

NDA 22-157  
XYZAL® (levocetirizine dihydrochloride) oral solution

Labeling Supplement  
12 February 2008

#### HIGHLIGHTS OF PRESCRIBING INFORMATION

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

XYZAL® (levocetirizine dihydrochloride)  
5 mg tablets

2.5 mg/5 mL (0.5 mg/mL) oral solution

Initial U.S. Approval: 1995

#### RECENT MAJOR CHANGES

Dosage and Administration (2) 03/200701/2008

Dosage and Administration, Adults & Children 12 Years & Older (2.1) 03/200701/2008

Dosage and Administration, Children 6 to 11 Years (2.2) 03/200701/2008

#### INDICATIONS AND USAGE

XYZAL is a histamine H<sub>1</sub>-receptor antagonist indicated for:

- The relief of symptoms associated with seasonal and perennial allergic rhinitis (1.1)
- The treatment of the uncomplicated skin manifestations of chronic idiopathic urticaria (1.2)

#### DOSAGE AND ADMINISTRATION

- Adults and children 12 years of age and older: 5 mg (1 tablet or 2 teaspoons [10 mL] oral solution) once daily in the evening (2.1)
- Children 6 to 11 years of age: 2.5 mg (1/2 tablet or 1 teaspoon [5 mL] oral solution) once daily in the evening (2.2)
- Renal Impairment  
Adjust the dose in patients 12 years of age and older with decreased renal function (2.3, 8.6, 12.3)

#### DOSAGE FORMS AND STRENGTHS

- Immediate release breakable (scored) tablets, 5 mg (3)
- Immediate release oral solution, 2.5 mg per 5 mL (0.5 mg per mL) (3)

#### CONTRAINDICATIONS

- Patients with a known hypersensitivity to levocetirizine or any of the ingredients of XYZAL or to cetirizine (4)

- Patients with end-stage renal impairment at less than 10 mL/min creatinine clearance or patients undergoing hemodialysis (2.3, 4)
- Children 6 to 11 years of age with renal impairment (2.3, 4)

#### WARNINGS AND PRECAUTIONS

- Avoid engaging in hazardous occupations requiring complete mental alertness such as driving or operating machinery when taking XYZAL (5.1).
- Avoid concurrent use of alcohol or other central nervous system depressants with XYZAL (5.1).

#### ADVERSE REACTIONS

The most common adverse reactions (rate ≥2% and > placebo) were somnolence, nasopharyngitis, fatigue, dry mouth, and pharyngitis in subjects 12 years of age and older, and pyrexia, somnolence, cough, and epistaxis in children 6 to 12 years of age (6.1).

To report SUSPECTED ADVERSE REACTIONS, contact UCB, Inc. at 866-822-0068 or FDA at 1-800-FDA-1088 or [www.fda.gov/medwatch](http://www.fda.gov/medwatch).

#### USE IN SPECIFIC POPULATIONS

- Renal Impairment  
Because XYZAL is substantially excreted by the kidneys, the risk of adverse reactions to this drug may be greater in patients with impaired renal function (8.5 and 12.3).
- Pediatric Use  
Do not exceed the recommended dose of 2.5 mg once daily in children 6 to 11 years of age. The systemic exposure with the 5 mg dose is approximately twice that of adults (12.3, 6.1).

See 17 for PATIENT COUNSELING INFORMATION

Revised: 01/2008

#### FULL PRESCRIBING INFORMATION: CONTENTS\*

1	INDICATIONS AND USAGE	8.6	Renal Impairment
1.1	Allergic Rhinitis	8.7	Hepatic Impairment
1.2	Chronic Idiopathic Urticaria	10	OVERDOSAGE
2	DOSAGE AND ADMINISTRATION	11	DESCRIPTION
2.1	Adults and Children 12 Years of Age and Older	12	CLINICAL PHARMACOLOGY
2.2	Children 6 to 11 Years of Age	12.1	Mechanism of Action
2.3	Dose Adjustment for Renal and Hepatic Impairment	12.2	Pharmacodynamics
3	DOSAGE FORMS AND STRENGTHS	12.3	Pharmacokinetics
4	CONTRAINDICATIONS	13	NONCLINICAL TOXICOLOGY
5	WARNINGS AND PRECAUTIONS	13.1	Carcinogenesis, Mutagenesis, Impairment of Fertility
5.1	Activities Requiring Mental Alertness	14	CLINICAL STUDIES
6	ADVERSE REACTIONS	14.1	Seasonal and Perennial Allergic Rhinitis
6.1	Clinical Trials Experience	14.2	Chronic Idiopathic Urticaria
6.2	Post-Marketing Experience	16	HOW SUPPLIED/STORAGE AND HANDLING
7	DRUG INTERACTIONS	17	PATIENT COUNSELING INFORMATION
7.1	Antipyrine, Azithromycin, Cimetidine, Erythromycin, Ketoconazole, Theophylline, and Pseudoephedrine	17.1	Activities Requiring Mental Alertness
7.2	Ritonavir	17.2	Concomitant Use of Alcohol and other Central Nervous System Depressants
8	USE IN SPECIFIC POPULATIONS	17.3	Dosing of XYZAL
8.1	Pregnancy		
8.3	Nursing Mothers		
8.4	Pediatric Use		
8.5	Geriatric Use		

\*Sections or subsections omitted from the full prescribing information are not listed

NDA 22-157  
XYZAL® (levocetirizine dihydrochloride) oral solution

Labeling Supplement  
12 February 2008

## FULL PRESCRIBING INFORMATION

### 1 INDICATIONS AND USAGE

#### 1.1 Allergic Rhinitis

XYZAL® is indicated for the relief of symptoms associated with allergic rhinitis (seasonal and perennial) in adults and children 6 years of age and older.

