

**CENTER FOR DRUG EVALUATION AND RESEARCH**

**APPLICATION NUMBER: 20-830/S008**

**FINAL PRINTED LABELING**

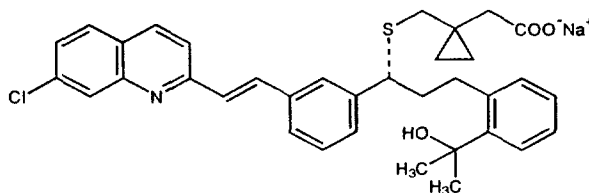
**SINGULAIR®**  
**(MONTELUKAST SODIUM)**  
TABLETS AND CHEWABLE TABLETS

**DESCRIPTION**

Montelukast sodium, the active ingredient in SINGULAIR\*, is a selective and orally active leukotriene receptor antagonist that inhibits the cysteinyl leukotriene CysLT<sub>1</sub> receptor.

Montelukast sodium is described chemically as [R-(E)]-1-[[[1-[3-[2-(7-chloro-2-quinolinyl)ethenyl]phenyl]-3-[2-(1-hydroxy-1-methylethyl)phenyl]propyl]thio]methyl]cyclopropaneacetic acid, monosodium salt.

The empirical formula is C<sub>35</sub>H<sub>35</sub>ClNNaO<sub>3</sub>S, and its molecular weight is 608.18. The structural formula is:



Montelukast sodium is a hygroscopic, optically active, white to off-white powder. Montelukast sodium is freely soluble in ethanol, methanol, and water and practically insoluble in acetonitrile.

Each 10-mg film-coated SINGULAIR tablet contains 10.4 mg montelukast sodium, which is the molar equivalent to 10.0 mg of free acid, and the following inactive ingredients: microcrystalline cellulose, lactose monohydrate, croscarmellose sodium, hydroxypropyl cellulose, and magnesium stearate. The film coating consists of: hydroxypropyl methylcellulose, hydroxypropyl cellulose, titanium dioxide, red ferric oxide, yellow ferric oxide, and carnauba wax.

Each 4-mg and 5-mg chewable SINGULAIR tablet for oral administration contains 4.2 and 5.2 mg montelukast sodium, respectively, which are the molar equivalents to 4.0 and 5.0 mg of free acid, respectively. Both chewable tablets contain the following inactive ingredients: mannitol, microcrystalline cellulose, hydroxypropyl cellulose, red ferric oxide, croscarmellose sodium, cherry flavor, aspartame, and magnesium stearate.

**CLINICAL PHARMACOLOGY**

*Mechanism of Action*

The cysteinyl leukotrienes (LTC<sub>4</sub>, LTD<sub>4</sub>, LTE<sub>4</sub>) are products of arachidonic acid metabolism and are released from various cells, including mast cells and eosinophils. These eicosanoids bind to cysteinyl leukotriene receptors (CysLT) found in the human airway. Cysteinyl leukotrienes and leukotriene receptor occupation have been correlated with the pathophysiology of asthma, including airway edema, smooth muscle contraction, and altered cellular activity associated with the inflammatory process, which contribute to the signs and symptoms of asthma.

Montelukast is an orally active compound that binds with high affinity and selectivity to the CysLT<sub>1</sub> receptor (in preference to other pharmacologically important airway receptors, such as the prostanoid, cholinergic, or β-adrenergic receptor). Montelukast inhibits physiologic actions of LTD<sub>4</sub> at the CysLT<sub>1</sub> receptor without any agonist activity.

\* Registered trademark of MERCK & CO., Inc.  
COPYRIGHT © MERCK & CO., Inc., 1998  
All rights reserved.

### Pharmacokinetics

#### Absorption

Montelukast is rapidly absorbed following oral administration. After administration of the 10-mg film-coated tablet to fasted adults, the mean peak montelukast plasma concentration ( $C_{max}$ ) is achieved in 3 to 4 hours ( $T_{max}$ ). The mean oral bioavailability is 64%. The oral bioavailability and  $C_{max}$  are not influenced by a standard meal in the morning.

For the 5-mg chewable tablet, the mean  $C_{max}$  is achieved in 2 to 2.5 hours after administration to adults in the fasted state. The mean oral bioavailability is 73% in the fasted state versus 63% when administered with a standard meal in the morning.

For the 4-mg chewable tablet, the mean  $C_{max}$  is achieved 2 hours after administration in pediatric patients 2 to 5 years of age in the fasted state.

The safety and efficacy of SINGULAIR were demonstrated in clinical trials in which the 10-mg and 5-mg formulations were administered in the evening without regard to the timing of food ingestion.

The comparative pharmacokinetics of montelukast when administered as two 5-mg chewable tablets versus one 10-mg film-coated tablet have not been evaluated.

#### Distribution

Montelukast is more than 99% bound to plasma proteins. The steady-state volume of distribution of montelukast averages 8 to 11 liters. Studies in rats with radiolabeled montelukast indicate minimal distribution across the blood-brain barrier. In addition, concentrations of radiolabeled material at 24 hours postdose were minimal in all other tissues.

#### Metabolism

Montelukast is extensively metabolized. In studies with therapeutic doses, plasma concentrations of metabolites of montelukast are undetectable at steady state in adults and pediatric patients.

*In vitro* studies using human liver microsomes indicate that cytochromes P450 3A4 and 2C9 are involved in the metabolism of montelukast. Clinical studies investigating the effect of known inhibitors of cytochromes P450 3A4 (e.g., ketoconazole, erythromycin) or 2C9 (e.g., fluconazole) on montelukast pharmacokinetics have not been conducted. Based on further *in vitro* results in human liver microsomes, therapeutic plasma concentrations of montelukast do not inhibit cytochromes P450 3A4, 2C9, 1A2, 2A6, 2C19, or 2D6 (see *Drug Interactions*).

#### Elimination

The plasma clearance of montelukast averages 45 mL/min in healthy adults. Following an oral dose of radiolabeled montelukast, 86% of the radioactivity was recovered in 5-day fecal collections and <0.2% was recovered in urine. Coupled with estimates of montelukast oral bioavailability, this indicates that montelukast and its metabolites are excreted almost exclusively via the bile.

In several studies, the mean plasma half-life of montelukast ranged from 2.7 to 5.5 hours in healthy young adults. The pharmacokinetics of montelukast are nearly linear for oral doses up to 50 mg. During once-daily dosing with 10-mg montelukast, there is little accumulation of the parent drug in plasma (14%).

