatric Use**

Of the total number of subjects enrolled in US and foreign controlled clinical trials of oral formulations of ranitidine hydrochloride, for which there were subgroup analyses, 4,197 were 65 and over, while 899 were 75 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.

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, caution should be exercised in dose selection, and it may be useful to monitor renal function (see CLINICAL PHARMACOLOGY: Pharmacokinetics: Geriatrics and DOSAGE AND ADMINISTRATION: Dosage Adjustment for Patients With Impaired Renal Function).

## **ADVERSE REACTIONS**

The following have been reported as events in clinical trials or in the routine management of patients treated with Ranitidine Oral Solution.

The relationship to therapy with Ranitidine Oral Solution has been unclear in many cases. Headache, sometimes severe, seems to be related to administration of Ranitidine Oral Solution.

**Central Nervous System:** Rarely, malaise, dizziness, somnolence, insomnia, and vertigo. Rare cases of reversible mental confusion, agitation, depression, and hallucinations have been reported, predominantly in severely ill elderly patients. Rare cases of reversible blurred vision suggestive of a change in accommodation have been reported. Rare reports of reversible involuntary motor disturbances have been received.

**Cardiovascular:** As with other H<sub>2</sub>-blockers, rare reports of arrhythmias such as tachycardia, bradycardia, atrioventricular block, and premature ventricular beats.

**Gastrointestinal:** Constipation, diarrhea, nausea/vomiting, abdominal discomfort/pain, and rare reports of pancreatitis.

**Hepatic:** There have been occasional reports of hepatocellular, cholestatic, or mixed hepatitis, with or

without jaundice. In such circumstances, ranitidine should be immediately discontinued. These events are usually reversible, but in rare circumstances death has occurred. Rare cases of hepatic failure have also been reported. In normal volunteers, SGPT values were increased to at least twice the pretreatment levels in 6 of 12 subjects receiving 100 mg intravenously 4 times daily for 7 days, and in 4 of 24 subjects receiving 50 mg intravenously 4 times daily for 5 days.

**Musculoskeletal:** Rare reports of arthralgias and myalgias.

**Hematologic:** Blood count changes (leukopenia, granulocytopenia, and thrombocytopenia) have occurred in a few patients. These were usually reversible. Rare cases of agranulocytosis, pancytopenia, sometimes with marrow hypoplasia, and aplastic anemia and exceedingly rare cases of acquired immune hemolytic anemia have been reported.

**Endocrine:** Controlled studies in animals and man have shown no stimulation of any pituitary hormone by ranitidine hydrochloride and no antiandrogenic activity, and cimetidine-induced gynecomastia and impotence in hypersecretory patients have resolved when Ranitidine Oral Solution has been substituted. However, occasional cases of impotence and loss of libido have been reported in male patients receiving Ranitidine Oral Solution, but the incidence did not differ from that in the general population. Rare cases of breast symptoms and conditions, including galactorrhea and gynecomastia, have been reported in both males and females.

**Integumentary:** Rash, including rare cases of erythema multiforme. Rare cases of alopecia and vasculitis.

**Respiratory:** A large epidemiological study suggested an increased risk of developing pneumonia in current users of histamine-2-receptor antagonists (H<sub>2</sub>RAs) compared to patients who had stopped H<sub>2</sub>RA treatment, with an observed adjusted relative risk of 1.63 (95% CI, 1.07 to 2.48). However, a causal relationship between use of H<sub>2</sub>RAs and pneumonia has not been established.

**Other:** Rare cases of hypersensitivity reactions (e.g., bronchospasm, fever, rash, eosinophilia), anaphylaxis, angioneurotic edema, acute interstitial nephritis and small increases in serum creatinine.

## OVERDOSAGE

There has been limited experience with overdosage. Reported acute ingestions of up to 18 g orally have been associated with transient adverse effects similar to those encountered in normal clinical experience (see ADVERSE REACTIONS). In addition, abnormalities of gait and hypotension have been reported.

