

## Summary of Product Characteristics

### 1 NAME OF THE MEDICINAL PRODUCT

Singulair Paediatric 4 mg granules

### 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

One sachet of granules contains montelukast sodium, which is equivalent to 4 mg montelukast.

For a full list of excipients, see section 6.1.

### 3 PHARMACEUTICAL FORM

Granules

*Product imported from the UK:*

White granules

### 4 CLINICAL PARTICULARS

#### 4.1 Therapeutic Indications

SINGULAIR is indicated in the treatment of asthma as add-on therapy in those 6 month to 5 year old patients with mild to moderate persistent asthma who are inadequately controlled on inhaled corticosteroids and in whom “as-needed” short acting  $\beta$ -agonists provide inadequate clinical control of asthma.

SINGULAIR may also be an alternative treatment option to low-dose inhaled corticosteroids for 2 to 5 year old patients with mild persistent asthma who do not have a recent history of serious asthma attacks that required oral corticosteroid use, and who have demonstrated that they are not capable of using inhaled corticosteroids (*see section 4.2*).

SINGULAIR is also indicated in the prophylaxis of asthma from two years of age and older in which the predominant component is exercise-induced bronchoconstriction.

#### 4.2 Posology and method of administration

This medicinal product is to be given to a child under adult supervision. The dosage for paediatric patients 6 months to 5 years of age is one sachet of 4 mg granules daily to be taken in the evening. No dosage adjustment within this age group is necessary. Efficacy data from clinical trials in paediatric patients 6 months to 2 years of age with persistent asthma are limited. Patients should be evaluated after 2 to 4 weeks for response to montelukast treatment. Treatment should be discontinued if a lack of response is observed. The SINGULAIR 4 mg granules formulation is not recommended below 6 months of age.

*Administration of SINGULAIR granules:*

SINGULAIR granules can be administered either directly in the mouth, or mixed with a spoonful of cold or room temperature soft food (e.g., applesauce, ice cream, carrots and rice). The sachet should not be opened until ready to use. After opening the sachet, the full dose of SINGULAIR granules must be administered immediately (within 15 minutes). If mixed with food, SINGULAIR granules must not be stored for future use.

SINGULAIR granules are not intended to be dissolved in liquid for administration. However, liquids may be taken subsequent to administration. SINGULAIR granules can be administered without regard to the timing of food ingestion.

*General recommendations.* The therapeutic effect of SINGULAIR on parameters of asthma control occurs within one day. Patients should be advised to continue taking SINGULAIR even if their asthma is under control, as well as during periods of worsening asthma.

No dosage adjustment is necessary for patients with renal insufficiency, or mild to moderate hepatic impairment. There are no data on patients with severe hepatic impairment. The dosage is the same for both male and female patients.

*SINGULAIR as an alternative treatment option to low-dose inhaled corticosteroids for mild, persistent asthma:*

Montelukast is not recommended as monotherapy in patients with moderate persistent asthma. The use of montelukast as an alternative treatment option to low-dose inhaled corticosteroids for children 2 to 5 years old with mild persistent asthma should only be considered for patients who do not have a recent history of serious asthma attacks that required oral corticosteroid use and who have demonstrated that they are not capable of using inhaled corticosteroids (*see section 4.1*). Mild persistent asthma is defined as asthma symptoms more than once a week but less than once a day, nocturnal symptoms more than twice a month but less than once a week, normal lung function between episodes. If satisfactory control of asthma is not achieved at follow-up (usually within one month), the need for an additional or different anti-inflammatory therapy based on the step system for asthma therapy should be evaluated. Patients should be periodically evaluated for their asthma control.

*SINGULAIR as prophylaxis of asthma for 2 to 5 year old patients in whom the predominant component is exercise-induced bronchoconstriction:*

In 2 to 5 year old patients, exercise-induced bronchoconstriction may be the predominant manifestation of persistent asthma that requires treatment with inhaled corticosteroids. Patients should be evaluated after 2 to 4 weeks of treatment with montelukast. If satisfactory response is not achieved, an additional or different therapy should be considered.