#### Special Populations

**Gender:** The pharmacokinetics of montelukast are similar in males and females.

**Elderly:** The pharmacokinetic profile and the oral bioavailability of a single 10-mg oral dose of montelukast are similar in elderly and younger adults. The plasma half-life of montelukast is slightly longer in the elderly. No dosage adjustment in the elderly is required.

**Race:** Pharmacokinetic differences due to race have not been studied.

**Hepatic Insufficiency:** Patients with mild-to-moderate hepatic insufficiency and clinical evidence of cirrhosis had evidence of decreased metabolism of montelukast resulting in 41% (90% CI=7%, 85%) higher mean montelukast area under the plasma concentration curve (AUC) following a single 10-mg dose. The elimination of montelukast was slightly prolonged compared with that in healthy subjects (mean half-life, 7.4 hours). No dosage adjustment is required in patients with mild-to-moderate hepatic insufficiency. The pharmacokinetics of SINGULAIR in patients with more severe hepatic impairment or with hepatitis have not been evaluated.

**Renal Insufficiency:** Since montelukast and its metabolites are not excreted in the urine, the pharmacokinetics of montelukast were not evaluated in patients with renal insufficiency. No dosage adjustment is recommended in these patients.

**Adolescents and Pediatric Patients:** The plasma concentration profile of montelukast following administration of the 10-mg film-coated tablet is similar in adolescents  $\geq 15$  years of age and young adults. The 10-mg film-coated tablet is recommended for use in patients  $\geq 15$  years of age.

Pharmacokinetic studies show that the mean systemic exposure (in terms of AUC) of the 5-mg chewable tablet in pediatric patients 6 to 14 years of age is similar to that of the 10-mg film-coated tablet in adults. In a pharmacokinetic study in pediatric patients 2 to 5 years of age, the mean systemic exposure (AUC) of the 4-mg chewable tablet is also similar to that of the 10-mg film-coated tablet in adults. The 5-mg chewable tablet should be used in pediatric patients 6 to 14 years of age and the 4-mg chewable tablet should be used in pediatric patients 2 to 5 years of age.

#### *Drug Interactions*

Montelukast at a dose of 10 mg once daily dosed to pharmacokinetic steady state:

- did not cause clinically significant changes in the kinetics of a single intravenous dose of theophylline (predominantly a cytochrome P450 1A2 substrate).
- did not change the pharmacokinetic profile of warfarin (a substrate of cytochromes P450 2A6 and 2C9) or influence the effect of a single 30-mg oral dose of warfarin on prothrombin time or the INR (International Normalized Ratio).
- did not change the pharmacokinetic profile or urinary excretion of immunoreactive digoxin.
- did not change the plasma concentration profile of terfenadine (a substrate of cytochrome P450 3A4) or fexofenadine, its carboxylated metabolite, and did not prolong the QTc interval following co-administration with terfenadine 60 mg twice daily.

Montelukast at doses of  $\geq 100$  mg daily dosed to pharmacokinetic steady state:

- did not significantly alter the plasma concentrations of either component of an oral contraceptive containing norethindrone 1 mg/ethinyl estradiol 35 mcg.
- did not cause any clinically significant change in plasma profiles of prednisone or prednisolone following administration of either oral prednisone or intravenous prednisolone.

Phenobarbital, which induces hepatic metabolism, decreased the AUC of montelukast approximately 40% following a single 10-mg dose of montelukast. No dosage adjustment for SINGULAIR is recommended. It is reasonable to employ appropriate clinical monitoring when potent cytochrome P450 enzyme inducers, such as phenobarbital or rifampin, are co-administered with SINGULAIR.

#### *Pharmacodynamics*

Montelukast causes inhibition of airway cysteinyl leukotriene receptors as demonstrated by the ability to inhibit bronchoconstriction due to inhaled LTD<sub>4</sub> in asthmatics. Doses as low as 5 mg cause substantial blockage of LTD<sub>4</sub>-induced bronchoconstriction. In a placebo-controlled, crossover study (n=12), SINGULAIR inhibited early- and late-phase bronchoconstriction due to antigen challenge by 75% and 57%, respectively.

The effect of SINGULAIR on eosinophils in the peripheral blood was examined in clinical trials in adults and pediatric asthmatic patients. SINGULAIR decreased mean peripheral blood eosinophils approximately 13 to 15% from baseline compared with placebo over the double-blind treatment periods. The relationship between this observation and the clinical benefits noted in the clinical trials is not known (see CLINICAL PHARMACOLOGY, *Clinical Studies*).

#### *Clinical Studies*

##### **GENERAL**

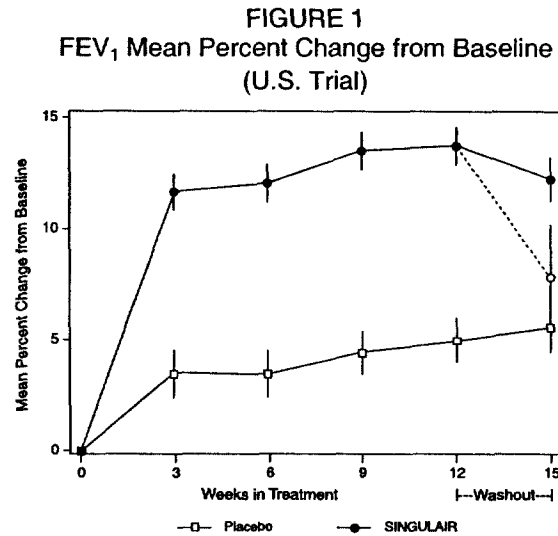
There have been no clinical trials evaluating the relative efficacy of morning versus evening dosing. Although the pharmacokinetics of montelukast are similar whether dosed in the morning or the evening, efficacy was demonstrated in clinical trials in adults and pediatric patients in which montelukast was administered in the evening without regard to the time of food ingestion.

##### **ADOLESCENTS AND ADULTS 15 YEARS OF AGE AND OLDER**

Clinical trials in adolescents and adults 15 years of age and older demonstrated there is no additional clinical benefit to montelukast doses above 10 mg once daily. This was shown in two chronic asthma trials using doses up to 200 mg once daily and in one exercise challenge study using doses up to 50 mg, evaluated at the end of the once-daily dosing interval.

