

# **ROFLUMILAST- roflumilast tablet**

## **Zydus Pharmaceuticals USA Inc.**

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### **HIGHLIGHTS OF PRESCRIBING INFORMATION**

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

**ROFLUMILAST tablets, for oral use**

**Initial U.S. Approval: 2011**

### **INDICATIONS AND USAGE**

Roflumilast is a selective phosphodiesterase 4 inhibitor indicated as a treatment to reduce the risk of COPD exacerbations in patients with severe COPD associated with chronic bronchitis and a history of exacerbations. (1, 14)

Limitations of Use:

- Roflumilast is not a bronchodilator and is not indicated for the relief of acute bronchospasm. (1, 14)
- Roflumilast tablets 250 mcg is a starting dose, for the first 4 weeks of treatment only and is not the effective (therapeutic) dose. (2, 14)

### **DOSAGE AND ADMINISTRATION**

- The maintenance dose for patients with COPD is one 500 mcg tablet per day, with or without food. Starting treatment with a dose of roflumilast 250 mcg once daily for 4 weeks and increasing to roflumilast 500 mcg once daily thereafter may reduce the rate of treatment discontinuation in some patients. (2)

### **DOSAGE FORMS AND STRENGTHS**

Tablets: 250 mcg, 500 mcg (3)

### **CONTRAINDICATIONS**

Moderate to severe liver impairment (Child-Pugh B or C) (4)

### **WARNINGS AND PRECAUTIONS**

- Acute Bronchospasm: Do not use for the relief of acute bronchospasm. (5.1)
- Psychiatric Events including Suicidality: Advise patients, their caregivers, and families to be alert for the emergence or worsening of insomnia, anxiety, depression, suicidal thoughts or other mood changes, and if such changes occur to contact their healthcare provider. Carefully weigh the risks and benefits of treatment with roflumilast in patients with a history of depression and/or suicidal thoughts or behavior. (5.2)
- Weight Decrease: Monitor weight regularly. If unexplained or clinically significant weight loss occurs, evaluate weight loss and consider discontinuation of roflumilast. (5.3)
- Drug Interactions: Use with strong cytochrome P450 enzyme inducers (e.g., rifampicin, phenobarbital, carbamazepine, phenytoin) is not recommended. (5.4)

### **ADVERSE REACTIONS**

Most common adverse reactions ( $\geq 2\%$ ) are diarrhea, weight decrease, nausea, headache, back pain, influenza, insomnia, dizziness and decreased appetite. (6.1)

**To report SUSPECTED ADVERSE REACTIONS, contact Zydus Pharmaceuticals (USA) Inc. at 1-877-993-8779 or FDA at 1-800-FDA-1088 or [www.fda.gov/medwatch](http://www.fda.gov/medwatch).**

### **DRUG INTERACTIONS**

Use with inhibitors of CYP3A4 or dual inhibitors of CYP3A4 and CYP1A2 (e.g., erythromycin, ketoconazole, fluvoxamine, enoxacin, cimetidine) will increase roflumilast systemic exposure and may result in increased adverse reactions. The risk of such concurrent use should be weighed carefully against benefit. (7.2)

### **USE IN SPECIFIC POPULATIONS**

Nursing Mothers: Roflumilast should not be used by women who are nursing as excretion of roflumilast and/or its metabolites into human milk is probable and there are no human studies that have investigated effects of roflumilast on breast-fed infants.(8.2)

**See 17 for PATIENT COUNSELING INFORMATION and Medication Guide.**

**Revised: 5/2023**

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## **1 INDICATIONS AND USAGE**

Roflumilast tablets are indicated as a treatment to reduce the risk of COPD exacerbations in patients with severe COPD associated with chronic bronchitis and a history of exacerbations.

### **Limitations of Use**

Roflumilast is not a bronchodilator and is not indicated for the relief of acute bronchospasm.

Roflumilast tablet 250 mcg is a starting dose, for the first 4 weeks of treatment only and is not the effective (therapeutic) dose.

## **2 DOSAGE AND ADMINISTRATION**

The maintenance dose of roflumilast is one 500 micrograms (mcg) tablet per day, with or without food. Starting treatment with a dose of roflumilast 250 mcg once daily for 4 weeks and increasing to roflumilast 500 mcg once daily thereafter may reduce the rate of treatment discontinuation in some patients [see *Clinical Studies (14.1)*]. However, 250 mcg per day is not the effective (therapeutic) dose.

## **3 DOSAGE FORMS AND STRENGTHS**

Roflumilast tablets, 250 mcg are white to off-white, round tablets, debossed with "T6" on one side and plain on other side.

Roflumilast tablets, 500 mcg are white to off-white, round tablets, debossed with "T5" on one side and plain on other side.

## **4 CONTRAINDICATIONS**

The use of roflumilast is contraindicated in the following condition:

Moderate to severe liver impairment (Child-Pugh B or C) [see *Clinical Pharmacology (12.3) and Use in Specific Populations (8.6)*].

## **5 WARNINGS AND PRECAUTIONS**

### **5.1 Treatment of Acute Bronchospasm**

Roflumilast is not a bronchodilator and should not be used for the relief of acute bronchospasm.

### **5.2 Psychiatric Events including Suicidality**

Treatment with roflumilast is associated with an increase in psychiatric adverse reactions. In 8 controlled clinical trials 5.9% (263) of patients treated with roflumilast 500 mcg daily reported psychiatric adverse reactions compared to 3.3% (137) treated with placebo. The most commonly reported psychiatric adverse reactions were insomnia, anxiety, and depression which were reported at higher rates in those treated with roflumilast 500 mcg daily (2.4%, 1.4%, and 1.2% for roflumilast versus 1%, 0.9%, and

0.9% for placebo, respectively) [see *Adverse Reactions (6.1)*]. Instances of suicidal ideation and behavior, including completed suicide, have been observed in clinical trials. Three patients experienced suicide-related adverse reactions (one completed suicide and two suicide attempts) while receiving roflumilast compared to one patient (suicidal ideation) who received placebo. One patient completed suicide while receiving roflumilast in Trial 9 [see *Clinical Studies (14.1)*], which assessed the effect of adding roflumilast to a fixed-dose combination (FDC) of ICS/LABA on rates of exacerbations in COPD patients over 1 year of treatment. Cases of suicidal ideation and behavior, including completed suicide, have been observed in the post-marketing setting in patients with or without a history of depression.

Before using roflumilast in patients with a history of depression and/or suicidal thoughts or behavior, prescribers should carefully weigh the risks and benefits of treatment with roflumilast in such patients. Patients, their caregivers, and families should be advised of the need to be alert for the emergence or worsening of insomnia, anxiety, depression, suicidal thoughts or other mood changes, and if such changes occur to contact their healthcare provider. Prescribers should carefully evaluate the risks and benefits of continuing treatment with roflumilast if such events occur.

### **5.3 Weight Decrease**

Weight loss was a common adverse reaction in roflumilast clinical trials and was reported in 7.5% (331) of patients treated with roflumilast 500 mcg once daily compared to 2.1% (89) treated with placebo [see *Adverse Reactions (6.1)*]. In addition to being reported as adverse reactions, weight was prospectively assessed in two placebo-controlled clinical trials of one year duration. In these studies, 20% of patients receiving roflumilast experienced moderate weight loss (defined as between 5 to 10% of body weight) compared to 7% of patients who received placebo. In addition, 7% of patients who received roflumilast compared to 2% of patients receiving placebo experienced severe (> 10% body weight) weight loss. During follow-up after treatment discontinuation, the majority of patients with weight loss regained some of the weight they had lost while receiving roflumilast. Patients treated with roflumilast should have their weight monitored regularly. If unexplained or clinically significant weight loss occurs, weight loss should be evaluated, and discontinuation of roflumilast should be considered.