*Therapy with SINGULAIR in relation to other treatments for asthma.*

When treatment with SINGULAIR is used as add-on therapy to inhaled corticosteroids, SINGULAIR should not be abruptly substituted for inhaled corticosteroids (*see section 4.4*).

10 mg film-coated tablets are available for adults 15 years of age and older.

5 mg chewable tablets are available for paediatric patients 6 to 14 years of age.

4 mg chewable tablets are available as an alternative formulation for paediatric patients 2 to 5 years of age.

### 4.3 Contraindications

Hypersensitivity to the active substance or to any of the excipients.

### 4.4 Special warnings and precautions for use

The diagnosis of persistent asthma in very young children (6 months – 2 years) should be established by a paediatrician or pulmonologist.

Patients should be advised never to use oral montelukast to treat acute asthma attacks and to keep their usual appropriate rescue medication for this purpose readily available. If an acute attack occurs, a short-acting inhaled  $\beta$ -agonist should be used. Patients should seek their doctors' advice as soon as possible if they need more inhalations of short-acting  $\beta$ -agonists than usual.

Montelukast should not be abruptly substituted for inhaled or oral corticosteroids.

There are no data demonstrating that oral corticosteroids can be reduced when montelukast is given concomitantly.

In rare cases, patients on therapy with anti-asthma agents including montelukast 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 cases usually, but not always, have been associated with the reduction or withdrawal of oral corticosteroid therapy.

The possibility that leukotriene receptor antagonists may be associated with emergence of Churg-Strauss syndrome can neither be excluded nor established. Physicians should be alert to eosinophilia, vasculitic rash, worsening pulmonary symptoms, cardiac complications, and/or neuropathy presenting in their patients. Patients who develop these symptoms should be reassessed and their treatment regimens evaluated.

#### 4.5 Interaction with other medicinal products and other forms of interaction

Montelukast may be administered with other therapies routinely used in the prophylaxis and chronic treatment of asthma. In drug-interactions studies, the recommended clinical dose of montelukast did not have clinically important effects on the pharmacokinetics of the following medicinal products: theophylline, prednisone, prednisolone, oral contraceptives (ethinyl estradiol/norethindrone 35/1), terfenadine, digoxin and warfarin.

The area under the plasma concentration curve (AUC) for montelukast was decreased approximately 40% in subjects with co-administration of phenobarbital. Since montelukast is metabolised by CYP 3A4, caution should be exercised, particularly in children, when montelukast is coadministered with inducers of CYP 3A4, such as phenytoin, phenobarbital and rifampicin.

*In vitro* studies have shown that montelukast is a potent inhibitor of CYP 2C8. However, data from a clinical drug-drug interaction study involving montelukast and rosiglitazone (a probe substrate representative of medicinal products primarily metabolized by CYP 2C8) demonstrated that montelukast does not inhibit CYP 2C8 *in vivo*. Therefore, montelukast is not anticipated to markedly alter the metabolism of medicinal products metabolized by this enzyme (e.g., paclitaxel, rosiglitazone, and repaglinide.)

#### 4.6 Fertility, pregnancy and lactation

##### Use During Pregnancy

Animal studies do not indicate harmful effects with respect to effects on pregnancy or embryonal/foetal development.

Limited data from available pregnancy databases do not suggest a causal relationship between SINGULAIR and malformations (i.e. limb defects) that have been rarely reported in worldwide post marketing experience.

SINGULAIR may be used during pregnancy only if it is considered to be clearly essential.

##### Use During Lactation

Studies in rats have shown that montelukast is excreted in milk (*see section 5.3*). It is not known if montelukast is excreted in human milk.

SINGULAIR may be used in breast-feeding mothers only if it is considered to be clearly essential.