The efficacy of SINGULAIR for the chronic treatment of asthma in adolescents and adults 15 years of age and older was demonstrated in two (U.S. and Multinational) similarly designed, randomized, 12-week, double-blind, placebo-controlled trials in 1576 patients (795 treated with SINGULAIR, 530 treated with placebo, and 251 treated with active control). The patients studied were mild and moderate, non-smoking asthmatics who required approximately 5 puffs of inhaled  $\beta$ -agonist per day on an "as-needed" basis. The patients had a mean baseline percent of predicted forced expiratory volume in 1 second (FEV<sub>1</sub>) of 66% (approximate range, 40 to 90%). The co-primary endpoints in these trials were FEV<sub>1</sub> and daytime asthma symptoms. Secondary endpoints included morning and evening peak expiratory flow rates (AM PEFr, PM PEFr), rescue  $\beta$ -agonist requirements, nocturnal awakening due to asthma, and other asthma-related

outcomes. In both studies after 12 weeks, a random subset of patients receiving SINGULAIR was switched to placebo for an additional 3 weeks of double-blind treatment to evaluate for possible rebound effects. The results of the U.S. trial on the primary endpoint, FEV<sub>1</sub>, expressed as mean percent change from baseline, are shown in FIGURE 1.



The effect of SINGULAIR on other primary and secondary endpoints is shown in TABLE 1 as combined analyses of the U.S. and Multinational trials.

TABLE 1  
Effect of SINGULAIR on Primary and Secondary Endpoints  
in Placebo-controlled Trials  
(Combined Analyses - U.S. and Multinational Trials)

| Endpoint                               | SINGULAIR |                           | Placebo  |                           |
|--|-----------|---------------------------|----------|---------------------------|
|  | Baseline  | Mean Change from Baseline | Baseline | Mean Change from Baseline |
| Daytime Asthma Symptoms (0 to 6 scale) | 2.43      | -0.45*                    | 2.45     | -0.22                     |
| β-agonist (puffs per day)              | 5.38      | -1.56*                    | 5.55     | -0.41                     |
| AM PEFR (L/min)                        | 361.3     | 24.5*                     | 364.9    | 3.3                       |
| PM PEFR (L/min)                        | 385.2     | 17.9*                     | 389.3    | 2.0                       |
| Nocturnal Awakenings (#/week)          | 5.37      | -1.84*                    | 5.44     | -0.79                     |

\* p<0.001, compared with placebo

In adult patients, SINGULAIR reduced “as-needed” β-agonist use by 26.1% from baseline compared with 4.6% for placebo. In patients with nocturnal awakenings of at least 2 nights per week, SINGULAIR reduced the nocturnal awakenings by 34% from baseline, compared with 15% for placebo (combined analysis).

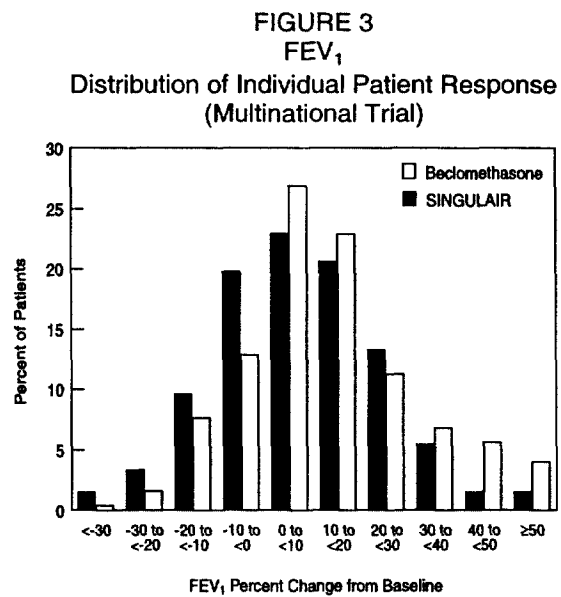
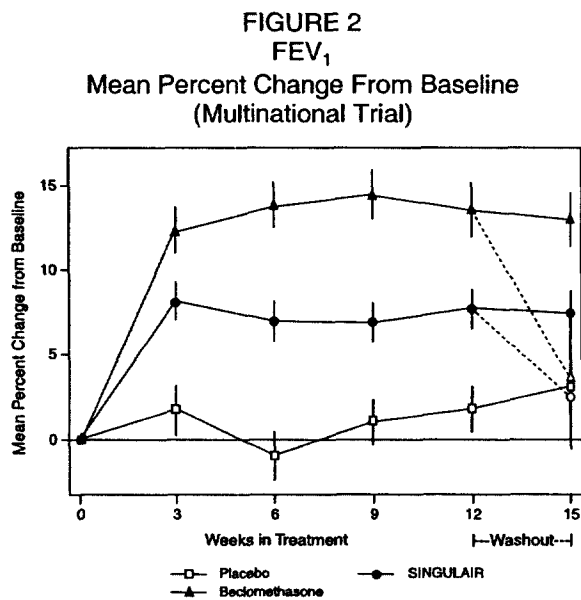
SINGULAIR, compared with placebo, significantly improved other protocol-defined, asthma-related outcome measurements (see TABLE 2).

TABLE 2  
Effect of SINGULAIR on Asthma-Related Outcome Measurements  
(Combined Analyses - U.S. and Multinational Trials)

|  | SINGULAIR                                   | Placebo |
|--|---|---------|
| Asthma Attack* (% of patients)                     | 11.6 <sup>†</sup>                           | 18.4    |
| Oral Corticosteroid Rescue (% of patients)         | 10.7 <sup>†</sup>                           | 17.5    |
| Discontinuation Due to Asthma (% of patients)      | 1.4 <sup>‡</sup>                            | 4.0     |
| Asthma Exacerbations **(% of days)                 | 12.8 <sup>†</sup>                           | 20.5    |
| Asthma Control Days*** (% of days)                 | 38.5 <sup>†</sup>                           | 27.2    |
| Physicians' Global Evaluation (score) <sup>§</sup> | 1.77 <sup>†</sup>                           | 2.43    |
| Patients' Global Evaluation (score) <sup>§§</sup>  | 1.60 <sup>†</sup>                           | 2.15    |
|  | <sup>†</sup> p<0.001, compared with placebo |         |
|  | <sup>‡</sup> p<0.01, compared with placebo  |         |

- \* Asthma Attack defined as utilization of health-care resources such as an unscheduled visit to a doctor's office, emergency room, or hospital; or treatment with oral, intravenous, or intramuscular corticosteroid.
- \*\* Asthma Exacerbation defined by specific clinically important decreases in PEFr, increase in  $\beta$ -agonist use, increases in day or nighttime symptoms, or the occurrence of an asthma attack.
- \*\*\* An Asthma Control Day defined as a day without any of the following: nocturnal awakening, use of more than 2 puffs of  $\beta$ -agonist, or an asthma attack.
- § Physicians' evaluation of the patient's asthma, ranging from 0 to 6 ("very much better" through "very much worse," respectively).
- §§ Patients' evaluation of asthma, ranging from 0 to 6 ("very much better" through "very much worse," respectively).