#### 1.2 Chronic Idiopathic Urticaria

XYZAL is indicated for the treatment of the uncomplicated skin manifestations of chronic idiopathic urticaria in adults and children 6 years of age and older.

### 2 DOSAGE AND ADMINISTRATION

XYZAL is available as 2.5 mg/5 mL (0.5 mg/mL) oral solution and as 5 mg breakable (scored) tablets, allowing for the administration of 2.5 mg, if needed. XYZAL can be taken without regard to food consumption.

#### 2.1 Adults and Children 12 Years of Age and Older

The recommended dose of XYZAL is 5 mg (1 tablet or 2 teaspoons [10 mL] oral solution) once daily in the evening. Some patients may be adequately controlled by 2.5 mg (1/2 tablet or 1 teaspoon [5 mL] oral solution) once daily in the evening.

#### 2.2 Children 6 to 11 Years of Age

The recommended dose of XYZAL is 2.5 mg (1/2 tablet or 1 teaspoon [5 mL] oral solution) once daily in the evening. The 2.5 mg dose should not be exceeded because the systemic exposure with 5 mg is approximately twice that of adults [see *Clinical Pharmacology* (12.3)].

XYZAL is not indicated for children under 6 years of age.

#### 2.3 Dose Adjustment for Renal and Hepatic Impairment

In adults and children 12 years of age and older with:

- Mild renal impairment (creatinine clearance [ $CL_{CR}$ ] = 50-80 mL/min): a dose of 2.5 mg once daily is recommended;
- Moderate renal impairment ( $CL_{CR}$  = 30-50 mL/min): a dose of 2.5 mg once every other day is recommended;
- Severe renal impairment ( $CL_{CR}$  = 10-30 mL/min): a dose of 2.5 mg twice weekly (administered once every 3-4 days) is recommended;
- End-stage renal disease patients ( $CL_{CR}$  < 10 mL/min) and patients undergoing hemodialysis should not receive XYZAL.

No dose adjustment is needed in patients with solely hepatic impairment. In patients with both hepatic impairment and renal impairment, adjustment of the dose is recommended.

### 3 DOSAGE FORMS AND STRENGTHS

XYZAL oral solution is a clear, colorless liquid containing 0.5 mg of levocetirizine dihydrochloride per mL.

XYZAL tablets are white, film-coated, oval-shaped, scored, imprinted (with the letter Y in red color on both halves of the scored tablet) and contain 5 mg levocetirizine dihydrochloride.

### 4 CONTRAINDICATIONS

The use of XYZAL is contraindicated in:

- Patients with known hypersensitivity to levocetirizine or any of the ingredients of XYZAL, or to cetirizine. Observed reactions range from urticaria to anaphylaxis [see *Adverse Reactions* (6.2)].
- Patients with end-stage renal disease ( $CL_{CR}$  < 10 mL/min) and patients undergoing hemodialysis.
- Pediatric patients 6 to 11 years of age with impaired renal function [see *Use in Specific Populations* (8.4)].

### 5 WARNINGS AND PRECAUTIONS

#### 5.1 Activities Requiring Mental Alertness

In clinical trials the occurrence of somnolence, fatigue, and asthenia has been reported in some patients under therapy with XYZAL. Patients should be cautioned against engaging in hazardous occupations requiring complete mental alertness, and motor coordination such as operating machinery or driving a motor vehicle after ingestion of XYZAL. Concurrent use of XYZAL with alcohol or other central nervous system depressants should be avoided because additional reductions in alertness and additional impairment of central nervous system performance may occur.

### 6 ADVERSE REACTIONS

Use of XYZAL has been associated with somnolence, fatigue, and asthenia [see *Warnings and Precautions* (5.1)].

#### 6.1 Clinical Trials Experience

The safety data described below reflect exposure to XYZAL in 2549 patients with seasonal or perennial allergic rhinitis and chronic idiopathic urticaria in 12 controlled clinical trials of 1 week to 6 months duration. The short-term (exposure up to 6 weeks) safety data for adults and adolescents are based upon eight clinical trials in which 1896 patients (825 males and 1071 females aged 12 years and older) were treated with XYZAL 2.5, 5, or 10 mg once daily in the evening. The short-term safety data from pediatric patients are based upon two clinical trials in which 243 children with seasonal or perennial allergic rhinitis (162 males and 81 females 6 to 12 years of age) were treated with XYZAL 5 mg once daily for 4 to 6 weeks. The long-term (exposure of 4 or 6 months) safety data are based upon two clinical trials in adults and adolescents in which 428 patients (190 males and 238 females) with allergic rhinitis were exposed to treatment with XYZAL 5 mg once daily. Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trial of another drug and may not reflect the rates observed in practice.

NDA 22-157  
XYZAL® (levocetirizine dihydrochloride) oral solution

Labeling Supplement  
12 February 2008

#### Adults and Adolescents 12 years of Age and Older

In studies up to 6 weeks in duration, the mean age of the adult and adolescent patients was 32 years, 44% of the patients were men and 56% were women, and the large majority (more than 90%) was Caucasian.