#### 4.7 Effects on ability to drive and use machines

Montelukast is not expected to affect a patient's ability to drive a car or operate machinery. However, in very rare cases, individuals have reported drowsiness or dizziness.

#### 4.8 Undesirable effects

Montelukast has been evaluated in clinical studies in patients with persistent asthma as follows:

- 10 mg film-coated tablets in approximately 4000 adult patients 15 years of age and older
- 5 mg chewable tablets in approximately 1750 paediatric patients 6 to 14 years of age
- 4 mg chewable tablets in 851 paediatric patients 2 to 5 years of age, and
- 4 mg granules in 175 paediatric patients 6 months to 2 years of age.
- Montelukast has been evaluated in a clinical study in patients with intermittent asthma as follows:

- 4 mg granules and chewable tablets in 1038 paediatric patients 6 months to 5 years of age

The following drug-related adverse reactions in clinical studies were reported commonly ( $\geq 1/100$  to  $< 1/10$ ) in patients treated with montelukast and at a greater incidence than in patients treated with placebo:

Body System Class	Adult Patients 15 years and older (two 12-week studies; n=795)	Paediatric Patients 6 to 14 years old (one 8-week study; n=201) (two 56-week studies; n=615)	Paediatric Patients 2 to 5 years old (one 12-week study; n=461) (one 48-week study; n=278)	Paediatric Patients 6 months up to 2 years old (one 6-week study; n=175)
Nervous system disorders	headache	headache		hyperkinesia
Respiratory, thoracic, and mediastinal disorders				asthma
Gastrointestinal disorders	abdominal pain		abdominal pain	diarrhoea
Skin and subcutaneous tissue disorders				eczematous dermatitis, rash
General disorders and administration site conditions			thirst	

With prolonged treatment in clinical trials with a limited number of patients for up to 2 years for adults, and up to 12 months for paediatric patients 6 to 14 years of age, the safety profile did not change.

Cumulatively, 502 paediatric patients 2 to 5 years of age were treated with montelukast for at least 3 months, 338 for 6 months or longer, and 534 patients for 12 months or longer. With prolonged treatment, the safety profile did not change in these patients either.

The safety profile in paediatric patients 6 months to 2 years of age did not change with treatment up to 3 months.

Post-marketing Experience

Adverse reactions reported in post-marketing use are listed, by System Organ Class and specific Adverse Experience Term, in the table below. Frequency Categories were estimated based on relevant clinical trials.

<b>System Organ Class</b>	<b>Adverse Experience Term</b>	<b>Frequency Category*</b>
Infections and infestations	upper respiratory infection <sup>†</sup>	Very Common
Blood and lymphatic system disorders	increased bleeding tendency	Rare
Immune system disorder	hypersensitivity reactions including anaphylaxis	Uncommon
	hepatic eosinophilic infiltration	Very Rare
Psychiatric disorders	dream abnormalities including nightmares, insomnia, somnambulism, irritability, anxiety, restlessness, agitation including aggressive behaviour or hostility, depression	Uncommon
	tremor	Rare
	hallucinations, suicidal thinking and behaviour (suicidality)	Very Rare
Nervous system disorder	dizziness, drowsiness, paraesthesia/hypoesthesia, seizure	Uncommon
Cardiac disorders	palpitations	Rare
Respiratory, thoracic and mediastinal disorders	epistaxis	Uncommon
	Churg-Strauss Syndrome (CSS) (see section 4.4)	Very Rare
Gastrointestinal disorders	diarrhoea <sup>‡</sup> , nausea <sup>‡</sup> , vomiting <sup>‡</sup>	Common
	dry mouth, dyspepsia	Uncommon
Hepatobiliary disorders	elevated levels of serum transaminases (ALT, AST)	Common
	hepatitis (including cholestatic, hepatocellular, and mixed-pattern liver injury).	Very Rare
Skin and subcutaneous tissue disorders	rash <sup>‡</sup>	Common
	bruising, urticaria, pruritus	Uncommon
	angiooedema	Rare
	erythema nodosum	Very Rare
Musculoskeletal, connective tissue and bone disorders	arthralgia, myalgia including muscle cramps	Uncommon
General disorders and administration site conditions	pyrexia <sup>‡</sup>	Common
	asthenia/fatigue, malaise, oedema,	Uncommon
*Frequency Category: Defined for each Adverse Experience Term by the incidence reported in the clinical trials data base: Very Common ( $\geq 1/10$ ), Common ( $\geq 1/100$ to $< 1/10$ ), Uncommon ( $\geq 1/1000$ to $< 1/100$ ), Rare ( $\geq 1/10,000$ to $< 1/1000$ ), Very Rare ( $< 1/10,000$ ).		
<sup>†</sup> This adverse experience, reported as Very Common in the patients who received montelukast, was also reported as Very Common in the patients who received placebo in clinical trials.		
<sup>‡</sup> This adverse experience, reported as Common in the patients who received montelukast, was also reported as Common in the patients who received placebo in clinical trials.		