In one of these trials, a non-U.S. formulation of inhaled beclomethasone dipropionate dosed at 200 mcg (two puffs of 100 mcg ex-valve) twice daily with a spacer device was included as an active control. Over the 12-week treatment period, the mean percentage change in FEV<sub>1</sub> over baseline for SINGULAIR and beclomethasone were 7.49% vs 13.3% (p<0.001) respectively, see FIGURE 2; and the change in daytime symptom scores was -0.49 vs -0.70 on a 0 to 6 scale (p<0.001) for SINGULAIR and beclomethasone, respectively. The percentages of individual patients treated with SINGULAIR or beclomethasone achieving any given percentage change in FEV<sub>1</sub> from baseline are shown in FIGURE 3.



### *Onset of Action and Maintenance of Benefits*

In each placebo-controlled trial in adults, the treatment effect of SINGULAIR, measured by daily diary card parameters, including symptom scores, "as-needed"  $\beta$ -agonist use, and PEFr measurements, was achieved after the first dose and was maintained throughout the dosing interval (24 hours). No significant change in treatment effect was observed during continuous once-daily evening administration in non-placebo-controlled extension trials for up to one year. Withdrawal of SINGULAIR in asthmatic patients after 12 weeks of continuous use did not cause rebound worsening of asthma.

### *PEDIATRIC PATIENTS 6 TO 14 YEARS OF AGE*

The efficacy of SINGULAIR in pediatric patients 6 to 14 years of age was demonstrated in one 8-week double-blind, placebo-controlled trial in 336 patients (201 treated with SINGULAIR and 135 treated with placebo) using an inhaled  $\beta$ -agonist on an "as-needed" basis. The patients had a mean baseline percent predicted FEV<sub>1</sub> of 72% (approximate range, 45 to 90%) and a mean daily inhaled  $\beta$ -agonist requirement of 3.4 puffs of albuterol. Approximately 36% of the patients were on inhaled corticosteroids.

Compared with placebo, treatment with one 5-mg SINGULAIR chewable tablet daily, resulted in a significant improvement in mean morning FEV<sub>1</sub> percent change from baseline (8.7% in the group treated with SINGULAIR vs 4.2% change from baseline in the placebo group,  $p < 0.001$ ). There was a significant decrease in the mean percentage change in daily "as-needed" inhaled  $\beta$ -agonist use (11.7% decrease from baseline in the group treated with SINGULAIR vs 8.2% increase from baseline in the placebo group,  $p < 0.05$ ). This effect represents a mean decrease from baseline of 0.56 and 0.23 puffs per day for the montelukast and placebo groups, respectively. Subgroup analyses indicated that younger pediatric patients aged 6 to 11 had efficacy results comparable to those of the older pediatric patients aged 12 to 14.

SINGULAIR, one 5-mg chewable tablet daily at bedtime, significantly decreased the percent of days asthma exacerbations occurred (SINGULAIR 20.6% vs placebo 25.7%,  $p \leq 0.05$ ). (See TABLE 2 for definition of asthma exacerbation.) Parents' global asthma evaluations (parental evaluations of the patients' asthma, see TABLE 2 for definition of score) were significantly better with SINGULAIR compared with placebo (SINGULAIR 1.34 vs placebo 1.69,  $p \leq 0.05$ ).

Similar to the adult studies, no significant change in the treatment effect was observed during continuous once-daily administration in one open-label extension trial without a concurrent placebo group for up to 6 months.

### *EFFECTS IN PATIENTS ON CONCOMITANT INHALED CORTICOSTEROIDS*

Separate trials in adults evaluated the ability of SINGULAIR to add to the clinical effect of inhaled corticosteroids and to allow inhaled corticosteroid tapering when used concomitantly.

One randomized, placebo-controlled, parallel-group trial ( $n=226$ ) enrolled stable asthmatic adults with a mean FEV<sub>1</sub> of approximately 84% of predicted who were previously maintained on various inhaled corticosteroids (delivered by metered-dose aerosol or dry powder inhalers). The types of inhaled corticosteroids and their mean baseline requirements included beclomethasone dipropionate (mean dose, 1203 mcg/day), triamcinolone acetonide (mean dose, 2004 mcg/day), flunisolide (mean dose, 1971 mcg/day), fluticasone propionate (mean dose, 1083 mcg/day), or budesonide (mean dose, 1192 mcg/day). Some of these inhaled corticosteroids were non-U.S.-approved formulations, and doses expressed may not be ex-actuator. The pre-study inhaled corticosteroid requirements were reduced by approximately 37% during a 5- to 7-week placebo run-in period designed to titrate patients toward their lowest effective inhaled corticosteroid dose. Treatment with SINGULAIR resulted in a further 47% reduction in mean inhaled corticosteroid dose compared with a mean reduction of 30% in the placebo group over the 12-week active treatment period ( $p \leq 0.05$ ). Approximately 40% of the montelukast-treated patients and 29% of the placebo-treated patients could be tapered off inhaled corticosteroids and remained off inhaled corticosteroids at the conclusion of the study ( $p=NS$ ). It is not known whether the results of this study are generalizable to asthmatics who require higher doses of inhaled corticosteroids or systemic corticosteroids.

In another randomized, placebo-controlled, parallel-group trial ( $n=642$ ) in a similar population of adult patients previously maintained, but not adequately controlled, on inhaled corticosteroids (beclomethasone 336 mcg/day), the addition of SINGULAIR to beclomethasone resulted in statistically significant improvements in FEV<sub>1</sub> compared with those patients who were continued on beclomethasone alone or those patients who were withdrawn from beclomethasone and treated with montelukast or placebo alone over the last 10 weeks of the 16-week, blinded treatment period. Patients who were randomized to treatment arms containing beclomethasone had statistically significantly better asthma control than those

patients randomized to SINGULAIR alone or placebo alone as indicated by FEV<sub>1</sub>, daytime asthma symptoms, PEF<sub>R</sub>, nocturnal awakenings due to asthma, and “as-needed” β-agonist requirements.

In adult asthmatic patients with documented aspirin sensitivity, nearly all of whom were receiving concomitant inhaled and/or oral corticosteroids, a 4-week randomized, parallel-group trial (n=80) demonstrated that SINGULAIR, compared with placebo, resulted in significant improvement in parameters of asthma control. The magnitude of effect of SINGULAIR in aspirin-sensitive patients was similar to the effect observed in the general population of asthmatic patients studied. The effect of SINGULAIR on the bronchoconstrictor response to aspirin or other non-steroidal anti-inflammatory drugs in aspirin-sensitive asthmatic patients has not been evaluated (see PRECAUTIONS, *General*).