### **5.4 Drug Interactions**

A major step in roflumilast metabolism is the N-oxidation of roflumilast to roflumilast N-oxide by CYP3A4 and CYP1A2. The administration of the cytochrome P450 enzyme inducer rifampicin resulted in a reduction in exposure, which may result in a decrease in the therapeutic effectiveness of roflumilast. Therefore, the use of strong cytochrome P450 enzyme inducers (e.g., rifampicin, phenobarbital, carbamazepine, phenytoin) with roflumilast is not recommended [see *Drug Interactions (7.1)* and *Clinical Pharmacology (12.3)*].

## **6 ADVERSE REACTIONS**

The following adverse reactions are described in greater detail in other sections:

- Psychiatric Events Including Suicidality [see *Warnings and Precautions (5.2)*]
- Weight Decrease [see *Warnings and Precautions (5.3)*]

## 6.1 Adverse Reactions in Clinical Studies

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 trials of another drug and may not reflect the rates observed in practice.

The safety data described below reflect exposure of 4,438 patients to roflumilast 500 mcg once daily in four 1 year placebo-controlled trials, two 6 month placebo-controlled trials, and two 6 month drug add-on trials [see *Clinical Studies (14.1)*]. In these trials, 3,136 and 1,232 COPD patients were exposed to roflumilast 500 mcg once daily for 6 months and 1 year, respectively.

The population had a median age of 64 years (range 40 to 91), 73% were male, 92.9% were Caucasian, and had COPD with a mean pre-bronchodilator forced expiratory volume in one second (FEV<sub>1</sub>) of 8.9 to 89.1% predicted. In these trials, 68.5% of the patients treated with roflumilast reported an adverse reaction compared with 65.3% treated with placebo.

The proportion of patients who discontinued treatment due to adverse reaction was 14.8% for roflumilast-treated patients and 9.9% for placebo-treated patients. The most common adverse reactions that led to discontinuation of roflumilast were diarrhea (2.4%) and nausea (1.6%).

Serious adverse reactions, whether considered drug-related or not by the investigators, which occurred more frequently in roflumilast-treated patients include diarrhea, atrial fibrillation, lung cancer, prostate cancer, acute pancreatitis, and acute renal failure.

Table 1 summarizes the adverse reactions reported by  $\geq 2\%$  of patients in the roflumilast group in 8 controlled COPD clinical trials.

**Table 1 Adverse Reactions Reported by  $\geq 2\%$  of Patients Treated with Roflumilast 500 mcg daily and Greater Than Placebo**

Adverse Reactions (Preferred Term)	Treatment	
	Roflumilast (N=4,438) n (%)	Placebo (N=4,192) n (%)
Diarrhea	420 (9.5)	113 (2.7)
Weight decreased	331 (7.5)	89 (2.1)
Nausea	209 (4.7)	60 (1.4)
Headache	195 (4.4)	87 (2.1)
Back pain	142 (3.2)	92 (2.2)
Influenza	124 (2.8)	112 (2.7)
Insomnia	105 (2.4)	41 (1)
Dizziness	92 (2.1)	45 (1.1)
Decreased appetite	91 (2.1)	15 (0.4)

Adverse reactions that occurred in the roflumilast group at a frequency of 1 to 2% where rates exceeded that in the placebo group include:

Gastrointestinal disorders - abdominal pain, dyspepsia, gastritis, vomiting

Infections and infestations - rhinitis, sinusitis, urinary tract infection

Musculoskeletal and connective tissue disorders - muscle spasms

Nervous system disorders - tremor

Psychiatric disorders - anxiety, depression

The safety profile of roflumilast reported during Trial 9 was consistent with the key pivotal studies.

## **6.2 Postmarketing Experience**

The following adverse reactions have been identified from spontaneous reports of roflumilast received worldwide and have not been listed elsewhere. These adverse reactions have been chosen for inclusion due to a combination of seriousness, frequency of reporting or potential causal connection to roflumilast. Because these adverse reactions were reported voluntarily from a population of uncertain size, it is not possible to estimate their frequency or establish a causal relationship to roflumilast exposure: hypersensitivity reactions (including angioedema, urticaria and rash), gynecomastia.

## **7 DRUG INTERACTIONS**

A major step in roflumilast metabolism is the N-oxidation of roflumilast to roflumilast N-oxide by CYP3A4 and CYP1A2 [see *Clinical Pharmacology (12.3)*].

### **7.1 Drugs that Induce Cytochrome P450 (CYP) Enzymes**

Strong cytochrome P450 enzyme inducers decrease systemic exposure to roflumilast and may reduce the therapeutic effectiveness of roflumilast. Therefore the use of strong cytochrome P450 inducers (e.g., rifampicin, phenobarbital, carbamazepine, and phenytoin) with roflumilast is not recommended [see *Warnings and Precautions (5.4) and Clinical Pharmacology (12.3)*].

### **7.2 Drugs that Inhibit Cytochrome P450 (CYP) Enzymes**

The co-administration of roflumilast (500 mcg) with CYP3A4 inhibitors or dual inhibitors that inhibit both CYP3A4 and CYP1A2 simultaneously (e.g., erythromycin, ketoconazole, fluvoxamine, enoxacin, cimetidine) may increase roflumilast systemic exposure and may result in increased adverse reactions. The risk of such concurrent use should be weighed carefully against benefit [see *Clinical Pharmacology (12.3)*].

### **7.3 Oral Contraceptives Containing Gestodene and Ethinyl Estradiol**

The co-administration of roflumilast (500 mcg) with oral contraceptives containing gestodene and ethinyl estradiol may increase roflumilast systemic exposure and may result in increased side effects. The risk of such concurrent use should be weighed carefully against benefit [see *Clinical Pharmacology (12.3)*].

## **8 USE IN SPECIFIC POPULATIONS**

## **8.1 Pregnancy**

### ***Risk Summary***

There are no randomized clinical studies of roflumilast in pregnant women. In animal reproductive toxicity studies, roflumilast administered to pregnant rats and rabbits during the period of organogenesis produced no fetal structural abnormalities. The highest roflumilast dose in these studies was approximately 30 and 26 times, respectively, the maximum recommended human dose (MRHD). Roflumilast induced post-implantation loss in rats at doses greater than or equal to approximately 10 times the MRHD. Roflumilast induced stillbirth and decreased pup viability in mice at doses corresponding to approximately 16 and 49 times, respectively, the MRHD. Roflumilast has been shown to adversely affect pup post-natal development when dams were treated with the drug during pregnancy and lactation periods in mice at doses corresponding to 49 times the MRHD (*see Data*).

The background risk of major birth defects and miscarriage for the indicated population is unknown. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2 to 4% and 15 to 20%, respectively.

### **Clinical Considerations**

#### ***Labor and delivery***

Roflumilast should not be used during labor and delivery. There are no human studies that have investigated effects of roflumilast on preterm labor or labor at term; however, animal studies showed that roflumilast disrupted the labor and delivery process in mice.

### ***Data***

#### ***Animal data***

In an embryo-fetal development study, pregnant rats were dosed orally during the period of organogenesis with up to 1.8 mg/kg/day roflumilast (approximately 30 times the MRHD on an AUC basis). No evidence of structural abnormalities or effects on survival rates were observed. Roflumilast did not affect embryo-fetal development at approximately 3 times the MRHD (on a mg/m<sup>2</sup> basis at a maternal oral dose of 0.2 mg/kg/day).

In a fertility and embryo-fetal development study, male rats were dosed orally with up to 1.8 mg/kg/day roflumilast for 10 weeks and females for two weeks prior to pairing and throughout the organogenesis period. Roflumilast induced pre- and post-implantation loss at doses greater than or equal to approximately 10 times the MRHD (on a mg/m<sup>2</sup> basis at maternal oral doses greater than or equal to 0.6 mg/kg/day). Roflumilast did not cause fetal structural abnormalities at exposures up to approximately 29 times the MRHD (on an AUC basis at maternal oral doses up to 1.8 mg/kg/day).

In an embryo-fetal development study in rabbits, pregnant does were dosed orally with 0.8 mg/kg/day roflumilast during the period of organogenesis. Roflumilast did not cause fetal structural abnormalities at exposures approximately 26 times the MRHD (on a mg/m<sup>2</sup> basis at maternal oral doses of 0.8 mg/kg/day).