In these trials 43% and 42% of the subjects in the XYZAL 2.5 mg and 5 mg groups, respectively, had at least one adverse event compared to 43% in the placebo group.

In placebo-controlled trials of 1-6 weeks in duration, the most common adverse reactions were somnolence, nasopharyngitis, fatigue, dry mouth, and pharyngitis, and most were mild to moderate in intensity. Somnolence with XYZAL showed dose ordering between tested doses of 2.5, 5 and 10 mg and was the most common adverse reaction leading to discontinuation (0.5%).

Table 1 lists adverse reactions that were reported in greater than or equal to 2% of subjects aged 12 years and older exposed to XYZAL 2.5 mg or 5 mg in eight placebo-controlled clinical trials and that were more common with XYZAL than placebo.

**Table 1 Adverse Reactions Reported in  $\geq 2\%$  of Subjects Aged 12 Years and Older Exposed to XYZAL 2.5 mg or 5 mg in Placebo-Controlled Clinical Trials 1-6 Weeks in Duration**

Adverse Reactions	XYZAL 2.5 mg (n = 421)	XYZAL 5 mg (n = 1070)	Placebo (n = 912)
Somnolence	22 (5%)	61 (6%)	16 (2%)
Nasopharyngitis	25 (6%)	40 (4%)	28 (3%)
Fatigue	5 (1%)	46 (4%)	20 (2%)
Dry Mouth	12 (3%)	26 (2%)	11 (1%)
Pharyngitis	10 (2%)	12 (1%)	9 (1%)

\*Rounded to the closest unit percentage

Additional adverse reactions of medical significance observed at a higher incidence than in placebo in adults and adolescents aged 12 years and older exposed to XYZAL are syncope (0.2%) and weight increased (0.5%).

#### Pediatric Patients 6 to 12 Years of Age

A total of 243 pediatric patients 6 to 12 years of age received XYZAL 5 mg once daily in two short-term placebo controlled double-blind trials. The mean age of the patients was 9.8 years, 79 (32%) were between 6-8 years of age, and 50% were Caucasian. Table 2 lists adverse reactions that were reported in greater than or equal to 2% of subjects aged 6-12 years exposed to XYZAL 5 mg in placebo-controlled clinical trials and that were more common with XYZAL than placebo.

The safety of XYZAL in children under 6 years of age has not been established [see *Use in Specific Populations* (8.4)].

**Table 2 Adverse Reactions in Subjects Aged 6-12 Years Reported in  $\geq 2\%$ \* for XYZAL 5 mg in Placebo-Controlled Clinical Trials 4 and 6 Weeks in Duration**

Adverse Reactions	XYZAL 5 mg/day (n = 243)	Placebo (n = 240)
Pyrexia	10 (4%)	5 (2%)
Cough	8 (3%)	2 (<1%)
Somnolence	7 (3%)	1 (<1%)
Epistaxis	6 (2%)	1 (<1%)

\*Rounded to the closest unit percentage

#### Long-Term Clinical Trials Experience

In two controlled clinical trials, 428 patients (190 males and 238 females) aged 12 years and older were treated with XYZAL 5 mg once daily for 4 or 6 months. The patient characteristics and the safety profile were similar to that seen in the short-term studies. Ten (2.3%) patients treated with XYZAL discontinued because of somnolence, fatigue or asthenia compared to 2 (<1%) in the placebo group.

#### Laboratory Test Abnormalities

Elevations of blood bilirubin and transaminases were reported in <1% of patients in the clinical trials. The elevations were transient and did not lead to discontinuation in any patient.

#### 6.2 Post-Marketing Experience

In addition to the adverse reactions reported during clinical trials and listed above, adverse events have also been identified during post-approval use of XYZAL in other countries. Because these events are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure. Adverse events of hypersensitivity and anaphylaxis, angioneurotic edema, fixed drug eruption, pruritus, rash, and urticaria, convulsion, aggression and agitation, visual disturbances, palpitations, dyspnea, nausea, hepatitis, and myalgia have been reported.

Besides these events reported under treatment with XYZAL, other potentially severe adverse events have been reported from the post-marketing experience with cetirizine. Since levocetirizine is the principal pharmacologically active component of cetirizine, one should take into account the fact that the following adverse events could also potentially occur under treatment with XYZAL: hallucinations, suicidal ideation, orofacial dyskinesia, severe hypotension, cholestasis, glomerulonephritis, and still birth.

#### 7 DRUG INTERACTIONS

*In vitro* data indicate that levocetirizine is unlikely to produce pharmacokinetic interactions through inhibition or induction of liver drug-metabolizing enzymes. No *in vivo* drug-drug interaction studies have been performed with levocetirizine. Drug interaction studies have been performed with racemic cetirizine.

NDA 22-157  
XYZAL® (levocetirizine dihydrochloride) oral solution

Labeling Supplement  
12 February 2008

### 7.1 Antipyrine, Azithromycin, Cimetidine, Erythromycin, Ketoconazole, Theophylline, and Pseudoephedrine

Pharmacokinetic interaction studies performed with racemic cetirizine demonstrated that cetirizine did not interact with antipyrine, pseudoephedrine, erythromycin, azithromycin, ketoconazole, and cimetidine. There was a small decrease (~16%) in the clearance of cetirizine caused by a 400 mg dose of theophylline. It is possible that higher theophylline doses could have a greater effect.