#### **EFFECTS ON EXERCISE-INDUCED BRONCHOCONSTRICTION (ADULTS AND PEDIATRIC PATIENTS)**

In a 12-week, randomized, double-blind, parallel group study of 110 adolescent and adult asthmatics 15 years of age and older, with a mean baseline FEV<sub>1</sub> percent of predicted of 83% and with documented exercise-induced exacerbation of asthma, treatment with SINGULAIR, 10 mg, once daily in the evening, resulted in a statistically significant reduction in mean maximal percent fall in FEV<sub>1</sub> and mean time to recovery to within 5% of the pre-exercise FEV<sub>1</sub>. Exercise challenge was conducted at the end of the dosing interval (i.e., 20 to 24 hours after the preceding dose). This effect was maintained throughout the 12-week treatment period indicating that tolerance did not occur. SINGULAIR did not, however, prevent clinically significant deterioration in maximal percent fall in FEV<sub>1</sub> after exercise (i.e., ≥20% decrease from pre-exercise baseline) in 52% of patients studied. In a separate crossover study in adults, a similar effect was observed after two once-daily 10-mg doses of SINGULAIR.

In pediatric patients 6 to 14 years of age, using the 5-mg chewable tablet, a 2-day crossover study demonstrated effects similar to those observed in adults when exercise challenge was conducted at the end of the dosing interval (i.e., 20 to 24 hours after the preceding dose).

SINGULAIR should not be used as monotherapy for the treatment and management of exercise-induced bronchospasm. Patients who have exacerbations of asthma after exercise should continue to use their usual regimen of inhaled β-agonists as prophylaxis and have available for rescue a short-acting inhaled β-agonist (see PRECAUTIONS, *General* and *Information for Patients*).

#### **INDICATIONS AND USAGE**

SINGULAIR is indicated for the prophylaxis and chronic treatment of asthma in adults and pediatric patients 2 years of age and older.

#### **CONTRAINDICATIONS**

Hypersensitivity to any component of this product.

#### **PRECAUTIONS**

##### *General*

SINGULAIR is not indicated for use in the reversal of bronchospasm in acute asthma attacks, including status asthmaticus.

Patients should be advised to have appropriate rescue medication available. Therapy with SINGULAIR can be continued during acute exacerbations of asthma.

While the dose of inhaled corticosteroid may be reduced gradually under medical supervision, SINGULAIR should not be abruptly substituted for inhaled or oral corticosteroids.

SINGULAIR should not be used as monotherapy for the treatment and management of exercise-induced bronchospasm. Patients who have exacerbations of asthma after exercise should continue to use their usual regimen of inhaled β-agonists as prophylaxis and have available for rescue a short-acting inhaled β-agonist.

Patients with known aspirin sensitivity should continue avoidance of aspirin or non-steroidal anti-inflammatory agents while taking SINGULAIR. Although SINGULAIR is effective in improving airway function in asthmatics with documented aspirin sensitivity, it has not been shown to truncate bronchoconstrictor response to aspirin and other non-steroidal anti-inflammatory drugs in aspirin-sensitive asthmatic patients (see CLINICAL PHARMACOLOGY, *Clinical Studies*).



### *Eosinophilic Conditions*

In rare cases, patients on therapy with SINGULAIR may present with systemic eosinophilia, sometimes presenting with clinical features of vasculitis consistent with Churg-Strauss syndrome, a condition which is often treated with systemic corticosteroid therapy. These events usually, but not always, have been associated with the reduction of oral corticosteroid therapy. Physicians should be alert to eosinophilia, vasculitic rash, worsening pulmonary symptoms, cardiac complications, and/or neuropathy presenting in their patients. A causal association between SINGULAIR and these underlying conditions has not been established (see ADVERSE REACTIONS).

### *Information for Patients*

- Patients should be advised to take SINGULAIR daily as prescribed, even when they are asymptomatic, as well as during periods of worsening asthma, and to contact their physicians if their asthma is not well controlled.
- Patients should be advised that oral tablets of SINGULAIR are not for the treatment of acute asthma attacks. They should have appropriate short-acting inhaled  $\beta$ -agonist medication available to treat asthma exacerbations.
- Patients should be advised that, while using SINGULAIR, medical attention should be sought if short-acting inhaled bronchodilators are needed more often than usual, or if more than the maximum number of inhalations of short-acting bronchodilator treatment prescribed for 24-hour period are needed.
- Patients receiving SINGULAIR should be instructed not to decrease the dose or stop taking any other anti-asthma medications unless instructed by a physician.
- Patients who have exacerbations of asthma after exercise should be instructed to continue to use their usual regimen of inhaled  $\beta$ -agonists as prophylaxis unless otherwise instructed by their physician. All patients should have available for rescue a short-acting inhaled  $\beta$ -agonist.
- Patients with known aspirin sensitivity should be advised to continue avoidance of aspirin or non-steroidal anti-inflammatory agents while taking SINGULAIR.

### *Chewable Tablets*

- *Phenylketonurics:* Phenylketonuric patients should be informed that the 4-mg and 5-mg chewable tablets contain phenylalanine (a component of aspartame), 0.674 and 0.842 mg per 4-mg and 5-mg chewable tablet, respectively.

### *Drug Interactions*

SINGULAIR has been administered with other therapies routinely used in the prophylaxis and chronic treatment of asthma with no apparent increase in adverse reactions. In drug-interaction studies, the recommended clinical dose of montelukast did not have clinically important effects on the pharmacokinetics of the following drugs: theophylline, prednisone, prednisolone, oral contraceptives (norethindrone 1 mg/ethinyl estradiol 35 mcg), terfenadine, digoxin, and warfarin.

Although additional specific interaction studies were not performed, SINGULAIR was used concomitantly with a wide range of commonly prescribed drugs in clinical studies without evidence of clinical adverse interactions. These medications included thyroid hormones, sedative hypnotics, non-steroidal anti-inflammatory agents, benzodiazepines, and decongestants.

Phenobarbital, which induces hepatic metabolism, decreased the AUC of montelukast approximately 40% following a single 10-mg dose of montelukast. No dosage adjustment for SINGULAIR is recommended. It is reasonable to employ appropriate clinical monitoring when potent cytochrome P450 enzyme inducers, such as phenobarbital or rifampin, are co-administered with SINGULAIR.

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

No evidence of tumorigenicity was seen in either a 2-year carcinogenicity study in Sprague-Dawley rats at oral gavage doses up to 200 mg/kg/day (estimated exposure was approximately 120 times the area under the plasma concentration versus time curve (AUC) for adults and children at the maximum recommended daily oral dose) or in a 92-week carcinogenicity study in mice at oral gavage doses up to 100 mg/kg/day (estimated exposure was approximately 45 times the AUC for adults and children at the maximum recommended daily oral dose).