When overdosage occurs, the usual measures to remove unabsorbed material from the gastrointestinal tract, clinical monitoring, and supportive therapy should be employed.

Studies in dogs receiving dosages of Ranitidine Oral Solution in excess of 225 mg/kg/day have shown muscular tremors, vomiting, and rapid respiration. Single oral doses of 1,000 mg/kg in mice and rats were not lethal. Intravenous LD<sub>50</sub> values in mice and rats were 77 and 83 mg/kg, respectively.

## DOSAGE AND ADMINISTRATION

### Active Duodenal Ulcer

The current recommended adult dosage of Ranitidine Oral Solution, USP for duodenal ulcer is 150 mg or 10 mL of oral solution (2 teaspoonfuls of solution equivalent to 150 mg of ranitidine) twice daily. An alternative dosage of 300 mg or 20 mL of oral solution (4 teaspoonfuls of solution equivalent to 300 mg of ranitidine) once daily after the evening meal or at bedtime can be used for patients in whom dosing convenience is important. The advantages of one treatment regimen compared to the other in a particular patient population have yet to be demonstrated (see Clinical Trials: Active Duodenal Ulcer). Smaller doses have been shown to be equally effective in inhibiting gastric acid secretion in US

studies, and several foreign trials have shown that 100 mg twice daily is as effective as the 150-mg dose.

Antacid should be given as needed for relief of pain (see CLINICAL PHARMACOLOGY: Pharmacokinetics).

### **Maintenance of Healing of Duodenal Ulcers**

The current recommended adult dosage is 150 mg or 10 mL of Ranitidine Oral Solution, USP (2 teaspoonfuls of solution equivalent to 150 mg of ranitidine) at bedtime.

### **Pathological Hypersecretory Conditions (such as Zollinger-Ellison syndrome)**

The current recommended adult dosage is 150 mg or 10 mL of Ranitidine Oral Solution, USP (2 teaspoonfuls of solution equivalent to 150 mg of ranitidine) twice daily. In some patients it may be necessary to administer Ranitidine Oral Solution, USP 150-mg doses more frequently. Dosages should be adjusted to individual patient needs, and should continue as long as clinically indicated. Dosages up to 6 g/day have been employed in patients with severe disease.

### **Benign Gastric Ulcer**

The current recommended adult oral dosage is 150 mg or 10 mL of Ranitidine Oral Solution, USP (2 teaspoonfuls of solution equivalent to 150 mg of ranitidine) twice daily.

### **Maintenance of Healing of Gastric Ulcers**

The current recommended adult oral dosage is 150 mg or 10 mL of Ranitidine Oral Solution, USP (2 teaspoonfuls of solution equivalent to 150 mg of ranitidine) at bedtime.

### **GERD**

The current recommended adult oral dosage is 150 mg or 10 mL of Ranitidine Oral Solution, USP (2 teaspoonfuls of solution equivalent to 150 mg of ranitidine) twice daily.

### **Erosive Esophagitis**

The current recommended adult oral dosage is 150 mg or 10 mL of Ranitidine Oral Solution, USP (2 teaspoonfuls of solution equivalent to 150 mg of ranitidine) 4 times daily.

### **Maintenance of Healing of Erosive Esophagitis**

The current recommended adult oral dosage is 150 mg or 10 mL of Ranitidine Oral Solution, USP (2 teaspoonfuls of solution equivalent to 150 mg of ranitidine) twice daily.

### **Pediatric Use**

The safety and effectiveness of Ranitidine Oral Solution, USP have been established in the age-group of 1 month to 16 years. There is insufficient information about the pharmacokinetics of ranitidine hydrochloride, USP in neonatal patients (less than 1 month of age) to make dosing recommendations.

The following 3 subsections provide dosing information for each of the pediatric indications.