### 7.2 Ritonavir

Ritonavir increased the plasma AUC of cetirizine by about 42% accompanied by an increase in half-life (53%) and a decrease in clearance (29%) of cetirizine. The disposition of ritonavir was not altered by concomitant cetirizine administration.

## 8 USE IN SPECIFIC POPULATIONS

### 8.1 Pregnancy

#### Teratogenic Effects: Pregnancy Category B

In rats and rabbits, levocetirizine was not teratogenic at oral doses up to 200 and 120 mg/kg, respectively (approximately 320 and 390 times the maximum recommended daily oral dose in adults on a mg/m<sup>2</sup> basis). There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, XYZAL should be used during pregnancy only if clearly needed.

### 8.3 Nursing Mothers

No peri- and post-natal animal studies have been conducted with levocetirizine. In mice, cetirizine caused retarded pup weight gain during lactation at an oral dose in dams of 96 mg/kg (approximately 40 times the maximum recommended daily oral dose in adults on a mg/m<sup>2</sup> basis). Studies in beagle dogs indicated that approximately 3% of the dose of cetirizine was excreted in milk. Cetirizine has been reported to be excreted in human breast milk. Because levocetirizine is also expected to be excreted in human milk, use of XYZAL in nursing mothers is not recommended.

### 8.4 Pediatric Use

The safety and effectiveness of XYZAL in pediatric patients under 6 years of age have not been established.

The recommended dose of XYZAL for the treatment of the uncomplicated skin manifestations of chronic idiopathic urticaria in patients 12 to 17 years of age is based on extrapolation of efficacy from adults 18 years of age and older [see *Clinical Studies (14)*].

The recommended dose of XYZAL in patients 6 to 11 years of age for the treatment of the symptoms of seasonal and perennial allergic rhinitis and chronic idiopathic urticaria is based on cross-study comparison of the systemic exposure of XYZAL in adults and pediatric patients and on the safety profile of XYZAL in both adult and pediatric patients at doses equal to or higher than the recommended dose for patients 6 to 11 years of age.

The safety of XYZAL 5 mg once daily was evaluated in 243 pediatric patients 6 to 12 years of age in two placebo-

controlled clinical trials lasting 4 and 6 weeks [see *Adverse Reactions (6.1)*]. The effectiveness of XYZAL 2.5 mg once daily for the treatment of the symptoms of seasonal and perennial allergic rhinitis and chronic idiopathic urticaria in children 6 to 11 years of age is supported by the extrapolation of demonstrated efficacy of XYZAL 5 mg once daily in patients 12 years of age and older and by the pharmacokinetic comparison in adults and children.

Cross-study comparisons indicate that administration of a 5 mg dose of XYZAL to 6 - 12 year old pediatric seasonal allergic rhinitis patients resulted in about 2-fold the systemic exposure (AUC) observed when 5 mg of XYZAL was administered to healthy adults. Therefore, in children 6 to 11 years of age the recommended dose of 2.5 mg once daily should not be exceeded [see *Dosage and Administration (2.2)*; *Clinical Studies (14)*; and *Clinical Pharmacology (12.3)*].

### 8.5 Geriatric Use

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

### 8.6 Renal Impairment

XYZAL is known to be substantially excreted by the kidneys 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, care should be taken in dose selection and it may be useful to monitor renal function [see *Dosage and Administration (2)* and *Clinical Pharmacology (12.3)*].

### 8.7 Hepatic Impairment

As levocetirizine is mainly excreted unchanged by the kidneys, it is unlikely that the clearance of levocetirizine is significantly decreased in patients with solely hepatic impairment [see *Clinical Pharmacology (12.3)*].

## 10 OVERDOSAGE

Overdosage has been reported with XYZAL.

Symptoms of overdose may include drowsiness in adults and initially agitation and restlessness, followed by drowsiness in children. There is no known specific antidote to XYZAL. Should overdose occur, symptomatic or supportive treatment is recommended. XYZAL is not effectively removed by dialysis, and dialysis will be ineffective unless a dialyzable agent has been concomitantly ingested.

The acute maximal non-lethal oral dose of levocetirizine was 240 mg/kg in mice (approximately 200 times the maximum recommended daily oral dose in adults and approximately 230 times the maximum recommended daily oral dose in children) on a mg/m<sup>2</sup> basis. In rats the maximal non-lethal oral dose was 240 mg/kg (approximately 390 times the maximum recommended daily oral dose in adults and

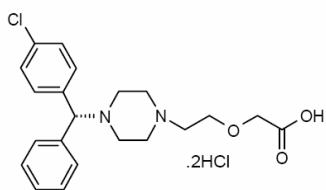
NDA 22-157  
XYZAL® (levocetirizine dihydrochloride) oral solution

Labeling Supplement  
12 February 2008

approximately 460 times the maximum recommended daily oral dose in children on a mg/m<sup>2</sup> basis).

## 11 DESCRIPTION

Levocetirizine dihydrochloride, the active component of XYZAL tablets and oral solution, is an orally active H<sub>1</sub>-receptor antagonist. The chemical name is (R)-[2-[4-[(4-chlorophenyl) phenylmethyl]-1-piperazinyl] ethoxy] acetic acid dihydrochloride. Levocetirizine dihydrochloride is the R enantiomer of cetirizine hydrochloride, a racemic compound with antihistaminic properties. The empirical formula of levocetirizine dihydrochloride is C<sub>21</sub>H<sub>25</sub>ClN<sub>2</sub>O<sub>3</sub>•2HCl. The molecular weight is 461.82 and the chemical structure is shown below:



Levocetirizine dihydrochloride is a white, crystalline powder and is water soluble.