Montelukast demonstrated no evidence of mutagenic or clastogenic activity in the following assays: the microbial mutagenesis assay, the V-79 mammalian cell mutagenesis assay, the alkaline elution assay in rat hepatocytes, the chromosomal aberration assay in Chinese hamster ovary cells, and in the *in vivo* mouse bone marrow chromosomal aberration assay.

In fertility studies in female rats, montelukast produced reductions in fertility and fecundity indices at an oral dose of 200 mg/kg (estimated exposure was approximately 70 times the AUC for adults at the

maximum recommended daily oral dose). No effects on female fertility or fecundity were observed at an oral dose of 100 mg/kg (estimated exposure was approximately 20 times the AUC for adults at the maximum recommended daily oral dose). Montelukast had no effects on fertility in male rats at oral doses up to 800 mg/kg (estimated exposure was approximately 160 times the AUC for adults at the maximum recommended daily oral dose).

*Pregnancy, Teratogenic Effects*

*Pregnancy Category B:*

No teratogenicity was observed in rats at oral doses up to 400 mg/kg/day (estimated exposure was approximately 100 times the AUC for adults at the maximum recommended daily oral dose) and in rabbits at oral doses up to 300 mg/kg/day (estimated exposure was approximately 110 times the AUC for adults at the maximum recommended daily oral dose). Montelukast crosses the placenta following oral dosing in rats and rabbits. There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, SINGULAIR should be used during pregnancy only if clearly needed.

Merck & Co., Inc. maintains a registry to monitor the pregnancy outcomes of women exposed to SINGULAIR while pregnant. Healthcare providers are encouraged to report any prenatal exposure to SINGULAIR by calling the Pregnancy Registry at (800) 986-8999.

*Nursing Mothers*

Studies in rats have shown that montelukast is excreted in milk. It is not known if montelukast is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when SINGULAIR is given to a nursing mother.

*Pediatric Use*

Safety and efficacy of SINGULAIR have been established in adequate and well-controlled studies in pediatric patients 6 to 14 years of age. Safety and efficacy profiles in this age group are similar to those seen in adults. (See *Clinical Studies* and ADVERSE REACTIONS.)

The safety of SINGULAIR 4-mg chewable tablets in pediatric patients 2 to 5 years of age has been demonstrated in an interim analysis of 314 pediatric patients in a 12-week double-blind, placebo-controlled study in approximately 650 patients (see ADVERSE REACTIONS). Efficacy of SINGULAIR in this age group is extrapolated from the demonstrated efficacy in adolescent and adult patients 15 years of age and older and pediatric patients 6 to 14 years of age with asthma based on similar mean systemic exposure (AUC), and that the disease course, pathophysiology and the drug's effect are substantially similar among these populations.

The safety and effectiveness in pediatric patients below the age of 2 years have not been established. Long-term trials evaluating the effect of chronic administration of SINGULAIR on linear growth in pediatric patients have not been conducted.

*Geriatric Use*

Of the total number of subjects in clinical studies of montelukast, 3.5% were 65 years of age and over and 0.4% were 75 years of age 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.

## **ADVERSE REACTIONS**

*Adolescents and Adults 15 Years of Age and Older*

SINGULAIR has been evaluated for safety in approximately 2600 adolescent and adult patients 15 years of age and older in clinical trials. In placebo-controlled clinical trials, the following adverse experiences reported with SINGULAIR occurred in greater than or equal to 1% of patients and at an incidence greater than that in patients treated with placebo, regardless of causality assessment:

Adverse Experiences Occurring in ≥1% of Patients  
with an Incidence Greater than that in Patients Treated with Placebo,  
Regardless of Causality Assessment

|  | SINGULAIR<br>10 mg/day<br>(%)<br>(n=1955) | Placebo<br>(%)<br>(n=1180) |
|--|---|----------------------------|
| <i>Body As A Whole</i>                 |   |                            |
| Asthenia/fatigue                       | 1.8                                       | 1.2                        |
| Fever                                  | 1.5                                       | 0.9                        |
| Pain, abdominal                        | 2.9                                       | 2.5                        |
| Trauma                                 | 1.0                                       | 0.8                        |
| <i>Digestive System Disorders</i>      |   |                            |
| Dyspepsia                              | 2.1                                       | 1.1                        |
| Gastroenteritis, infectious            | 1.5                                       | 0.5                        |
| Pain, dental                           | 1.7                                       | 1.0                        |
| <i>Nervous System/Psychiatric</i>      |   |                            |
| Dizziness                              | 1.9                                       | 1.4                        |
| Headache                               | 18.4                                      | 18.1                       |
| <i>Respiratory System Disorders</i>    |   |                            |
| Congestion, nasal                      | 1.6                                       | 1.3                        |
| Cough                                  | 2.7                                       | 2.4                        |
| Influenza                              | 4.2                                       | 3.9                        |
| <i>Skin/Skin Appendages Disorder</i>   |   |                            |
| Rash                                   | 1.6                                       | 1.2                        |
| <i>Laboratory Adverse Experiences*</i> |   |                            |
| ALT increased                          | 2.1                                       | 2.0                        |
| AST increased                          | 1.6                                       | 1.2                        |
| Pyuria                                 | 1.0                                       | 0.9                        |

\* Number of patients tested (SINGULAIR and placebo, respectively): ALT and AST, 1935, 1170; pyuria, 1924, 1159.

The frequency of less common adverse events was comparable between SINGULAIR and placebo.

Cumulatively, 569 patients were treated with SINGULAIR for at least 6 months, 480 for one year, and 49 for two years in clinical trials. With prolonged treatment, the adverse experience profile did not significantly change.

#### *Pediatric Patients 6 to 14 Years of Age*

SINGULAIR has also been evaluated for safety in approximately 320 pediatric patients 6 to 14 years of age. Cumulatively, 169 pediatric patients were treated with SINGULAIR for at least 6 months, and 121 for one year or longer in clinical trials. The safety profile of SINGULAIR versus placebo in the double-blind, 8-week, pediatric efficacy trial was generally similar to the adult safety profile with the exception of the adverse events listed below. In pediatric patients 6 to 14 years of age receiving SINGULAIR, the following events occurred with a frequency ≥2% and more frequently than in pediatric patients who received placebo, regardless of causality assessment: diarrhea, laryngitis, pharyngitis, nausea, otitis, sinusitis, and viral infection. The frequency of less common adverse events was comparable between SINGULAIR and placebo. With prolonged treatment, the adverse experience profile did not significantly change.