## 4.9 Overdose

No specific information is available on the treatment of overdose with montelukast. In chronic asthma studies, montelukast has been administered at doses up to 200 mg/day to adult patients for 22 weeks and in short term studies, up to 900 mg/day to patients for approximately one week without clinically important adverse experiences.

There have been reports of acute overdose in post-marketing experience and clinical studies with montelukast. These include reports in adults and children with a dose as high as 1000 mg (approximately 61 mg/kg in a 42 month old child). The clinical and laboratory findings observed were consistent with the safety profile in adults and paediatric patients. There were no adverse experiences in the majority of overdose reports. The most frequently occurring adverse experiences were consistent with the safety profile of montelukast and included abdominal pain, somnolence, thirst, headache, vomiting, and psychomotor hyperactivity.

It is not known whether montelukast is dialyzable by peritoneal- or hemo-dialysis.

## 5 PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

**Pharmacotherapeutic group:** Leukotriene receptor antagonist

**ATC-code:** R03D C03

The cysteinyl leukotrienes (LTC<sub>4</sub>, LTD<sub>4</sub>, LTE<sub>4</sub>) are potent inflammatory eicosanoids released from various cells including mast cells and eosinophils. These important pro-asthmatic mediators bind to cysteinyl leukotriene receptors (CysLT) found in the human airway and cause airway actions, including bronchoconstriction, mucous secretion, vascular permeability, and eosinophil recruitment.

Montelukast is an orally active compound which binds with high affinity and selectivity to the CysLT<sub>1</sub> receptor. In clinical studies, montelukast inhibits bronchoconstriction due to inhaled LTD<sub>4</sub> at doses as low as 5 mg.

Bronchodilation was observed within 2 hours of oral administration. The bronchodilation effect caused by a β-agonist was additive to that caused by montelukast. Treatment with montelukast inhibited both early- and late-phase bronchoconstriction due to antigen challenge. Montelukast, compared with placebo, decreased peripheral blood eosinophils in adult and paediatric patients. In a separate study, treatment with montelukast significantly decreased eosinophils in the airways (as measured in sputum). In adult and paediatric patients 2 to 14 years of age, montelukast, compared with placebo, decreased peripheral blood eosinophils while improving clinical asthma control.

In studies in adults, montelukast, 10 mg once daily, compared with placebo, demonstrated significant improvements in morning FEV<sub>1</sub> (10.4% vs 2.7% change from baseline), AM peak expiratory flow rate (PEFR) (24.5 L/min vs 3.3 L/min change from baseline), and significant decrease in total β-agonist use (-26.1% vs -4.6% change from baseline). Improvement in patient-reported daytime and nighttime asthma symptoms scores was significantly better than placebo.