#### **Treatment of Duodenal and Gastric Ulcers**

The recommended oral dose for the treatment of active duodenal and gastric ulcers is 2 to 4 mg/kg twice daily to a maximum of 300 mg/day. This recommendation is derived from adult clinical studies and pharmacokinetic data in pediatric patients.

#### **Maintenance of Healing of Duodenal and Gastric Ulcers**

The recommended oral dose for the maintenance of healing of duodenal and gastric ulcers is 2 to 4

mg/kg once daily to a maximum of 150 mg/day. This recommendation is derived from adult clinical studies and pharmacokinetic data in pediatric patients.

#### Treatment of GERD and Erosive Esophagitis

Although limited data exist for these conditions in pediatric patients, published literature supports a dosage of 5 to 10 mg/kg/day, usually given as 2 divided doses.

#### **Dosage Adjustment for Patients With Impaired Renal Function**

On the basis of experience with a group of subjects with severely impaired renal function treated with ranitidine hydrochloride USP, the recommended dosage in patients with a creatinine clearance <50 mL/min is 150 mg or 10 mL of Ranitidine Oral Solution, USP (2 teaspoonfuls of solution equivalent to 150 mg of ranitidine) every 24 hours. Should the patient's condition require, the frequency of dosing may be increased to every 12 hours or even further with caution. Hemodialysis reduces the level of circulating ranitidine. Ideally, the dosing schedule should be adjusted so that the timing of a scheduled dose coincides with the end of hemodialysis.

Elderly patients are more likely to have decreased renal function, therefore caution should be exercised in dose selection, and it may be useful to monitor renal function (see CLINICAL PHARMACOLOGY: Pharmacokinetics: Geriatrics and PRECAUTIONS: Geriatric Use).

#### **HOW SUPPLIED**

Ranitidine Oral Solution USP, a clear peppermint flavored liquid, contains 16.8 mg of ranitidine HCl, USP equivalent to 15 mg of ranitidine per 1 mL (75 mg/5 mL).

NDC 68094-204-61

10 mL per unit dose cup

One hundred (100) cups per shipper

NDC 68094-204-62

10 mL per unit dose cup

Thirty (30) cups per shipper

**Store between 4° and 25°C (39° and 77°F). Dispense in tight, light-resistant containers as defined in the USP/NF. Do not freeze.**

MULTISTIX is a registered trademark of Bayer Healthcare LLC.

Manufactured by:

**Amneal Pharmaceuticals**

Branchburg, NJ 08876

Distributed by:

**Amneal Pharmaceuticals**

Glasgow, KY 42141

Packaged by:

**Precision Dose, Inc.**

South Beloit, IL 61080

LI807 Rev. 04/16

#### **PRINCIPAL DISPLAY PANEL - 1 mL Syringe Label**

**RANITIDINE**

**Oral Solution, USP**

15 mg/mL Delivers 1 mL

Each mL contains 16.8 mg of ranitidine  
HCl equivalent to 15 mg of ranitidine.

Store at 20°-25°C (68°-77°F)

**For Oral Use Only**



**PRINCIPAL DISPLAY PANEL - 5 mL Syringe Label**

NDC# 68094-205-58

**RANITIDINE Oral Solution, USP 75 mg/5 mL**

Each mL contains 16.8 mg of ranitidine  
HCl equivalent to 15 mg of ranitidine.

Delivers 5mL

Store at 20°-25°C (68°-77°F)