#### *Pediatric Patients 2 to 5 Years of Age*

Safety data for SINGULAIR in pediatric patients 2 to 5 years of age are available from an interim analysis of 314 pediatric patients from a 12-week, double-blind, placebo-controlled clinical study in approximately 650 patients. The safety profile of SINGULAIR in this interim analysis of patients who received SINGULAIR for at least 6 weeks was generally similar to the safety profile in pediatric patients 6 to 14 years of age. In pediatric patients 2 to 5 years of age receiving SINGULAIR, the following events occurred with a frequency ≥2% and more frequently than in pediatric patients who received placebo, regardless of causality assessment: rhinorrhea, otitis, ear pain, bronchitis, leg pain, thirst, sneezing, rash and urticaria.

#### *Post-Marketing Experience*

The following additional adverse reactions have been reported in post-marketing use: hypersensitivity reactions (including anaphylaxis, angioedema, pruritus, urticaria, and very rarely, hepatic eosinophilic infiltration); dream abnormalities, drowsiness, irritability, restlessness, insomnia, and very rarely seizure; nausea, vomiting, dyspepsia, diarrhea, and very rarely pancreatitis; myalgia including muscle cramps; increased bleeding tendency, bruising; and edema.

In rare cases, patients on therapy with SINGULAIR may present with systemic eosinophilia, sometimes presenting with clinical features of vasculitis consistent with Churg-Strauss syndrome, a condition which is

often treated with systemic corticosteroid therapy. These events usually, but not always, have been associated with the reduction of oral corticosteroid therapy. Physicians should be alert to eosinophilia, vasculitic rash, worsening pulmonary symptoms, cardiac complications, and/or neuropathy presenting in their patients. A causal association between SINGULAIR and these underlying conditions has not been established (see PRECAUTIONS, *Eosinophilic Conditions*).

## OVERDOSAGE

No mortality occurred following single oral doses of montelukast up to 5000 mg/kg in mice (estimated exposure was approximately 340 times the AUC for adults and children at the maximum recommended daily oral dose) and rats (estimated exposure was approximately 230 times the AUC for adults and children at the maximum recommended daily oral dose).

No specific information is available on the treatment of overdosage with SINGULAIR. In chronic asthma studies, montelukast has been administered at doses up to 200 mg/day to patients for 22 weeks and, in short-term studies, up to 900 mg/day to patients for approximately a week without clinically important adverse experiences. In the event of overdose, it is reasonable to employ the usual supportive measures; e.g., remove unabsorbed material from the gastrointestinal tract, employ clinical monitoring, and institute supportive therapy, if required.

There have been reports of acute overdosage in pediatric patients in post-marketing experience and clinical studies of up to at least 150 mg/day with SINGULAIR. The clinical and laboratory findings observed were consistent with the safety profile in adults and older pediatric patients. There were no adverse experiences reported in the majority of overdosage reports. The most frequent adverse experiences observed were thirst, somnolence, mydriasis, hyperkinesia, and abdominal pain.

It is not known whether montelukast is removed by peritoneal dialysis or hemodialysis.

## DOSAGE AND ADMINISTRATION

### *General Information:*

#### *Adolescents and Adults 15 Years of Age and Older*

The dosage for adolescents and adults 15 years of age and older is one 10-mg tablet daily to be taken in the evening.

#### *Pediatric Patients 6 to 14 Years of Age*

The dosage for pediatric patients 6 to 14 years of age is one 5-mg chewable tablet daily to be taken in the evening. No dosage adjustment within this age group is necessary.

#### *Pediatric Patients 2 to 5 Years of Age*

The dosage for pediatric patients 2 to 5 years of age is one 4-mg chewable tablet daily to be taken in the evening. Safety and effectiveness in pediatric patients younger than 2 years of age have not been established.

The safety and efficacy of SINGULAIR was demonstrated in clinical trials where it was administered in the evening without regard to the time of food ingestion. There have been no clinical trials evaluating the relative efficacy of morning versus evening dosing.

## HOW SUPPLIED

No. 3796 —SINGULAIR Tablets, 4 mg, are pink, oval, bi-convex-shaped chewable tablets, with code MRK 711 on one side and SINGULAIR on the other. They are supplied as follows:

**NDC 0006-0711-31** unit of use high-density polyethylene (HDPE) bottles of 30 with a polypropylene child-resistant cap, an aluminum foil induction seal, and a silica gel desiccant canister

**NDC 0006-0711-54** unit of use high-density polyethylene (HDPE) bottles of 90 with a polypropylene child-resistant cap, an aluminum foil induction seal, and a silica gel desiccant canister

**NDC 0006-0711-68** high-density polyethylene (HDPE) bulk bottles of 100 with a polypropylene non-child-resistant cap, an aluminum foil induction seal, and a silica gel desiccant canister

**NDC 0006-0711-74** high-density polyethylene (HDPE) bulk bottles of 500 with a polypropylene non-child-resistant cap, an aluminum foil induction seal, and three silica gel desiccant canisters

**NDC 0006-0711-28** unit dose paper and aluminum foil-backed aluminum foil peelable blister packs of 100.

No. 3760 — SINGULAIR Tablets, 5 mg, are pink, round, bi-convex-shaped chewable tablets, with code MRK 275 on one side and SINGULAIR on the other. They are supplied as follows:

SINGULAIR®  
(Montelukast Sodium)  
Tablets and Chewable Tablets

9088809

**NDC 0006-0275-31** unit of use high-density polyethylene (HDPE) bottles of 30 with a polypropylene child-resistant cap, an aluminum foil induction seal, and a silica gel desiccant canister

**NDC 0006-0275-54** unit of use high-density polyethylene (HDPE) bottles of 90 with a polypropylene child-resistant cap, an aluminum foil induction seal, and a silica gel desiccant canister

**NDC 0006-0275-28** unit dose paper and aluminum foil-backed aluminum foil peelable blister packs of 100.

No. 3761 — SINGULAIR Tablets, 10 mg, are beige, rounded square-shaped, film-coated tablets, with code MRK 117 on one side and SINGULAIR on the other. They are supplied as follows:

**NDC 0006-0117-31** unit of use high-density polyethylene (HDPE) bottles of 30 with a polypropylene child-resistant cap, an aluminum foil induction seal, and a silica gel desiccant canister

**NDC 0006-0117-54** unit of use high-density polyethylene (HDPE) bottles of 90 with a polypropylene child-resistant cap, an aluminum foil induction seal, and a silica gel desiccant canister

**NDC 0006-0117-28** unit dose paper and aluminum foil-backed aluminum foil peelable blister pack of 100.

*Storage*

Store the 4-mg chewable tablets, the 5-mg chewable tablets and the 10-mg film-coated tablets at room temperature 15-30°C (59-86°F), protected from moisture and light.