Studies in adults demonstrated the ability of montelukast to add to the clinical effect of inhaled corticosteroid (% change from baseline for inhaled beclomethasone plus montelukast vs beclomethasone, respectively for FEV<sub>1</sub>: 5.43% vs 1.04%; β-agonist use: -8.70% vs 2.64%).

Compared with inhaled beclomethasone (200 µg twice daily with a spacer device), montelukast demonstrated a more rapid initial response, although over the 12-week study, beclomethasone provided a greater average treatment effect (% change from baseline for montelukast vs beclomethasone, respectively for FEV<sub>1</sub>: 7.49% vs 13.3%; β-agonist use: -28.28% vs -43.89%). However, compared with beclomethasone, a high percentage of patients treated with montelukast achieved similar clinical responses (e.g., 50% of patients treated with beclomethasone achieved an improvement in FEV<sub>1</sub> of approximately 11% or more over baseline while approximately 42% of patients treated with montelukast achieved the same response).

In an 8-week study in paediatric patients 6 to 14 years of age, montelukast 5 mg once daily, compared with placebo, significantly improved respiratory function (FEV<sub>1</sub> 8.71% vs 4.16% change from baseline; AM PEF 27.9 L/min vs 17.8 L/min change from baseline) and decreased "as-needed"  $\beta$ -agonist use (-11.7% vs +8.2% change from baseline).

In a 12-month study comparing the efficacy of montelukast to inhaled fluticasone on asthma control in paediatric patients 6 to 14 years of age with mild persistent asthma, montelukast was non-inferior to fluticasone in increasing the percentage of asthma rescue-free days (RFDs), the primary endpoint.

Averaged over the 12-month treatment period, the percentage of asthma FRDs increased from 61.6 to 84.0 in the montelukast group and from 60.9 to 86.7 in the fluticasone group. The between group difference in LS mean increase in the percentage of asthma RFDs was statistically significant (-2.8 with a 95% CI of -4.7, -0.9), but within the limit pre-defined to be clinically not inferior.

Both montelukast and fluticasone also improved asthma control on secondary variables assessed over the 12 month treatment period:

FEV<sub>1</sub> increased from 1.83 L to 2.09 L in the montelukast group and from 1.85 L to 2.14 L in the fluticasone group. The between-group difference in LS mean increase in FEV<sub>1</sub> was -0.02 L with a 95% CI of -0.06, 0.02. The mean increase from baseline in % predicted FEV<sub>1</sub> was 0.6% in the montelukast treatment group, and 2.7% in the fluticasone treatment group. The difference in LS means for the change from baseline in the % predicted FEV<sub>1</sub> was significant: -2.2% with a 95% CI of -3.6, -0.7.

The percentage of days with  $\beta$ -agonist use decreased from 38.0 to 15.4 in the montelukast group, and from 38.5 to 12.8 in the fluticasone group. The between group difference in LS means for the percentage of days with  $\beta$ -agonist use was significant: 2.7 with a 95% CI of 0.9, 4.5.

The percentage of patients with an asthma attack (an asthma attack being defined as a period of worsening asthma that required treatment with oral steroids, an unscheduled visit to the doctor's office, an emergency room visit, or hospitalization) was 32.2 in the montelukast group and 25.6 in the fluticasone group; the odds ratio (95% CI) being significant: equal to 1.38 (1.04, 1.84).

The percentage of patients with systemic (mainly oral) corticosteroid use during the study period was 17.8% in the montelukast group and 10.5% in the fluticasone group. The between group difference in LS means was significant: 7.3% with a 95% CI of 2.9; 11.7.

In a 12-week, placebo-controlled study in paediatric patients 2 to 5 years of age, montelukast 4 mg once daily improved parameters of asthma control compared with placebo irrespective of concomitant controller therapy (inhaled/nebulized corticosteroids or inhaled/nebulized sodium cromoglycate). Sixty percent of patients were not on any other controller therapy.

Montelukast improved daytime symptoms (including coughing, wheezing, trouble breathing and activity limitation) and nighttime symptoms compared with placebo. Montelukast also decreased "as-needed"  $\beta$ -agonist use and corticosteroid rescue for worsening asthma compared with placebo.