Pkg: Precision Dose, Inc. S. Beloit, IL 61080

LSY831 Rev. 09/10

**Rx Only**

**For Oral Use Only**



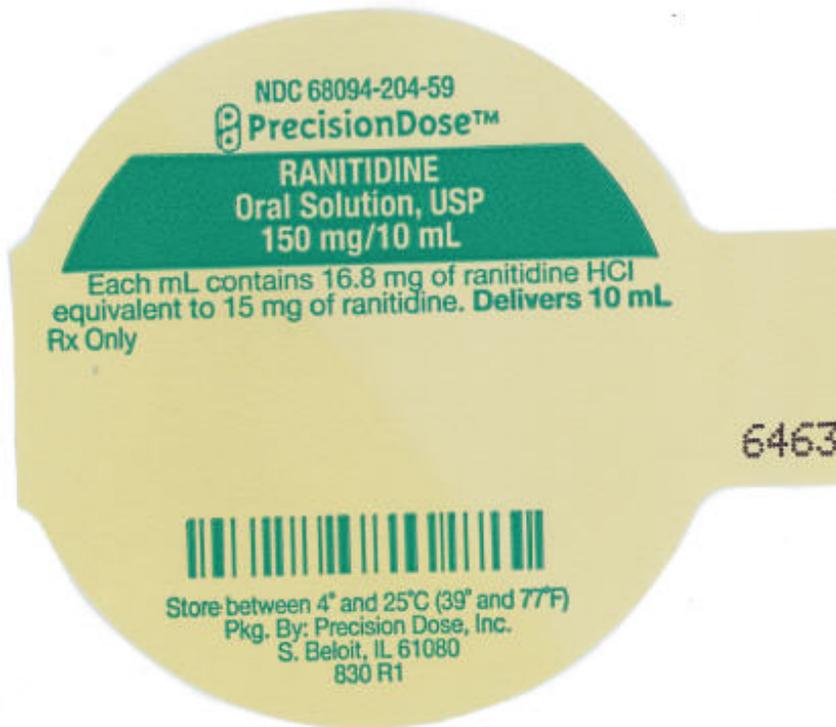
**PRINCIPAL DISPLAY PANEL - 10 mL Cup Label**

**NDC 68094-204-59**  
**PrecisionDose™**

**RANITIDINE**  
**Oral Solution, USP**  
**150 mg/10 mL**

Each mL contains 16.8 mg of ranitidine HCl  
equivalent to 15 mg of ranitidine. **Delivers 10 mL**  
Rx Only

Store between 4° and 25°C (39° and 77°F)  
Pkg. By: Precision Dose, Inc.  
S. Beloit, IL 61080  
830 R1



## RANITIDINE HYDROCHLORIDE

ranitidine hydrochloride solution

### Product Information

<b>Product Type</b>	HUMAN PRESCRIPTION DRUG	<b>Item Code (Source)</b>	NDC:68094-316
<b>Route of Administration</b>	ORAL		

### Active Ingredient/Active Moiety

Ingredient Name	Basis of Strength	Strength
<b>Ranitidine Hydrochloride</b> (UNII: BK76465IHM) (Ranitidine - UNII:884KT10YB7)	Ranitidine	15 mg in 1 mL

### Inactive Ingredients

Ingredient Name	Strength
<b>butylparaben</b> (UNII: 3QPIU3FV8)	
<b>sodium phosphate, dibasic, unspecified form</b> (UNII: GR686LBA74)	
<b>hypromellose, unspecified</b> (UNII: 3NXW29V3WO)	
<b>sodium phosphate, monobasic, unspecified form</b> (UNII: 3980JIH2SW)	
<b>propylene glycol</b> (UNII: 6DC9Q167V3)	
<b>propylparaben</b> (UNII: Z8IX2SC1OH)	
<b>water</b> (UNII: 059QF0KO0R)	
<b>saccharin sodium</b> (UNII: SB8ZUX40TY)	
<b>sodium chloride</b> (UNII: 451W47IQ8X)	
<b>sorbitol</b> (UNII: 506T60A25R)	

## Product Characteristics

Color		Score	
Shape		Size	
Flavor	PEPPERMINT	Imprint Code	
Contains			

## Packaging

#	Item Code	Package Description	Marketing Start Date	Marketing End Date
1	NDC:68094-316-58	50 in 1 CASE	04/25/2011	03/31/2013
1		1 in 1 BAG		
1		1 mL in 1 SYRINGE, PLASTIC; Type 0: Not a Combination Product		

## Marketing Information

Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date
ANDA	ANDA078312	04/25/2011	03/31/2013