In pre- and post-natal developmental studies in mice, dams were dosed orally with up to 12 mg/kg/day roflumilast during the period of organogenesis and lactation. Roflumilast induced stillbirth and decreased pup viability at doses corresponding to approximately

16 and 49 times, respectively, the MRHD (on a mg/m<sup>2</sup> basis at maternal doses > 2 mg/kg/day and 6 mg/kg/day, respectively). Roflumilast induced delivery retardation in pregnant mice at doses greater or equal to approximately 16 times the MRHD (on a mg/m<sup>2</sup> basis at maternal doses > 2 mg/kg/day). Roflumilast decreased pup rearing frequencies at approximately 49 times the MRHD (on a mg/m<sup>2</sup> basis at a maternal dose of 6 mg/kg/day) during pregnancy and lactation. Roflumilast also decreased survival and forelimb grip reflex and delayed pinna detachment in mouse pups at approximately 97 times the MRHD (on a mg/m<sup>2</sup> basis at a maternal dose of 12 mg/kg/day).

## **8.2 Lactation**

### ***Risk Summary***

There is no information regarding the presence of roflumilast in human milk, the effects on the breastfed infant, or the effects on milk production.

Roflumilast and/or its metabolites are excreted into the milk of lactating rats. Excretion of roflumilast and/or its metabolites into human milk is probable. Roflumilast should not be used by women who are nursing.

### ***Data***

#### *Animal data*

Roflumilast and/or its metabolite concentrations measured 8 hours after an oral dose of 1 mg/kg given to lactating rats were 0.32 and 0.02 mcg/g in the milk and pup liver, respectively.

## **8.4 Pediatric Use**

COPD does not normally occur in children. The safety and effectiveness of roflumilast in pediatric patients have not been established.

## **8.5 Geriatric Use**

Of the 4,438 COPD subjects exposed to roflumilast for up to 12 months in 8 controlled clinical trials, 2,022 were > 65 years of age and 471 were > 75 years of age. 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. Based on available data for roflumilast, no adjustment of dosage in geriatric patients is warranted [*see Clinical Pharmacology (12.3)*].

## **8.6 Hepatic Impairment**

Roflumilast 250 mcg once daily for 14 days was studied in subjects with mild-to-moderate hepatic impairment classified as Child-Pugh A and B (8 subjects in each group). The AUCs of roflumilast and roflumilast N-oxide were increased by 51% and 24%, respectively, in Child-Pugh A subjects and by 92% and 41%, respectively in Child-Pugh B subjects, as compared to age-, weight- and gender-matched healthy subjects. The C<sub>max</sub> of roflumilast and roflumilast N-oxide were increased by 3% and 26%, respectively, in Child-Pugh A subjects and by 26% and 40%, respectively in Child-Pugh B subjects, as compared to healthy subjects. Roflumilast 500 mcg has not been studied in



hepatically impaired patients. Clinicians should consider the risk-benefit of administering roflumilast to patients who have mild liver impairment (Child-Pugh A). Roflumilast is not recommended for use in patients with moderate or severe liver impairment (Child-Pugh B or C) [see *Contraindications (4) and Clinical Pharmacology (12.3)*].

## **8.7 Renal Impairment**

In twelve subjects with severe renal impairment administered a single dose of 500 mcg roflumilast, the AUCs of roflumilast and roflumilast N-oxide were decreased by 21% and 7%, respectively and  $C_{max}$  were reduced by 16% and 12%, respectively. No dosage adjustment is necessary for patients with renal impairment [see *Clinical Pharmacology (12.3)*].

## **10 OVERDOSAGE**

### **10.1 Human Experience**

No case of overdose has been reported in clinical studies with roflumilast. During the Phase I studies of roflumilast, the following symptoms were observed at an increased rate after a single oral dose of 2,500 mcg and a single dose of 5,000 mcg: headache, gastrointestinal disorders, dizziness, palpitations, lightheadedness, clamminess and arterial hypotension.

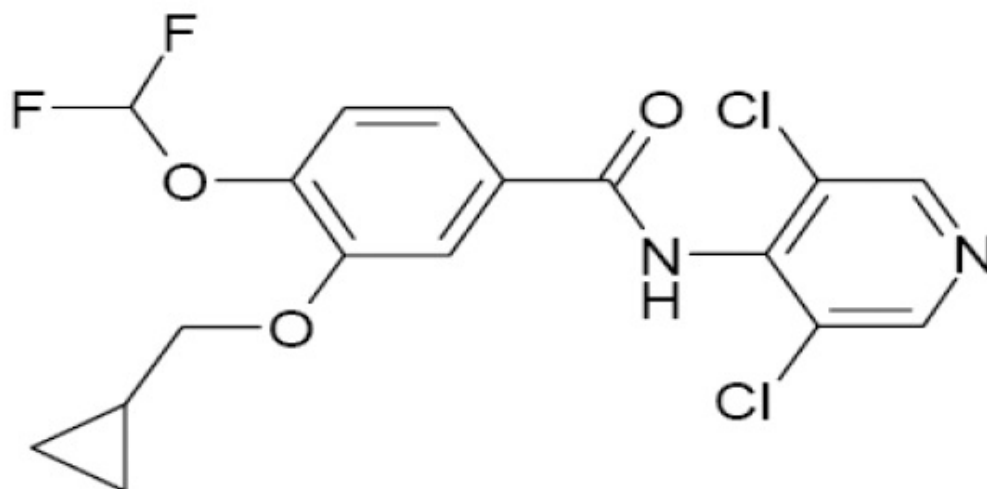
### **10.2 Management of Overdose**

In case of overdose, patients should seek immediate medical help. Appropriate supportive medical care should be provided. Since roflumilast is highly protein bound, hemodialysis is not likely to be an efficient method of drug removal. It is not known whether roflumilast is dialyzable by peritoneal dialysis.

## **11 DESCRIPTION**

The active ingredient in roflumilast tablet is roflumilast. Roflumilast and its active metabolite (roflumilast N-oxide) are selective phosphodiesterase 4 (PDE4) inhibitors. The chemical name of roflumilast is N-(3,5- dichloropyridin-4-yl)-3-cyclopropylmethoxy-4-difluoromethoxy-benzamide. Its molecular formula is  $C_{17}H_{14}Cl_2F_2N_2O_3$  and the molecular weight is 403.22.

The Chemical Structure is:



Roflumilast is white to off-white solid. It is practically insoluble in water and in hexane, sparingly soluble in ethanol and tetrahydrofuran and freely soluble in acetone.

Roflumilast tablets are white to off-white, round tablets, debossed with "T6" for 250 mcg and "T5" for 500 mcg on one side and plain on other side.

Each tablet of roflumilast for oral administration contains the following inactive ingredients: corn starch, colloidal silicon dioxide, low substituted hydroxypropyl cellulose, lactose monohydrate, magnesium stearate, microcrystalline cellulose, poloxamer 407 and pregelatinized starch (corn).

## 12 CLINICAL PHARMACOLOGY

### 12.1 Mechanism of Action

Roflumilast and its active metabolite (roflumilast N-oxide) are selective inhibitors of phosphodiesterase 4 (PDE4). Roflumilast and roflumilast N-oxide inhibition of PDE4 (a major cyclic-3',5'-adenosine monophosphate (cyclic AMP)-metabolizing enzyme in lung tissue) activity leads to accumulation of intracellular cyclic AMP. While the specific mechanism(s) by which roflumilast exerts its therapeutic action in COPD patients is not well defined, it is thought to be related to the effects of increased intracellular cyclic AMP in lung cells.

### 12.2 Pharmacodynamics

In COPD patients, 4 week treatment with roflumilast 500 mcg oral once daily reduced sputum neutrophils and eosinophils by 31% and 42%, respectively. In a pharmacodynamic study in healthy volunteers, roflumilast 500 mcg once daily reduced the number of total cells, neutrophils and eosinophils found in bronchoalveolar lavage fluid following segmental pulmonary lipopolysaccharide (LPS) challenge by 35%, 38% and 73%, respectively. The clinical significance of these findings is unknown.