Patients receiving montelukast had more days without asthma than those receiving placebo. A treatment effect was achieved after the first dose.

In a 12-month, placebo-controlled study in pediatric patients 2 to 5 years of age with mild asthma and episodic exacerbations, montelukast 4 mg once daily significantly ( $p \leq 0.001$ ) reduced the yearly rate of asthma exacerbation episodes (EE) compared with placebo (1.60 EE vs. 2.34 EE, respectively), [EE defined as  $\geq 3$  consecutive days with daytime symptoms requiring  $\beta$ -agonist use, or corticosteroids (oral or inhaled), or hospitalization for asthma]. The percentage reduction in yearly EE rate was 31.9%, with a 95% CI of 16.9, 44.1.

Efficacy of montelukast is supported in paediatric patients 6 months to 2 years of age by extrapolation from the demonstrated efficacy in patients 2 years of age and older with asthma, and is based on similar pharmacokinetic data,

as well as the assumption that the disease course, pathophysiology and the medicinal product's effect are substantially similar among these populations.

Significant reduction of exercise-induced bronchoconstriction (EIB) was demonstrated in a 12-week study in adults (maximal fall in FEV<sub>1</sub> 22.33% for montelukast vs 32.40% for placebo; time to recovery to within 5% of baseline FEV<sub>1</sub> 44.22 min vs 60.64 min). This effect was consistent throughout the 12-week study period. Reduction in EIB was also demonstrated in a short term study in paediatric patients 6 to 14 years of age (maximal fall in FEV<sub>1</sub> 18.27% vs 26.11%; time to recovery to within 5% of baseline FEV<sub>1</sub> 17.76 min vs 27.98 min). The effect in both studies was demonstrated at the end of the once-daily dosing interval.

In aspirin-sensitive asthmatic patients receiving concomitant inhaled and/or oral corticosteroids, treatment with montelukast, compared with placebo, resulted in significant improvement in asthma control (FEV<sub>1</sub> 8.55% vs -1.74% change from baseline and decrease in total  $\beta$ -agonist use -27.78% vs 2.09% change from baseline).

## 5.2 Pharmacokinetic properties

### *Absorption.*

Montelukast is rapidly absorbed following oral administration. For the 10-mg film-coated tablet, the mean peak plasma concentration ( $C_{\max}$ ) is achieved 3 hours ( $T_{\max}$ ) after administration in adults in the fasted state. The mean oral bioavailability is 64%. The oral bioavailability and  $C_{\max}$  are not influenced by a standard meal. Safety and efficacy were demonstrated in clinical trials where the 10-mg film-coated tablet was administered without regard to the timing of food ingestion.

For the 5-mg chewable tablet, the  $C_{\max}$  is achieved in 2 hours after administration in adults in the fasted state. The mean oral bioavailability is 73% and is decreased to 63% by a standard meal.

After administration of the 4-mg chewable tablet to paediatric patients 2 to 5 years of age in the fasted state,  $C_{\max}$  is achieved 2 hours after administration. The mean  $C_{\max}$  is 66% higher while mean  $C_{\min}$  is lower than in adults receiving a 10-mg tablet.

The 4-mg granule formulation is bioequivalent to the 4-mg chewable tablet when administered to adults in the fasted state. In paediatric patients 6 months to 2 years of age,  $C_{\max}$  is achieved 2 hours after administration of the 4-mg granules formulation.  $C_{\max}$  is nearly 2-fold greater than in adults receiving a 10-mg tablet. The co-administration of applesauce or a high-fat standard meal with the granule formulation did not have a clinically meaningful effect on the pharmacokinetics of montelukast as determined by AUC (1225.7 vs 1223.1 ng·hr/mL with and without applesauce, respectively, and 1191.8 vs 1148.5 ng·hr/mL with and without a high-fat standard meal, respectively).