## RANITIDINE HYDROCHLORIDE

ranitidine hydrochloride solution

### Product Information

Product Type	HUMAN PRESCRIPTION DRUG	Item Code (Source)	NDC:68094-205
Route of Administration	ORAL		

### Active Ingredient/Active Moiety

Ingredient Name	Basis of Strength	Strength
Ranitidine Hydrochloride (UNII: BK76465IHM) (Ranitidine - UNII:884KT10YB7)	Ranitidine	75 mg in 5 mL

### Inactive Ingredients

Ingredient Name	Strength
butylparaben (UNII: 3QP1U3FV8)	
sodium phosphate, dibasic, unspecified form (UNII: GR686LBA74)	
hypromellose, unspecified (UNII: 3NXW29V3WO)	
sodium phosphate, monobasic, unspecified form (UNII: 3980JIH2SW)	
propylene glycol (UNII: 6DC9Q167V3)	
propylparaben (UNII: Z8IX2SC1OH)	
water (UNII: 059QF0KO0R)	
saccharin sodium (UNII: SB8ZUX40TY)	
sodium chloride (UNII: 451W47IQ8X)	

sorbitol (UNII: 506T60A25R)				
<b>Product Characteristics</b>				
Color		Score		
Shape		Size		
Flavor	PEPPERMINT	Imprint Code		
Contains				
<b>Packaging</b>				
#	Item Code	Package Description	Marketing Start Date	Marketing End Date
1	NDC:68094-205-58	5 in 1 CASE	10/13/2006	10/31/2014
1		10 in 1 BAG		
1		5 mL in 1 SYRINGE, PLASTIC; Type 0: Not a Combination Product		
<b>Marketing Information</b>				
Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date	
ANDA	ANDA078312	10/13/2006	10/31/2014	

<b>RANITIDINE HYDROCHLORIDE</b>			
ranitidine hydrochloride solution			
<b>Product Information</b>			
Product Type	HUMAN PRESCRIPTION DRUG	Item Code (Source)	NDC:68094-204
Route of Administration	ORAL		
<b>Active Ingredient/Active Moiety</b>			
Ingredient Name		Basis of Strength	Strength
Ranitidine Hydrochloride (UNII: BK76465IHM) (Ranitidine - UNII:884KT10YB7)		Ranitidine	150 mg in 10 mL
<b>Inactive Ingredients</b>			
Ingredient Name			Strength
butylparaben (UNII: 3QPIIU3FV8)			
sodium phosphate, dibasic, unspecified form (UNII: GR686LBA74)			
hypromellose, unspecified (UNII: 3NXW29V3WO)			
sodium phosphate, monobasic, unspecified form (UNII: 3980JIH2SW)			
propylene glycol (UNII: 6DC9Q167V3)			
propylparaben (UNII: Z8IX2SC1OH)			
water (UNII: 059QF0KO0R)			

saccharin sodium (UNII: SB8ZUX40TY)

sodium chloride (UNII: 451W47IQ8X)

sorbitol (UNII: 506T60A25R)

### Product Characteristics

Color		Score	
Shape		Size	
Flavor	PEPPERMINT	Imprint Code	
Contains			

### Packaging

#	Item Code	Package Description	Marketing Start Date	Marketing End Date
1	NDC:68094-204-62	3 in 1 CASE	08/21/2003	
1		10 in 1 TRAY		
1	NDC:68094-204-59	10 mL in 1 CUP, UNIT-DOSE; Type 0: Not a Combination Product		
2	NDC:68094-204-61	10 in 1 CASE	08/21/2003	
2		10 in 1 TRAY		
2	NDC:68094-204-59	10 mL in 1 CUP, UNIT-DOSE; Type 0: Not a Combination Product		

### Marketing Information

Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date
ANDA	ANDA078312	08/21/2003	

**Labeler** - Precision Dose Inc. (035886746)

Revised: 10/2017

Precision Dose Inc.