### 12.3 Pharmacokinetics

#### ***Absorption***

The absolute bioavailability of roflumilast following a 500 mcg oral dose is approximately 80%. Maximum plasma concentrations ( $C_{max}$ ) of roflumilast typically occur approximately one hour after dosing (ranging from 0.5 to 2 hours) in the fasted state while plateau-like maximum concentrations of the N-oxide metabolite are reached in approximately eight hours (ranging from 4 to 13 hours). Food has no effect on total drug absorption, but delays time to maximum concentration ( $T_{max}$ ) of roflumilast by one hour and reduces  $C_{max}$  by approximately 40%, however,  $C_{max}$  and  $T_{max}$  of roflumilast N-oxide are unaffected. An *in vitro* study showed that roflumilast and roflumilast N-oxide did not inhibit P-gp transporter.

### **Distribution**

Plasma protein binding of roflumilast and its N-oxide metabolite is approximately 99% and 97%, respectively. Volume of distribution for single-dose 500 mcg roflumilast is about 2.9 L/kg. Studies in rats with radiolabeled roflumilast indicate low penetration across the blood-brain barrier.

### **Metabolism**

Roflumilast is extensively metabolized via Phase I (cytochrome P450) and Phase II (conjugation) reactions. The N-oxide metabolite is the only major metabolite observed in the plasma of humans. Together, roflumilast and roflumilast N-oxide account for the majority (87.5%) of total dose administered in plasma. In urine, roflumilast was not detectable while roflumilast N-oxide was only a trace metabolite (less than 1%). Other conjugated metabolites such as roflumilast N-oxide glucuronide and 4-amino-3,5-dichloropyridine N-oxide were detected in urine.

While roflumilast is three times more potent than roflumilast N-oxide at inhibition of the PDE4 enzyme *in vitro*, the plasma AUC of roflumilast N-oxide on average is about 10-fold greater than the plasma AUC of roflumilast. *In vitro* studies and clinical drug-drug interaction studies suggest that the biotransformation of roflumilast to its N-oxide metabolite is mediated by CYP1A2 and 3A4. Based on further *in vitro* results in human liver microsomes, therapeutic plasma concentrations of roflumilast and roflumilast N-oxide do not inhibit CYP1A2, 2A6, 2B6, 2C8, 2C9, 2C19, 2D6, 2E1, 3A4/5, or 4A9/11. Therefore, there is a low probability of relevant interactions with substances metabolized by these P450 enzymes. In addition, *in vitro* studies demonstrated no induction of the CYP1A2, 2A6, 2C9, 2C19, or 3A4/5 and only a weak induction of CYP2B6 by roflumilast.

### **Elimination**

The plasma clearance after short-term intravenous infusion of roflumilast is on average about 9.6 L/h. Following an oral dose, the median plasma effective half-life of roflumilast and its N-oxide metabolite are approximately 17 and 30 hours, respectively. Steady state plasma concentrations of roflumilast and its N-oxide metabolite are reached after approximately 4 days for roflumilast and 6 days for roflumilast N-oxide following once-daily dosing. Following intravenous or oral administration of radiolabeled roflumilast, about 70% of the radioactivity was recovered in the urine.

### **Special Populations**

#### *Hepatic Impairment*

Roflumilast 250 mcg once daily for 14 days was studied in subjects with mild-to-moderate hepatic impairment classified as Child-Pugh A and B (8 subjects in each group). The AUC of roflumilast and roflumilast N-oxide were increased by 51% and 24%,

respectively in Child-Pugh A subjects and by 92% and 41%, respectively, in Child-Pugh B subjects, as compared to age-, weight- and gender-matched healthy subjects. The  $C_{max}$  of roflumilast and roflumilast N-oxide were increased by 3% and 26%, respectively, in Child-Pugh A subjects and by 26% and 40%, respectively in Child-Pugh B subjects, as compared to healthy subjects. Roflumilast 500 mcg has not been studied in hepatically impaired patients. Clinicians should consider the risk-benefit of administering roflumilast to patients who have mild liver impairment (Child-Pugh A). Roflumilast is not recommended for use in patients with moderate or severe liver impairment (Child-Pugh B or C) [see *Contraindications (4) and Use in Specific Populations (8.6)*].

### *Renal Impairment*

In twelve subjects with severe renal impairment administered a single dose of 500 mcg roflumilast, roflumilast and roflumilast N-oxide AUCs were decreased by 21% and 7%, respectively and  $C_{max}$  were reduced by 16% and 12%, respectively. No dosage adjustment is necessary for patients with renal impairment [see *Use in Specific Populations (8.7)*].

### *Age*

Roflumilast 500 mcg once daily for 15 days was studied in young, middle aged, and elderly healthy subjects. The exposure in elderly (> 65 years of age) were 27% higher in AUC and 16% higher in  $C_{max}$  for roflumilast and 19% higher in AUC and 13% higher in  $C_{max}$  for roflumilast-N-oxide than that in young volunteers (18 to 45 years old). No dosage adjustment is necessary for elderly patients [see *Use in Specific Populations (8.5)*].

### *Gender*

In a Phase I study evaluating the effect of age and gender on the pharmacokinetics of roflumilast and roflumilast N-oxide, a 39% and 33% increase in roflumilast and roflumilast N-oxide AUC were noted in healthy female subjects as compared to healthy male subjects. No dosage adjustment is necessary based on gender.

### *Smoking*

The pharmacokinetics of roflumilast and roflumilast N-oxide were comparable in smokers as compared to non-smokers. There was no difference in  $C_{max}$  between smokers and non-smokers when roflumilast 500 mcg was administered as a single dose to 12 smokers and 12 non-smokers. The AUC of roflumilast in smokers was 13% less than that in non-smokers while the AUC of roflumilast N-oxide in smokers was 17% more than that in non-smokers.

### *Race*

As compared to Caucasians, African Americans, Hispanics, and Japanese showed 16%, 41%, and 15% higher AUC, respectively, for roflumilast and 43%, 27%, and 16% higher AUC, respectively, for roflumilast N-oxide. As compared to Caucasians, African Americans, Hispanics, and Japanese showed 8%, 21%, and 5% higher  $C_{max}$ , respectively, for roflumilast and 43%, 27%, and 17% higher  $C_{max}$ , respectively, for roflumilast N-oxide. No dosage adjustment is necessary for race.

### *Drug Interactions*

Drug interaction studies were performed with roflumilast and other drugs likely to be coadministered or drugs commonly used as probes for pharmacokinetic interaction [see

*Drug Interactions (7)*]. No significant drug interactions were observed when 500 mcg oral roflumilast was administered with inhaled salbutamol, formoterol, budesonide and oral montelukast, digoxin, theophylline, warfarin, sildenafil, midazolam, or antacids.

The effect of concomitant drugs on the exposure of roflumilast and roflumilast N-oxide is shown in the Figure 1 below.