### *Distribution.*

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

### *Biotransformation.*

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

*In vitro* studies using human liver microsomes indicate that cytochrome P450 3A4, 2A6 and 2C9 are involved in the metabolism of montelukast. 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. The contribution of metabolites to the therapeutic effect of montelukast is minimal.



*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.

*Characteristics in Patients.*

No dosage adjustment is necessary for the elderly or mild to moderate hepatic insufficiency. Studies in patients with renal impairment have not been undertaken. Because montelukast and its metabolites are eliminated by the biliary route, no dose adjustment is anticipated to be necessary in patients with renal impairment. There are no data on the pharmacokinetics of montelukast in patients with severe hepatic insufficiency (Child-Pugh score >9).

With high doses of montelukast (20- and 60-fold the recommended adult dose), a decrease in plasma theophylline concentration was observed. This effect was not seen at the recommended dose of 10 mg once daily.

### 5.3 Preclinical safety data

In animal toxicity studies, minor serum biochemical alterations in ALT, glucose, phosphorus and triglycerides were observed which were transient in nature. The signs of toxicity in animals were increased excretion of saliva, gastrointestinal symptoms, loose stools and ion imbalance. These occurred at dosages which provided >17-fold the systemic exposure seen at the clinical dosage.

In monkeys, the adverse effects appeared at doses from 150 mg/kg/day (>232-fold the systemic exposure seen at the clinical dose). In animal studies, montelukast did not affect fertility or reproductive performance at systemic exposure exceeding the clinical systemic exposure by greater than 24-fold. A slight decrease in pup body weight was noted in the female fertility study in rats at 200 mg/kg/day (>69-fold the clinical systemic exposure). In studies in rabbits, a higher incidence of incomplete ossification, compared with concurrent control animals, was seen at systemic exposure >24-fold the clinical systemic exposure seen at the clinical dose. No abnormalities were seen in rats. Montelukast has been shown to cross the placental barrier and is excreted in breast milk of animals.

No deaths occurred following a single oral administration of montelukast sodium at doses up to 5000 mg/kg in mice and rats (15,000 mg/m<sup>2</sup> and 30,000 mg/m<sup>2</sup> in mice and rats, respectively), the maximum dose tested. This dose is equivalent to 25,000 times the recommended daily adult human dose (based on an adult patient weight of 50 kg).

Montelukast was determined not to be phototoxic in mice for UVA, UVB or visible light spectra at doses up to 500 mg/kg/day (approximately >200-fold based on systemic exposure).

Montelukast was neither mutagenic in *in vitro* and *in vivo* tests nor tumorigenic in rodent species.

## 6 PHARMACEUTICAL PARTICULARS

### 6.1 List of excipients

Mannitol  
Hyprolose (E 463)  
Magnesium stearate

### 6.2 Incompatibilities

Not applicable.

### 6.3 Shelf life

The shelf-life expiry date of this product shall be the date shown on the sachet and outer package of the product on the market in the country of origin.

#### **6.4 Special precautions for storage**

Store in the original package in order to protect from light and moisture

#### **6.5 Nature and contents of container**

Packaged in polyethylene/aluminum/polyester sachet in over labelled cartons containing 28 sachets.

#### **6.6 Special precautions for disposal of a used medicinal product or waste materials derived from such medicinal product and other handling of the product**

Any unused product or waste material should be disposed of in accordance with local requirements.

### **7 PARALLEL PRODUCT AUTHORISATION HOLDER**

IPS Healthcare Limited  
Sterling House  
501 Middleton Road  
Chadderton, Oldham  
Lancashire OL9 9LY  
United Kingdom

### **8 PARALLEL PRODUCT AUTHORISATION NUMBER**

PPA 1659/29/3

### **9 DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION**

Date of first authorisation: 15<sup>th</sup> of October 2010

### **10 DATE OF REVISION OF THE TEXT**

August 2011