XYZAL 5 mg tablets are formulated as immediate release, white, film-coated, oval-shaped scored tablets for oral administration. The tablets are imprinted on both halves of the scored line with the letter Y in red (Opacode® Red). Inactive ingredients are: microcrystalline cellulose, lactose monohydrate, colloidal anhydrous silica, and magnesium stearate. The film coating contains hypromellose, titanium dioxide, and macrogol 400.

XYZAL 0.5 mg/mL oral solution is formulated as an immediate release, clear, colorless liquid. Inactive ingredients are: sodium acetate trihydrate, glacial acetic acid, maltitol solution, glycerin, methylparaben, propylparaben, saccharin, flavoring (consisting of triacetin, natural & artificial flavors, dl-alpha-tocopherol), purified water.

## 12 CLINICAL PHARMACOLOGY

### 12.1 Mechanism of Action

Levocetirizine, the active enantiomer of cetirizine, is an anti-histamine; its principal effects are mediated via selective inhibition of H<sub>1</sub> receptors. The antihistaminic activity of levocetirizine has been documented in a variety of animal and human models. *In vitro* binding studies revealed that levocetirizine has an affinity for the human H<sub>1</sub>-receptor 2-fold higher than that of cetirizine (K<sub>i</sub> = 3 nmol/L vs. 6 nmol/L, respectively). The clinical relevance of this finding is unknown.

### 12.2 Pharmacodynamics

Studies in adult healthy subjects showed that levocetirizine at doses of 2.5 mg and 5 mg inhibited the skin wheal and flare caused by the intradermal injection of histamine. In contrast, dextrocetirizine exhibited no clear change in the inhibition of the wheal and flare reaction. Levocetirizine at a dose of 5 mg inhibited the wheal and flare caused by intradermal injection of histamine in 14 pediatric subjects (aged 6 to 11

years) and the activity persisted for at least 24 hours. The clinical relevance of histamine wheal skin testing is unknown.

A QT/QTc study using a single dose of 30 mg of levocetirizine did not demonstrate an effect on the QTc interval. While a single dose of levocetirizine had no effect, the effects of levocetirizine may not be at steady state following single dose. The effect of levocetirizine on the QTc interval following multiple dose administration is unknown. Levocetirizine is not expected to have QT/QTc effects because of the results of QTc studies with cetirizine and the long post-marketing history of cetirizine without reports of QT prolongation.

### 12.3 Pharmacokinetics

Levocetirizine exhibited linear pharmacokinetics over the therapeutic dose range in adult healthy subjects.

#### • Absorption

Levocetirizine is rapidly and extensively absorbed following oral administration. In adults, peak plasma concentrations are achieved 0.9 hour after administration of the oral tablet. The accumulation ratio following daily oral administration is 1.12 with steady state achieved after 2 days. Peak concentrations are typically 270 ng/mL and 308 ng/mL following a single and a repeated 5 mg once daily dose, respectively. Food had no effect on the extent of exposure (AUC) of the levocetirizine tablet, but T<sub>max</sub> was delayed by about 1.25 hours and C<sub>max</sub> was decreased by about 36% after administration with a high fat meal; therefore, levocetirizine can be administered with or without food.

A dose of 5 mg (10 mL) of XYZAL oral solution is bioequivalent to a 5 mg dose of XYZAL tablets. Following oral administration of a 5 mg dose of XYZAL oral solution to healthy adult subjects, the mean peak plasma concentrations were achieved approximately 0.5 hour post-dose.

#### • Distribution

The mean plasma protein binding of levocetirizine *in vitro* ranged from 91 to 92%, independent of concentration in the range of 90-5000 ng/mL, which includes the therapeutic plasma levels observed. Following oral dosing, the average apparent volume of distribution is approximately 0.4 L/kg, representative of distribution in total body water.

#### • Metabolism

The extent of metabolism of levocetirizine in humans is less than 14% of the dose and therefore differences resulting from genetic polymorphism or concomitant intake of hepatic drug metabolizing enzyme inhibitors are expected to be negligible. Metabolic pathways include aromatic oxidation, N- and O-dealkylation, and taurine conjugation. Dealkylation pathways are primarily mediated by CYP 3A4 while aromatic oxidation involves multiple and/or unidentified CYP isoforms.

#### • Elimination

The plasma half-life in adult healthy subjects was about 8 to 9 hours after administration of oral tablets and oral solution, and the mean oral total body clearance for levocetirizine was approximately 0.63 mL/kg/min. The major route of excretion of levocetirizine and its metabolites is via urine, accounting for a mean of 85.4% of the dose. Excretion

NDA 22-157  
XYZAL® (levocetirizine dihydrochloride) oral solution

Labeling Supplement  
12 February 2008

via feces accounts for only 12.9% of the dose. Levocetirizine is excreted both by glomerular filtration and active tubular secretion. Renal clearance of levocetirizine correlates with that of creatinine clearance. In patients with renal impairment the clearance of levocetirizine is reduced [see *Dosage and Administration* (2.3)].