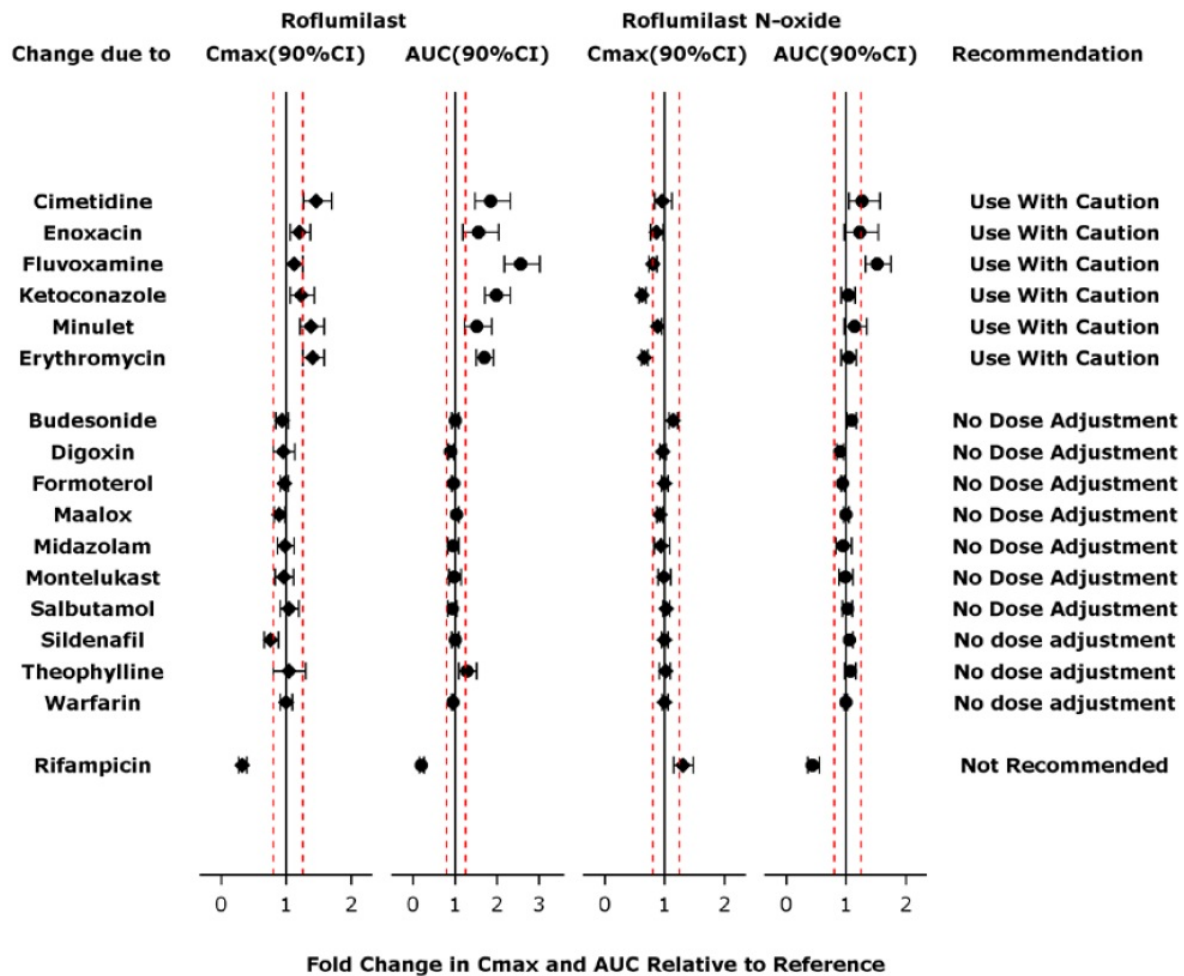


Figure 1. Effect of concomitant drugs on the exposure of roflumilast and roflumilast N-oxide. Note that the dashed lines indicate the lower and higher bounds (0.8 to 1.25) of the 90% confidence interval of the geometric mean ratio of C<sub>max</sub> or AUC for roflumilast or roflumilast N-oxide for Treatment (roflumilast + Coadministered Drug) vs. Reference (roflumilast). The dosing regimens of coadministered drugs was: Midazolam: 2 mg po SD; Erythromycin: 500 mg po TID; Ketoconazole: 200 mg po BID; Rifampicin: 600 mg po QD; Fluvoxamine: 50 mg po QD; Digoxin: 250 mcg po SD; Maalox: 30 mL po SD; Salbutamol: 0.2 mg po TID; Cimetidine: 400 mg po BID; Formoterol: 40 mcg po BID; Budesonide: 400 mcg po BID; Theophylline: 375 mg po BID; Warfarin: 250 mg po SD; Enoxacin: 400 mg po BID; Sildenafil: 100 mg SD; Minulet (combination oral contraceptive): 0.075 mg gestodene/0.03 mg ethinylestradiol po QD; Montelukast: 10 mg po QD

Drug interactions considered to be significant are described in more detail below [see

*Warnings and Precautions (5.4) and Drug Interactions (7)].*

#### *Inhibitors of CYP3A4 and CYP1A2*

##### *Erythromycin:*

In an open-label crossover study in 16 healthy volunteers, the coadministration of CYP3A4 inhibitor erythromycin (500 mg three times daily for 13 days) with a single oral dose of 500 mcg roflumilast resulted in 40% and 70% increase in  $C_{\max}$  and AUC for roflumilast, respectively, and a 34% decrease and a 4% increase in  $C_{\max}$  and AUC for roflumilast N-oxide, respectively.

##### *Ketoconazole:*

In an open-label crossover study in 16 healthy volunteers, the coadministration of a strong CYP 3A4 inhibitor ketoconazole (200 mg twice daily for 13 days) with a single oral dose of 500 mcg roflumilast resulted in 23% and 99% increase in  $C_{\max}$  and AUC for roflumilast, respectively, and a 38% reduction and 3% increase in  $C_{\max}$  and AUC for roflumilast N-oxide, respectively.

##### *Fluvoxamine:*

In an open-label crossover study in 16 healthy volunteers, the coadministration of dual CYP 3A4/1A2 inhibitor fluvoxamine (50 mg daily for 14 days) with a single oral dose of 500 mcg roflumilast showed a 12% and 156% increase in roflumilast  $C_{\max}$  and AUC along with a 210% decrease and 52% increase in roflumilast N-oxide  $C_{\max}$  and AUC, respectively.

##### *Enoxacin:*

In an open-label crossover study in 16 healthy volunteers, the coadministration of dual CYP 3A4/1A2 inhibitor enoxacin (400 mg twice daily for 12 days) with a single oral dose of 500 mcg roflumilast resulted in an increased  $C_{\max}$  and AUC of roflumilast by 20% and 56%, respectively. Roflumilast N-oxide  $C_{\max}$  was decreased by 14% while roflumilast N-oxide AUC was increased by 23%.

##### *Cimetidine:*

In an open-label crossover study in 16 healthy volunteers, the coadministration of a dual CYP 3A4/1A2 inhibitor cimetidine (400 mg twice daily for 7 days) with a single dose of 500 mcg oral roflumilast resulted in a 46% and 85% increase in roflumilast  $C_{\max}$  and AUC; and a 4% decrease in  $C_{\max}$  and 27% increase in AUC for roflumilast N-oxide, respectively.

##### *Oral Contraceptives containing Gestodene and Ethinyl Estradiol:*

In an open-label crossover study in 20 healthy adult volunteers, coadministration of a single oral dose of 500 mcg roflumilast with repeated doses of a fixed combination oral contraceptive containing 0.075 mg gestodene and 0.03 mg ethinyl estradiol to steady state caused a 38% increase and 12 % decrease in  $C_{\max}$  of roflumilast and roflumilast N-oxide, respectively. Roflumilast and roflumilast N-oxide AUCs were increased by 51% and 14%, respectively.

##### *Inducers of CYP enzymes:*

##### *Rifampicin:*

In an open-label, three-period, fixed-sequence study in 15 healthy volunteers,

coadministration of the strong CYP3A4 inducer rifampicin (600 mg once daily for 11 days) with a single oral dose of 500 mcg roflumilast resulted in reduction of roflumilast  $C_{max}$  and AUC by 68% and 79%, respectively; and an increase of roflumilast N-oxide  $C_{max}$  by 30% and reduced roflumilast N-oxide AUC by 56%.

## **13 NONCLINICAL TOXICOLOGY**

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

Long-term studies were conducted in hamsters and mice with roflumilast to evaluate its carcinogenic potential. In 2 year oral gavage carcinogenicity studies, roflumilast treatment resulted in dose-related, statistically significant increases in the incidence of undifferentiated carcinomas of nasal epithelium in hamsters at  $\geq 8$  mg/kg/day (approximately 11 times the MRHD based on summed AUCs of roflumilast and its metabolites).