---

 **MERCK & CO., INC.**, Whitehouse Station, NJ 08889, USA

**APPEARS THIS WAY  
ON ORIGINAL**

**SINGULAIR® (Montelukast Sodium) Tablets and Chewable Tablets**  
**Patient Information about**  
**SINGULAIR® (SING-u-lair)**  
**Generic name: montelukast (mon-te-LOO-kast) sodium**

Read this information before you start taking SINGULAIR®. Also, read the leaflet each time you renew your prescription, in case anything has changed. This leaflet does not take the place of complete discussions with your doctor. You and your doctor should discuss SINGULAIR when you start taking your medicine and at regular checkups.

**What is SINGULAIR?**

- Your doctor has prescribed SINGULAIR once a day for the long-term treatment of your (or your child's) asthma.
- SINGULAIR is a medicine called a leukotriene receptor antagonist. It works by blocking substances in the body called leukotrienes. Blocking leukotrienes improves asthma symptoms. SINGULAIR is not a steroid.
- SINGULAIR comes in 3 forms:
  1. A 10-mg tablet that you swallow whole (for adults and children above age 14).
  2. A 5-mg chewable tablet (for children ages 6-14).
  3. A 4-mg chewable tablet (for children ages 2-5).
- **SINGULAIR should NOT be used for the fast relief of asthma attacks.** If you get an asthma attack, you should follow the instructions your doctor gave you for treating asthma attacks.

**What is asthma?**

- Asthma is a continuing (chronic) lung disease. It cannot be cured, but it can be controlled.
- Symptoms of asthma include:
  - coughing
  - wheezing
  - chest tightness
- In some patients, symptoms worsen during the night or after exercise.

**Who should not take SINGULAIR?**

Patients with allergies to any components of SINGULAIR should not take SINGULAIR. The active ingredient in SINGULAIR is montelukast sodium. The inactive ingredients are listed at the end of this leaflet.

The safety and efficacy of SINGULAIR has not been established in children younger than age 2.

**What should I tell my doctor before taking SINGULAIR?**

Tell your doctor:

- If you are pregnant or plan to become pregnant. SINGULAIR may not be right for you.
- If you are breast-feeding. SINGULAIR may be passed in your milk to your baby.
- About any medical problems or allergies you have now or have had.
- About all medicines that you are taking or plan to take, including those you can get without a prescription.

**How should I take SINGULAIR?**

- Take SINGULAIR once a day in the evening.

- Take SINGULAIR daily for as long as your doctor prescribes it, even if you have no symptoms.
- You may take SINGULAIR with or without food.
- Children who are prescribed SINGULAIR should take it under the supervision of an adult.
- If your symptoms get worse, or if you need to increase the use of your inhaled rescue medicine for asthma attacks, contact your doctor at once.
- **Do NOT take SINGULAIR to stop an asthma attack.** If an attack occurs, follow the instructions your doctor gave you for asthma attacks.
- It is very important that you continue taking your other asthma medicines unless your doctor tells you to stop. In addition, do not lower the dose of any of your asthma medicines unless you are told to do so by your doctor. Your doctor may decide to reduce the amount you use of your current asthma medicine.
- If your asthma is made worse by exercise, continue to use the medicines your doctor prescribed for you to use before exercise, unless your doctor tells you otherwise. Always have your inhaled rescue medicine for asthma attacks with you in case you need it.

The dose for adults and adolescents 15 years and older is one 10-mg tablet daily. The dose for children 6 to 14 years old is one 5-mg chewable tablet daily. The dose for children 2 to 5 years old is one 4-mg chewable tablet daily.

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

- If your asthma is made worse by aspirin, you should continue to avoid aspirin or other non-steroidal anti-inflammatory drugs, such as ibuprofen and naproxen.

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

The side effects of SINGULAIR are usually mild.

- The side effects in patients treated with SINGULAIR were similar in type and frequency to side effects in patients who were given a placebo (a pill containing no medication).

The list below is **NOT** a complete list of side effects reported with SINGULAIR. Your doctor can discuss with you a more complete list of side effects. The most common side effects are listed below.

tiredness  
fever  
abdominal (stomach) pain  
stomach or intestinal upset (gastroenteritis)  
heartburn  
dizziness  
headache  
rash  
cough  
flu  
stuffy nose

Less common side effects included the following

- allergic reactions including:
  - swelling of the face, lips, tongue, and/or throat, which may cause difficulty in breathing or swallowing
  - hives
  - itching
- bad/vivid dreams
- irritability
- restlessness
- insomnia
- seizure
- nausea

- vomiting
- dyspepsia
- diarrhea
- pancreatitis
- muscle aches and muscle cramps
- increased bleeding tendency
- bruising
- edema

Rarely, patients taking SINGULAIR have experienced a condition that includes a combination of certain symptoms that do not go away or that get worse. These symptoms may include:

- a flu-like illness
- rash
- a feeling of pins and needles or numbness of arms or legs
- severe inflammation (pain and swelling) of the sinuses (sinusitis)

These have occurred usually, but not always, in patients who were taking oral corticosteroid pills for asthma and those corticosteroids were being slowly lowered or stopped. Although SINGULAIR has not been shown to cause this condition, you must tell your doctor right away if you develop one or more of these symptoms.

Remember, anytime you have a medical problem you think may be related to SINGULAIR, talk to your doctor.

#### **Other Information**

Do not share SINGULAIR with anyone else; it was prescribed only for you. Do not use it for a condition for which it was not prescribed.

Keep SINGULAIR and all medicines out of the reach of children.

Phenylketonurics: SINGULAIR 4-mg and 5-mg chewable tablets contain 0.674 and 0.842 mg phenylalanine, respectively.

This leaflet provides a summary of information about SINGULAIR. If you have any questions or concerns about either SINGULAIR or asthma, talk to your doctor. In addition, you can talk to your pharmacist or other health care provider. Your doctor or pharmacist can give you an additional leaflet that is written for health professionals.

#### **Inactive ingredients:**

4-mg and 5-mg chewable tablets: mannitol, microcrystalline cellulose, hydroxypropyl cellulose, red ferric oxide, croscarmellose sodium, cherry flavor, aspartame, and magnesium stearate.

10-mg tablet: microcrystalline cellulose, lactose monohydrate, croscarmellose sodium, hydroxypropyl cellulose, magnesium stearate, hydroxypropyl methylcellulose, titanium dioxide, red ferric oxide, yellow ferric oxide, and carnauba wax.

**MERCK & CO., INC.**  
Whitehouse Station, NJ 08889, USA