- **Drug Interaction Studies**

*In vitro* data on metabolite interaction indicate that levocetirizine is unlikely to produce, or be subject to metabolic interactions. Levocetirizine at concentrations well above  $C_{max}$  level achieved within the therapeutic dose ranges is not an inhibitor of CYP isoenzymes 1A2, 2C9, 2C19, 2A1, 2D6, 2E1, and 3A4, and is not an inducer of UGT1A or CYP isoenzymes 1A2, 2C9 and 3A4.

No formal *in vivo* drug interaction studies have been performed with levocetirizine. Studies have been performed with the racemic cetirizine [see *Drug Interactions* (7)].

- **Pediatric Patients**

Data from a pediatric pharmacokinetic study with oral administration of a single dose of 5 mg levocetirizine in 14 children age 6 to 11 years with body weight ranging between 20 and 40 kg show that  $C_{max}$  and AUC values are about 2-fold greater than that reported in healthy adult subjects in a cross-study comparison. The mean  $C_{max}$  was 450 ng/mL, occurring at a mean time of 1.2 hours, weight-normalized, total body clearance was 30% greater, and the elimination half-life 24% shorter in this pediatric population than in adults.

- **Geriatric Patients**

Limited pharmacokinetic data are available in elderly subjects. Following once daily repeat oral administration of 30 mg levocetirizine for 6 days in 9 elderly subjects (65–74 years of age), the total body clearance was approximately 33% lower compared to that in younger adults. The disposition of racemic cetirizine has been shown to be dependent on renal function rather than on age. This finding would also be applicable for levocetirizine, as levocetirizine and cetirizine are both predominantly excreted in urine. Therefore, the XYZAL dose should be adjusted in accordance with renal function in elderly patients [see *Dosage and Administration* (2)].

- **Gender**

Pharmacokinetic results for 77 patients (40 men, 37 women) were evaluated for potential effect of gender. The half-life was slightly shorter in women ( $7.08 \pm 1.72$  hr) than in men ( $8.62 \pm 1.84$  hr); however, the body weight-adjusted oral clearance in women ( $0.67 \pm 0.16$  mL/min/kg) appears to be comparable to that in men ( $0.59 \pm 0.12$  mL/min/kg). The same daily doses and dosing intervals are applicable for men and women with normal renal function.

- **Race**

The effect of race on levocetirizine has not been studied. As levocetirizine is primarily renally excreted, and there are no important racial differences in creatinine clearance, pharmacokinetic characteristics of levocetirizine are not expected to be different across races. No race-related

differences in the kinetics of racemic cetirizine have been observed.

- **Renal Impairment**

Levocetirizine exposure (AUC) exhibited 1.8-, 3.2-, 4.3-, and 5.7-fold increase in mild, moderate, severe, renal impaired, and end-stage renal disease patients, respectively, compared to healthy subjects. The corresponding increases of half-life estimates were 1.4-, 2.0-, 2.9-, and 4-fold, respectively.

The total body clearance of levocetirizine after oral dosing was correlated to the creatinine clearance and was progressively reduced based on severity of renal impairment. Therefore, it is recommended to adjust the dose and dosing intervals of levocetirizine based on creatinine clearance in patients with mild, moderate, or severe renal impairment. In end-stage renal disease patients ( $CL_{CR} < 10$  mL/min) levocetirizine is contraindicated. The amount of levocetirizine removed during a standard 4-hour hemodialysis procedure was <10%.

The dosage of XYZAL should be reduced in patients with mild renal impairment. Both the dosage and frequency of administration should be reduced in patients with moderate or severe renal impairment [see *Dosage and Administration* (2)].

- **Hepatic Impairment**

XYZAL has not been studied in patients with hepatic impairment. The non-renal clearance (indicative of hepatic contribution) was found to constitute about 28% of the total body clearance in healthy adult subjects after oral administration.

As levocetirizine is mainly excreted unchanged by the kidney, it is unlikely that the clearance of levocetirizine is significantly decreased in patients with solely hepatic impairment [see *Dosage and Administration* (2)].

## 13 NONCLINICAL TOXICOLOGY

### 13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

No carcinogenesis studies have been performed with levocetirizine. However, evaluation of cetirizine carcinogenicity studies are relevant for determination of the carcinogenic potential of levocetirizine. In a 2-year carcinogenicity study, in rats, cetirizine was not carcinogenic at dietary doses up to 20 mg/kg (approximately 16 times the maximum recommended daily oral dose in adults and approximately 20 times the maximum recommended daily oral dose in children on a mg/m<sup>2</sup> basis). In a 2-year carcinogenicity study in mice, cetirizine caused an increased incidence of benign hepatic tumors in males at a dietary dose of 16 mg/kg (approximately 7 times the maximum recommended daily oral dose in adults and approximately 8 times the maximum recommended daily oral dose in children on a mg/m<sup>2</sup> basis). No increased incidence of benign tumors was observed at a dietary dose of 4 mg/kg (approximately 2 times the maximum recommended daily oral dose in adults and children on a mg/m<sup>2</sup> basis). The clinical significance of these findings during long-term use of XYZAL is not known.

Levocetirizine was not mutagenic in the Ames test, and not clastogenic in the human lymphocyte assay, the mouse lymphoma assay, and *in vivo* micronucleus test in mice.

NDA 22-157  
XYZAL® (levocetirizine dihydrochloride) oral solution

Labeling Supplement  
12 February 2008

In a fertility and general reproductive performance study in mice, cetirizine did not impair fertility at an oral dose of 64 mg/kg (approximately 25 times the recommended daily oral dose in adults on a mg/m<sup>2</sup> basis).