The tumorigenicity of roflumilast appears to be attributed to a reactive metabolite of 4-amino-3,5-dichloro-pyridine N-oxide (ADCP N-oxide). No evidence of tumorigenicity was observed in mice at roflumilast oral doses up to 12 and 18 mg/kg/day in females and males, respectively (approximately 10 and 15 times the MRHD, respectively, based on summed AUCs of roflumilast and its metabolites).

Roflumilast tested positive in an *in vivo* mouse micronucleus test, but negative in the following assays: Ames test for bacterial gene mutation, *in vitro* chromosome aberration assay in human lymphocytes, *in vitro* HPRT test with V79 cells, an *in vitro* micronucleus test with V79 cells, DNA adduct formation assay in rat nasal mucosa, liver and testes, and *in vivo* mouse bone marrow chromosome aberration assay. Roflumilast N-oxide was negative in the Ames test and *in vitro* micronucleus test with V79 cells.

In a human spermatogenesis study, roflumilast 500 mcg had no effects on semen parameters or reproductive hormones during the 3 month treatment period and the following 3 month off-treatment period. In a fertility study, roflumilast decreased fertility rates in male rats at 1.8 mg/kg/day (approximately 29 times the MRHD on a  $\text{mg}/\text{m}^2$  basis). The male rats also showed increases in the incidence of tubular atrophy, degeneration in the testis and spermiogenic granuloma in the epididymides. No effect on rat fertility rate or male reproductive organ morphology was observed at 0.6 mg/kg/day (approximately 10 times the MRHD on a  $\text{mg}/\text{m}^2$  basis). In a female fertility study, no effect on fertility was observed up to the highest roflumilast dose of 1.5 mg/kg/day in rats (approximately 24 times the MRHD on a  $\text{mg}/\text{m}^2$  basis).

## **14 CLINICAL STUDIES**

### **14.1 Chronic Obstructive Pulmonary Disease (COPD)**

The efficacy and safety of roflumilast in COPD was evaluated in 8 randomized double-blind, controlled, parallel-group clinical trials in 9,394 adult patients (4,425 receiving roflumilast 500 mcg) 40 years of age and older with COPD. Of the 8 trials, two were placebo-controlled dose selection trials (Trials 1 and 2) of 6 months' duration that evaluated the efficacy of roflumilast 250 mcg and 500 mcg once daily, four were placebo-controlled 1 year trials (Trials 3, 4, 5, and 6) primarily designed to evaluate the efficacy of roflumilast on COPD exacerbations, and two were 6 month efficacy trials

(Trials 7 and 8) which assessed the effect of roflumilast as add-on therapy to a long-acting beta agonist or long-acting anti-muscarinic. The 8 trials enrolled patients with nonreversible obstructive lung disease ( $FEV_1/FVC \leq 70\%$  and  $\leq 12\%$  or 200 mL improvement in  $FEV_1$  in response to 4 puffs of albuterol/salbutamol) but the severity of airflow obstruction at baseline was different among the trials. Patients enrolled in the dose selection trials had the full range of COPD severity ( $FEV_1$  30 to 80% predicted); median age of 63 years, 73% male, and 99% Caucasian. Patients enrolled in the four exacerbation trials had severe COPD ( $FEV_1 \leq 50\%$  predicted); median age of 64 years, 74% male, and 90% Caucasian.

Patients enrolled in the two 6 month efficacy trials had moderate to severe COPD ( $FEV_1$  40 to 70% predicted); median age of 65 years, 68% male, and 97% Caucasian. COPD exacerbations and lung function ( $FEV_1$ ) were co-primary efficacy outcome measures in the four 1 year trials. In the two 6 month supportive efficacy trials, lung function ( $FEV_1$ ) alone was the primary efficacy outcome measure.

The two 6 month dose-selection efficacy trials (Trials 1 and 2) explored doses of 250 mcg and 500 mcg once daily in a total of 1,929 patients (751 and 724 on roflumilast 250 and 500 mcg, respectively). The selection of the 500 mcg dose was primarily based on nominal improvements in lung function ( $FEV_1$ ) over the 250 mcg dose. The once-daily dosing regimen was primarily based on the determination of a plasma half-life of 17 hours for roflumilast and 30 hours for its active metabolite roflumilast N-oxide [see *Clinical Pharmacology (12.3)*].

An additional placebo-controlled 1-year trial (Trial 9) evaluated the effect of roflumilast 500 mcg on COPD exacerbations when added to a fixed-dose combination (FDC) product containing an inhaled corticosteroid and long-acting beta agonist (ICS/LABA). At screening, patients were required to have two or more exacerbations in the previous year. This trial randomized a total of 2,354 patients (1,178 randomized to roflumilast, 1,176 to placebo). Approximately 60% of the patients enrolled had severe COPD (postbronchodilator  $FEV_1$  30% to 50% of predicted) associated with chronic bronchitis and 39% had very severe COPD (postbronchodilator  $FEV_1 \leq 30\%$  of predicted) associated with chronic bronchitis; mean age of 64 years, 69% male, and 80% Caucasian. The use of long-acting muscarinic antagonists was allowed.

### *Effect on Exacerbations*

The effect of roflumilast 500 mcg once daily on COPD exacerbations was evaluated in five 1 year trials (Trials 3, 4, 5, 6 and 9).

Two of the trials (Trials 3 and 4) conducted initially enrolled a population of patients with severe COPD ( $FEV_1 \leq 50\%$  of predicted) inclusive of those with chronic bronchitis and/or emphysema who had a history of smoking of at least 10 pack years. Inhaled corticosteroids were allowed as concomitant medications and used in 61% of both roflumilast and placebo-treated patients and short-acting beta agonists were allowed as rescue therapy. The use of long-acting beta agonists, long-acting anti-muscarinics, and theophylline were prohibited. The rate of moderate or severe COPD exacerbations was a co-primary endpoint in both trials. There was not a symptomatic definition of exacerbation in these 2 trials. Exacerbations were defined in terms of severity requiring treatment with a moderate exacerbation defined as treatment with systemic glucocorticosteroids in Trial 3 or systemic glucocorticosteroids and/or antibiotics in Trial 4 and a severe exacerbation defined as requiring hospitalizations and/or leading to death in Trial 3 or requiring hospitalization in Trial 4. The trials randomized 1,176 patients (567



on roflumilast) in Trial 3 and 1,514 patients (760 on roflumilast) in Trial 4. Both trials failed to demonstrate a significant reduction in the rate of COPD exacerbations.

Exploratory analyses of the results of Trials 3 and 4 identified a subpopulation of patients with severe COPD associated with chronic bronchitis and COPD exacerbations within the previous year that appeared to demonstrate a better response in the reduction of the rate of COPD exacerbations compared to the overall population. As a result, two subsequent trials (Trial 5 and Trial 6) were conducted that enrolled patients with severe COPD but associated with chronic bronchitis, at least one COPD exacerbation in the previous year, and at least a 20 pack-year smoking history. In these trials, long-acting beta agonists and short-acting anti-muscarinics were allowed and were used by 44% and 35% of patients treated with roflumilast and 45% and 37% of patients treated with placebo, respectively. The use of inhaled corticosteroids was prohibited. As in trials 3 and 4, the rate of moderate exacerbations (defined as requiring intervention with systemic glucocorticosteroids) or severe exacerbations (defined as leading to hospitalization and/or to death) was a co-primary endpoint.

Trial 5 randomized a total of 1,525 patients (765 on roflumilast) and Trial 6 randomized a total of 1,571 patients (772 on roflumilast). In both trials, roflumilast 500 mcg once daily demonstrated a significant reduction in the rate of moderate or severe exacerbations compared to placebo (Table 2). These two trials provide the evidence to support the use of roflumilast for the reduction of COPD exacerbations.