## 14 CLINICAL STUDIES

### 14.1 Seasonal and Perennial Allergic Rhinitis

#### *Adults and Adolescents 12 Years of Age and Older*

The efficacy of XYZAL was evaluated in six randomized, placebo-controlled, double-blind clinical trials in adult and adolescent patients 12 years and older with symptoms of seasonal allergic rhinitis or perennial allergic rhinitis. The six clinical trials include three dose-ranging trials of 2 to 4 weeks duration, one 2-week efficacy trial in patients with seasonal allergic rhinitis, and two efficacy trials (one 6-week and one 6-month) in patients with perennial allergic rhinitis.

These trials included a total of 2412 patients (1068 males and 1344 females) of whom 265 were adolescents 12-17 years of age. Efficacy was assessed using a total symptom score from patient recording of 4 symptoms (sneezing, rhinorrhea, nasal pruritus, and ocular pruritus) in five studies and 5 symptoms (sneezing, rhinorrhea, nasal pruritus, ocular pruritus, and nasal congestion) in one study. Patients recorded symptoms using a 0-3 categorical severity scale (0 = absent, 1 = mild, 2 = moderate, 3 = severe) once daily in the evening reflective of the 24 hour treatment period. In one study, patients also recorded these symptoms in an instantaneous (1 hour before the next dose) manner. The primary endpoint was the mean total symptom score averaged over the first week and over 2 weeks for seasonal allergic rhinitis trials, and 4 weeks for perennial allergic rhinitis trials.

The three dose-ranging trials were conducted to evaluate the efficacy of XYZAL 2.5, 5, and 10 mg once daily in the evening. One trial was 2 weeks in duration conducted in patients with seasonal allergic rhinitis, and two trials were 4 weeks in duration conducted in patients with perennial allergic rhinitis. In these trials, each of the three doses of XYZAL demonstrated greater decrease in the reflective total symptom score than placebo and the difference was statistically significant for all three doses in two of the studies. Results for two of these trials are shown in Table 3.

**Table 3 Mean Reflective Total Symptom Score\* in Allergic Rhinitis Dose-Ranging Trials**

Treatment	N	Baseline	On Treatment Adjusted Mean	Difference from Placebo		
				Estimate	95% CI	p-value
<b>Seasonal Allergic Rhinitis Trial – Reflective total symptom score</b>						
XYZAL 2.5 mg	116	7.83	4.27	0.91	(0.37, 1.45)	0.001
XYZAL 5 mg	115	7.45	4.06	1.11	(0.57, 1.65)	<0.001
XYZAL 10 mg	118	7.15	3.57	1.61	(1.07, 2.15)	<0.001
Placebo	118	7.94	5.17			
<b>Perennial Allergic Rhinitis Trial – Reflective total symptom score</b>						
XYZAL 2.5 mg	133	7.14	4.12	1.17	(0.71, 1.63)	<0.001
XYZAL 5 mg	127	7.18	4.07	1.22	(0.76, 1.69)	<0.001
XYZAL 10 mg	129	7.58	4.19	1.10	(0.64, 1.57)	<0.001
Placebo	128	7.22	5.29			

\*Total symptom score is the sum of individual symptoms of sneezing, rhinorrhea, nasal pruritus, and ocular pruritus as assessed by patients on a 0-3 categorical severity scale.

One clinical trial was designed to evaluate the efficacy of XYZAL 5 mg once daily in the evening compared with placebo in patients with seasonal allergic rhinitis over a 2-week treatment period. In this trial, XYZAL 5 mg demonstrated a greater decrease from baseline in the reflective and instantaneous total symptom score than placebo, and the difference was statistically significant (see Table 4). The results of the instantaneous total symptom score support efficacy at the end of the dosing interval.

One clinical trial evaluated the efficacy of XYZAL 5 mg once daily in the evening compared to placebo in patients with perennial allergic rhinitis over a 6-week treatment period. Another trial conducted over a 6-month treatment period assessed efficacy at 4 weeks. XYZAL 5 mg demonstrated a greater decrease from baseline in the reflective total symptom score than placebo and the difference from placebo was statistically significant. Results of one of these trials are shown in Table 4.

NDA 22-157  
XYZAL® (levocetirizine dihydrochloride) oral solution

Labeling Supplement  
12 February 2008

**Table 4 Mean Reflective Total Symptom Score\* and Instantaneous Total Symptom Score in Allergic Rhinitis Trials**

Treatment	N	Baseline	On Treatment Adjusted Mean	Difference from Placebo		
				Estimate	95% CI	p-value
<b>Seasonal Allergic Rhinitis Trial – Reflective total symptom score</b>						
XYZAL 5 mg	118	8.40	5.20	0.89	(0.30, 1.47)	0.003
Placebo	117	8.50	6.09			
<b>Seasonal Allergic Rhinitis Trial – Instantaneous total symptom score</b>						
XYZAL 5 mg	118	7.24	4.58	0.73	(0.17, 1.28)	0.011
Placebo	117	7.48	5.30			
<b>Perennial Allergic Rhinitis Trial – Reflective total symptom score</b>						
XYZAL 5 mg	150	7.69	3.93	1.17	(0.70, 1.64)	<0.001
Placebo	142	7.44	5.10			

\*Total symptom score is the sum of individual symptoms of sneezing, rhinorrhea, nasal pruritus, and ocular pruritus as assessed by patients on a 0-3 categorical severity scale.

Onset of action was evaluated in two environmental exposure unit studies in allergic rhinitis patients with a single dose of XYZAL 2.5 or 5 mg. XYZAL 5 mg was found to have an onset of action 1 hour after oral intake. Onset of action was also assessed from the daily recording of symptoms in the evening before dosing in the seasonal and perennial allergic rhinitis trials. In these trials, onset of effect was seen after 1 day of dosing.

**Pediatric Patients Less than 12 Years of Age**

There are no clinical trials with XYZAL 2.5 mg once daily in pediatric patients under 12 years of age [see *Use in Specific Populations* (8.4)].

**14.2 Chronic Idiopathic Urticaria**

**Adult Patients 18 Years of Age and Older**

The efficacy of XYZAL for the treatment of the uncomplicated skin manifestations of chronic idiopathic urticaria was evaluated in two multi-center, randomized, placebo-controlled, double-blind clinical trials of 4 weeks duration in adult patients 18 to 85 years of age with chronic idiopathic urticaria. The two trials included one 4-week dose-ranging trial and one 4-week single-dose level efficacy trial. These trials included 423 patients (139 males and 284 females). Most patients (>90%) were Caucasian and the mean age was 41. Of these patients, 146 received XYZAL 5 mg once daily in the evening. Efficacy was assessed based on patient recording of pruritus severity on a severity score of 0–3 (0 = none to 3 = severe). The primary efficacy endpoint was the mean reflective pruritus severity score over the first week and over the entire treatment period. Additional efficacy variables were the instantaneous pruritus severity score, the number and size of wheals, and duration of pruritus.

The dose-ranging trial was conducted to evaluate the efficacy of XYZAL 2.5, 5, and 10 mg once daily in the evening. In this trial, each of the three doses of XYZAL demonstrated greater decrease in the reflective pruritus severity score than placebo and the difference was statistically significant for all three doses (see Table 5).

The single dose level trial evaluated the efficacy of XYZAL 5 mg once daily in the evening compared to placebo in patients with chronic idiopathic urticaria over a 4-week treatment period. XYZAL 5 mg demonstrated a greater decrease from baseline in the reflective pruritus severity score than placebo and the difference from placebo was statistically significant.

Duration of pruritus, number and size of wheals, and instantaneous pruritus severity score also showed significant improvement over placebo. The significant improvement in the instantaneous pruritus severity score over placebo confirmed end of dosing interval efficacy (see Table 5).

**Table 5 Mean Reflective Pruritus Severity Score in Chronic Idiopathic Urticaria Trials**

Treatment	N	Baseline	On Treatment Adjusted Mean	Difference from Placebo		
				Estimate	95% CI	p-value
<b>Dose-Ranging Trial – Reflective pruritus severity score</b>						
XYZAL 2.5 mg	69	2.08	1.02	0.82	(0.58, 1.06)	<0.001
XYZAL 5 mg	62	2.07	0.92	0.91	(0.66, 1.16)	<0.001
XYZAL 10 mg	55	2.04	0.73	1.11	(0.85, 1.37)	<0.001
Placebo	60	2.25	1.84			
<b>Chronic Idiopathic Urticaria Trial – Reflective pruritus severity score</b>						
XYZAL 5 mg	80	2.07	0.94	0.62	(0.38, 0.86)	<0.001
Placebo	82	2.06	1.56			

**Pediatric Patients**

There are no clinical trials in pediatric patients with chronic idiopathic urticaria [see *Use in Specific Populations* (8.4)].

**16 HOW SUPPLIED/STORAGE AND HANDLING**

XYZAL tablets are white, film-coated, oval-shaped, scored, imprinted (with the letter Y in red color on both halves of the scored tablet) and contain 5 mg levocetirizine dihydrochloride. They are supplied in unit of use HDPE bottles and unit of use blisters.

90 Tablets (NDC 0024-5800-90)

30 count box, 3 cards of 10 (NDC 0024-5800-32)

XYZAL oral solution is a clear, colorless liquid containing 0.5 mg of levocetirizine dihydrochloride per mL.

Oral solution in 5 oz glass bottles (NDC 0024-5801-20)

NDA 22-157  
XYZAL® (levocetirizine dihydrochloride) oral solution

Labeling Supplement  
12 February 2008

**Storage:**

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

**17 PATIENT COUNSELING INFORMATION**

**17.1 Activities Requiring Mental Alertness**

Patients should be cautioned against engaging in hazardous occupations requiring complete mental alertness, and motor coordination such as operating machinery or driving a motor vehicle after ingestion of XYZAL.

**17.2 Concomitant Use of Alcohol and other Central Nervous System Depressants**

Concurrent use of XYZAL with alcohol or other central nervous system depressants should be avoided because additional reduction in mental alertness may occur.

**17.3 Dosing of XYZAL**

The daily dose in adults and adolescents 12 years of age and older should not exceed 5 mg once daily in the evening. In children 6 to 11 years of age the recommended dose is 2.5 mg once daily in the evening. Patients should be advised to not ingest more than the recommended dose of XYZAL because of the increased risk of somnolence at higher doses.

**Manufactured for:**

**UCB, Inc.**  
Smyrna, GA 30080

and

**Co-marketed by sanofi-aventis U.S. LLC**  
Bridgewater, NJ 08807

XYZAL is a registered trademark of the UCB Group of companies.

©2008 UCB, Inc. All rights reserved.