**Table 2 Effect of Roflumilast on Rate of Moderate or Severe Exacerbations**

Study	Exacerbations Per Patient-Year			RR <sup>2</sup>	95% CI	Percent Reduction <sup>3</sup>
	Roflumilast	Placebo	Absolute Reduction <sup>1</sup>			
Trial 5	1.1	1.3	0.2	0.85	0.74, 0.98	15
Trial 6	1.2	1.5	0.3	0.82	0.71, 0.94	18

1. Absolute reduction measured as difference between placebo and roflumilast-treated patients.

2. RR is Rate Ratio.

3. Percent reduction is defined as 100 (1-RR).

For patients in Trials 5 and 6 who received concomitant long-acting beta agonists or short-acting anti-muscarinics, reduction of moderate or severe exacerbations with roflumilast was similar to that observed for the overall populations of the two trials.

In Trial 9, when added to background therapy of FDC ICS/LABA, the rate ratio for COPD exacerbations among patients administered roflumilast vs. placebo was 0.92 (95% CI 0.81, 1.04).

### *Effect on Lung Function*

While roflumilast is not a bronchodilator, all 1 year trials (Trials 3, 4, 5, and 6) evaluated the effect of roflumilast on lung function as determined by the difference in FEV<sub>1</sub> between roflumilast and placebo-treated patients (pre-bronchodilator FEV<sub>1</sub> measured prior to study drug administration in three of the trials and post-bronchodilator FEV<sub>1</sub>

measured 30 minutes after administration of 4 puffs of albuterol/salbutamol in one trial) as a co-primary endpoint. In each of these trials roflumilast 500 mcg once daily demonstrated a statistically significant improvement in FEV<sub>1</sub> which averaged approximately 50 mL across the four trials. Table 3 shows FEV<sub>1</sub> results from Trials 5 and 6 which had demonstrated a significant reduction in COPD exacerbations.

**Table 3 Effect of roflumilast on FEV<sub>1</sub>**

Study	Change in FEV <sub>1</sub> from Baseline, mL			
	Roflumilast	Placebo	Effect <sup>1</sup>	95% CI
Trial 5	46	8	39	18, 60
Trial 6	33	-25	58	41, 75

<sup>1</sup> Effect measured as difference between roflumilast and placebo treated patients.

Lung function was also evaluated in two 6 month trials (Trials 7 and 8) to assess the effect of roflumilast when administered as add-on therapy to treatment with a long-acting beta agonist or a long-acting anti-muscarinic. These trials were conducted in a different population of COPD patients [moderate to severe COPD (FEV<sub>1</sub> 40 to 70% of predicted) without a requirement for chronic bronchitis or frequent history of exacerbations] from that for which efficacy in reduction of exacerbations has been demonstrated and provide safety support to the roflumilast COPD program.

#### *Starting dose titration trial*

The tolerability of roflumilast was evaluated in a 12-week randomized, double-blind, parallel group trial in patients with severe COPD associated with chronic bronchitis (Trial 10). At screening, patients were required to have had at least one exacerbation in the previous year. A total of 1323 patients were randomized to receive roflumilast 500 mcg once a day for 12 weeks (n=443), roflumilast 500 mcg every other day for 4 weeks followed by roflumilast 500 mcg once a day for 8 weeks (n=439), or roflumilast 250 mcg once a day for 4 weeks followed by roflumilast 500 mcg once a day for 8 weeks (n=441).

Over the 12 week study period, the percentage of patients discontinuing treatment was 6.2% lower in patients initially receiving roflumilast 250 mcg daily for 4 weeks followed by roflumilast 500 mcg daily for 8 weeks (18.4%) compared to those receiving roflumilast 500 mcg daily for 12 weeks (24.6%) (Odds Ratio = 0.66; 95% CI: 0.47 to 0.93; p=0.017). Because this trial was limited to 12 weeks in duration, whether initiation of dosing with roflumilast 250 mcg improves the long term tolerability of roflumilast 500 mcg has not been determined.

## **16 HOW SUPPLIED/STORAGE AND HANDLING**

### **16.1 How Supplied**

Roflumilast tablets, 250 mcg are white to off-white, round tablets, debossed with "T6" on one side and plain on other side and are supplied as:

NDC 68382-624-31 in blister pack of 28 tablets (child-resistant)

NDC 68382-624-83 in cartons of 20 tablets (2 x 10 unit-dose)

Roflumilast tablets, 500 mcg are white to off-white, round tablets, debossed with "T5" on one side and plain on other side and are supplied as:

NDC 68382-969-06 in bottle of 30 tablets with child-resistant closure.

NDC 68382-969-16 in bottle of 90 tablets with child-resistant closure.

## 16.2 Storage and Handling

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

## 17 PATIENT COUNSELING INFORMATION

*Advise the patient to read the FDA-approved patient labeling (Medication Guide).*

- **Bronchospasm**

Roflumilast is not a bronchodilator and should not be used for immediate relief of breathing problems (i.e., as a rescue medication).

- **Psychiatric Events including Suicidality**

Treatment with roflumilast is associated with an increase in psychiatric adverse reactions. Cases of suicidal ideation and behavior, including completed suicide, have been observed in the post-marketing setting in patients with or without a history of depression. The risks and benefits of treatment with roflumilast in patients with a history of depression and/or suicidal thoughts or behavior should be carefully considered. Advise patients, caregivers, and families to be alert for the emergence or worsening of insomnia, anxiety, depression, suicidal thoughts or other mood changes, and if such changes occur to contact their healthcare provider so that the risks and benefits of continuing treatment with roflumilast may be considered [see *Warnings and Precautions (5.2)*].

- **Weight Decrease**

Weight loss was a common adverse reaction in roflumilast clinical trials. During follow-up after treatment discontinuation, the majority of patients with weight loss regained some of the weight they had lost while receiving roflumilast. Advise patients treated with roflumilast to have their weight monitored regularly. If unexplained weight loss occurs, patients should inform their healthcare provider so that the weight loss can be evaluated, as discontinuation of roflumilast may need to be considered [see *Warnings and Precautions (5.3)*].

- **Drug Interactions**

The use of cytochrome P450 enzyme inducers resulted in a reduction in exposure which may result in decreased therapeutic effectiveness of roflumilast. The use of strong cytochrome P450 enzyme inducers (e.g., rifampicin, phenobarbital, carbamazepine, phenytoin) with roflumilast is not recommended [see *Drugs that Induce Cytochrome P450 (CYP) Enzymes (7.1) and Clinical Pharmacology (12.3)*].

Medication Guide available at [www.zyclus.com/medguides](http://www.zyclus.com/medguides) or call 1-877-993-8779.

**Manufactured by:**

## **Cadila Healthcare Ltd.**

Ahmedabad, India.

### **Distributed by:**

## **Zydus Pharmaceuticals (USA) Inc.**

Pennington, NJ 08534

Rev.: 06/22

## **MEDICATION GUIDE**

### **Roflumilast**

**(roe flue' mi last)**

#### **Tablets**

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

#### **What is the most important information I should know about roflumilast tablets?**

**Roflumilast tablets can cause serious side effects.** Tell your healthcare provider right away if you have any of the symptoms listed below while taking roflumilast tablets.

1. **Roflumilast tablets may cause mental health problems including suicidal thoughts and behavior.** Some people taking roflumilast tablets may develop mood or behavior problems including:

- thoughts of suicide or dying
- attempt to commit suicide
- trouble sleeping (insomnia)
- new or worse anxiety
- new or worse depression
- acting on dangerous impulses
- other unusual changes in your behavior or mood

#### **2. Weight loss.**

Roflumilast tablets can cause weight loss. You should check your weight on a regular basis. You will also need to see your healthcare provider regularly to have your weight checked. If you notice that you are losing weight, call your healthcare provider. Your healthcare provider may ask you to stop taking roflumilast tablets if you lose too much weight.

**Roflumilast tablets may affect the way other medicines work, and other medicines may affect how roflumilast tablet works.** Tell your healthcare provider about all the medicines you take, including prescription and non-prescription medicines, vitamins, and herbal supplements.

#### **What are roflumilast tablets?**

Roflumilast tablets are a prescription medicine used in adults with severe Chronic

Obstructive Pulmonary Disease (COPD) to decrease the number of flare-ups or the worsening of COPD symptoms (exacerbations).

**Roflumilast tablets are not a bronchodilator and should not be used for treating sudden breathing problems.** Your healthcare provider may give you other medicine to use for sudden breathing problems. It is not known if roflumilast tablets are safe and effective in children.

### **Who should not take roflumilast tablets?**

#### **Do not take roflumilast tablets if you:**

- have certain liver problems. Talk with your healthcare provider before you take roflumilast tablets if you have liver problems.

### **What should I tell my healthcare provider before taking roflumilast tablets?**

Before you take roflumilast tablets, tell your healthcare provider if you:

- have or have had a history of mental health problems including depression and suicidal behavior.
- have liver problems
- have any other medical conditions
- are pregnant or plan to become pregnant. It is not known if roflumilast tablets will harm your unborn baby. Talk to your healthcare provider if you are pregnant or plan to become pregnant.
- are breastfeeding or plan to breastfeed. It is not known if roflumilast passes into your breast milk. You and your healthcare provider should decide if you will take roflumilast tablets or breastfeed. You should not do both.

### **How should I take roflumilast tablets?**

- Take roflumilast tablets exactly as your healthcare provider tells you to take it.
- Roflumilast tablets can be taken with or without food.
- If you take more than your prescribed dose of roflumilast tablet, call your healthcare provider or go to the nearest hospital emergency room right away.

### **What are the possible side effects of roflumilast tablets?**

#### **Roflumilast tablets can cause serious side effects, including:**

See "**What is the most important information I should know about roflumilast tablet?**"

#### **The most common side effects of roflumilast tablets include:**

- diarrhea
- weight loss
- nausea
- headache
- back pain
- flu like symptoms
- problems sleeping (insomnia)
- dizziness
- decreased appetite

Tell your healthcare provider if you have any side effect that bothers you or that does

not go away.

These are not all the possible side effects of roflumilast tablets.

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

### **How do I store roflumilast tablets?**

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

**Keep Roflumilast Tablets and all medicines out of the reach of children.**

### **General information about roflumilast tablets**

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

This Medication Guide summarizes the most important information about roflumilast tablets. For more information about roflumilast tablets, talk with your healthcare provider. You can ask your healthcare provider or pharmacist for information about roflumilast tablets that is written for health professionals.

Please address medical inquiries to, MedicalAffairs@zydususa.com or Tel.: 1-877-993-8779.

### **What are the ingredients in roflumilast tablets?**

**Active ingredient:** roflumilast

**Inactive ingredients:** corn starch, colloidal silicon dioxide, low substituted hydroxypropyl cellulose, lactose monohydrate, magnesium stearate, microcrystalline cellulose, poloxamer 407 and pregelatinized starch (corn).

Medication Guide available at [www.zydususa.com/medguides](http://www.zydususa.com/medguides) or call 1-877-993-8779.

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

**Manufactured by:**

**Cadila Healthcare Ltd.**

Ahmedabad, India.

**Distributed by:**

**Zydus Pharmaceuticals (USA) Inc.**

Pennington, NJ 08534

Rev.: 06/22

**PACKAGE LABEL.PRINCIPAL DISPLAY PANEL**

NDC 68382-969-06

Roflumilast Tablets, 500 mcg

30 tablets

Rx only

Zydus



Over Coding Template  
No Varnished Area (Do Not Print)  
(18 x 41 mm)

NDC 68382-969-06

# Roflumilast Tablets

## 500 mcg

PHARMACIST: Dispense the Medication Guide provided separately to each patient.

**30 Tablets**  
**Rx only**

Each tablet contains 500 mcg of roflumilast.  
**Dosage:** The recommended dose for adults is one tablet (500 mcg) by mouth once a day. See package insert for full prescribing information.  
**This package is child-resistant.**  
Store at 20°C to 25°C (68°F to 77°F); excursions permitted between 15°C to 30°C (59°F to 86°F) [see USP Controlled Room Temperature].  
**Keep this and all drugs out of the reach of children.**  
Medication Guide available at [www.zydususa.com/medguides](http://www.zydususa.com/medguides) or call 1-877-993-8779.  
Mfg. by: Cadila Healthcare Ltd., Ahmedabad, India  
Dist. by: Zydus Pharmaceuticals (USA) Inc. Pennington, NJ 08534

Rev.: 11/20

NDC 68382-624-31

Roflumilast Tablets, 250 mcg

Blister pack of 28 tablets

Rx only





**Active Ingredient/Active Moiety**

Ingredient Name	Basis of Strength	Strength
ROFLUMILAST (UNII: 0P6C6ZOP5U) (ROFLUMILAST - UNII:0P6C6ZOP5U)	ROFLUMILAST	500 ug

**Inactive Ingredients**

Ingredient Name	Strength
CELLULOSE, MICROCRYSTALLINE (UNII: OP1R32D61U)	
HYDROXYPROPYL CELLULOSE, LOW SUBSTITUTED (UNII: 2165RE0K14)	
LACTOSE MONOHYDRATE (UNII: EWQ57Q8I5X)	
MAGNESIUM STEARATE (UNII: 70097M6I30)	
POLOXAMER 407 (UNII: TUF2IVW3M2)	
SILICON DIOXIDE (UNII: ETJ7Z6XBU4)	
STARCH, CORN (UNII: O8232NY3SJ)	

**Product Characteristics**

Color	WHITE (off-white)	Score	no score
Shape	ROUND	Size	6mm
Flavor		Imprint Code	T5
Contains			

**Packaging**

#	Item Code	Package Description	Marketing Start Date	Marketing End Date
1	NDC:68382-969-06	30 in 1 BOTTLE; Type 0: Not a Combination Product	10/03/2022	
2	NDC:68382-969-16	90 in 1 BOTTLE; Type 0: Not a Combination Product	10/03/2022	

**Marketing Information**

Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date
ANDA	ANDA208303	10/03/2022	

**ROFLUMILAST**

roflumilast tablet

**Product Information**

Product Type	HUMAN PRESCRIPTION DRUG	Item Code (Source)	NDC:68382-624
Route of Administration	ORAL		

Active Ingredient/Active Moiety			
Ingredient Name		Basis of Strength	Strength
ROFLUMILAST (UNII: 0P6C6ZOP5U) (ROFLUMILAST - UNII:0P6C6ZOP5U)		ROFLUMILAST	250 ug

Inactive Ingredients		Strength
Ingredient Name		Strength
CELLULOSE, MICROCRYSTALLINE (UNII: OP1R32D61U)		
HYDROXYPROPYL CELLULOSE, LOW SUBSTITUTED (UNII: 2165RE0K14)		
LACTOSE MONOHYDRATE (UNII: EWQ57Q8I5X)		
MAGNESIUM STEARATE (UNII: 70097M6I30)		
POLOXAMER 407 (UNII: TUF2IVW3M2)		
SILICON DIOXIDE (UNII: ETJ7Z6XBU4)		
STARCH, CORN (UNII: O8232NY3SJ)		

Product Characteristics			
Color	WHITE (off-white)	Score	no score
Shape	ROUND	Size	6mm
Flavor		Imprint Code	T6
Contains			

Packaging				
#	Item Code	Package Description	Marketing Start Date	Marketing End Date
1	NDC:68382-624-83	2 in 1 CARTON	05/18/2023	
1	NDC:68382-624-30	10 in 1 BLISTER PACK; Type 0: Not a Combination Product		
2	NDC:68382-624-31	1 in 1 CARTON	05/18/2023	
2		28 in 1 BLISTER PACK; Type 0: Not a Combination Product		

Marketing Information			
Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date
ANDA	ANDA208303	05/18/2023	

**Labeler** - Zydus Pharmaceuticals USA Inc. (156861945)

**Registrant** - Zydus Pharmaceuticals USA Inc. (156861945)

### Establishment

Name	Address	ID/FEI	Business Operations
Zydus Lifesciences			ANALYSIS (68382-624-68382-060) MANUFACTURE (68382-624-68382-

Revised: 5/2023

Zyus Pharmaceuticals USA Inc.